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Buruli ulcer

Prevention of disability (POD)
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World Health Organization
Objectives of this manual

Health workers should be able to use this manual to:

- understand the importance of an early prevention of disability (POD)
- identify and document the person’s problems
- determine interventions based on identified problems
- provide the needed interventions in order to prevent or minimize disability
- teach the person affected by Buruli ulcer and the family how to do self-care
- monitor the response to the intervention and modify as needed
- refer to other specialized services

Target groups for this manual

GROUP 1 – Health workers starting to practice some POD activities who need a theoretical basis for POD, plus practical guidelines that will help them do a better job and avoid common mistakes.

GROUP 2 – People who provide supervision and training of others in POD.

GROUP 3 – Programme managers at various levels who need to understand that POD services are an essential component in the correct management of Buruli ulcer, even if they are not themselves practitioners.

Implementing POD

The manual will be most helpful if it is used in conjunction with a participatory method of training to develop knowledge and skills.

Periodic supervision will be the key to assuring that POD activities are developed and appropriately implemented.

POD should be integrated within the relevant training and supervision programmes. Specialized POD training can be introduced when health workers have participated in general Buruli ulcer control workshops and have worked with persons affected by Buruli ulcer.
Acknowledgements

CONTRIBUTIONS

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PHOTOS AND ILLUSTRATIONS

- Photo in Figure 2.1 of oedematous plaque with beginning ulceration by Paul Saunderson.
- Photo in Figure 3.1 on participation in sports by Brenda Davidson.
- Photo in Figure 5.1.6 of person affected by Buruli ulcer with a leg amputation by Charles Mensah.
- Photo in Figure 5.1.7 of man with Buruli ulcer lesion by Eric Bafende.
- Wound-healing illustrations in Table 5.2.2 by Hugh Cross.

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Preface

Buruli ulcer was described decades ago in both Australia and Uganda. Buruli County in Uganda – the site of an outbreak of the disease in the 1960s – gave its name to the condition, which is an infection caused by *Mycobacterium ulcerans*. Since 1980, the disease has emerged rapidly in several parts of the world – particularly West Africa – prompting action by the World Health Organization (WHO) in 1998.

In view of the increasing geographical spread, the severe consequences, and the limited knowledge of the disease, the World Health Assembly in 2004 adopted a resolution to improve the surveillance and control of Buruli ulcer and to accelerate research to develop better tools for its control. WHO and its partners have produced a number of publications to facilitate the mobilization and training of health staff in the affected areas.

In developing countries, the persons who are most affected live in remote rural areas with little contact with the health system, and often seek treatment late. In most affected areas, health and rehabilitation services are poorly developed or non-existent. Although mortality from Buruli ulcer is low, the main problem is long-term disability in an estimated 25% of those affected. The scarring process is similar to that in severe burns and often leads to contractures, sometimes resulting in marked disability and deformity. In some severe cases of Buruli ulcer, amputation may be necessary. Stigma may add to the burden of those affected, leading to loss of participation in normal community affairs.

Current strategies for treating Buruli ulcer are antibiotics (a combination of rifampicin and streptomycin/amikacin) to limit the infection; surgery to remove necrotic tissue and restore skin coverage; and interventions to prevent or minimize disabilities. So far, however, not enough attention has been devoted to preventing disability. It is now clear that “prevention of disability” activities must be started in every case of Buruli ulcer – right at the beginning of treatment – if the contractures, stiffness, and weakness so typical of late cases are to be avoided or reversed.

This manual has been developed – after extensive training sessions for health workers in Cameroon and Ghana – to assist Buruli ulcer programme managers, policy-makers, health workers, social workers, and other actors in the field of prevention of disabilities and rehabilitation to implement activities that can reduce suffering and disability. It is also the hope of the authors, WHO, and partners that the implementation of the manual will contribute to strengthening general rehabilitation services in affected areas.

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Buruli ulcer

Prevention of disability (POD)

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Buruli ulcer disability is preventable:
go to hospital without delay!

WITH THE FINANCIAL SUPPORT OF:
Aide aux Lépreux Emmaüs-Suisse
American Leprosy Missions
Association Française Raoul Follereau
Fondation luxembourgeoise Raoul Follereau

http://www.who.int/buruli/en
Introduction
Introduction

Buruli ulcer (BU) can cause permanent disability and deformity, which may severely limit a person’s ability to carry out normal daily activities. The stigma associated with the disease may have the additional effect of greatly restricting the social participation of affected persons. Early detection and adequate medical and surgical treatment are important in helping to minimize future disability. However, there are additional, more specific interventions that can prevent or reduce the disability and deformity caused by BU.

The purpose of this manual is to describe these essential interventions, which can become a normal part of the management of those affected by Buruli ulcer. Prevention of disability (POD) is a process involving health workers, the individuals affected by BU and their families, and communities. This process should start as soon as the diagnosis of Buruli ulcer is made. Rehabilitation aims to reduce the impact of disability, enabling the individual to achieve independence, social integration, and a better quality of life.

POD is an integral part of BU case management, and has three main objectives:

1. to maintain or improve skin conditions to prevent soft tissue (ligament, tendon, and muscle) contractures, which can lead to joint contractures and deformity (soft tissue and joints require good “antideformity” positioning and early mobilization before and after surgical excision and during the wound-healing process);

2. to minimize or reduce oedema, infection, pain, adhesions, and thick scarring during the wound-healing process; and

3. to encourage, enable, and empower persons affected by BU to maintain or improve their ability to perform everyday activities and participate in family, educational, work, and community activities.

KEY POINTS

- Prevention of disability (POD) is an essential component in Buruli ulcer (BU) case management.

- The implementation of essential POD interventions requires initial orientation, followed by continued on-the-job training under supervision, to develop the knowledge and skills of the health team.

- This POD manual will be most helpful if used in conjunction with a participatory method of training.
Health workers need knowledge, skills, resources, and support to:

- assess and monitor the individual’s physical impairments, activity limitations, and participation restrictions;
- document assessment results;
- analyse assessment results and determine priority interventions;
- document the specific interventions used;
- monitor the results of interventions;
- monitor and care for wounds;
- position and splint the body and limbs correctly to prevent complications and facilitate function;
- control oedema;
- manage scars and adhesions through massage, compression, exercise, and appropriate activity;
- mobilize joints early on, with exercise and age-appropriate activities, to maintain joint flexibility and facilitate function;
- teach self-care knowledge and skills to those affected by BU and their families, to enable them to practise self-care;
- adapt objects and instruments to facilitate active participation in activities of daily living (ADL) and other age-appropriate activities in the hospital and at home;
- empower those affected by BU and their families to find solutions to their problems; and
- identify individuals affected by BU who need to be referred for specialized rehabilitation interventions and know where and how to refer them.

![Figure 1.1 POD goals, interventions, and results – integrated within Buruli ulcer management](image-url)
Buruli ulcer disease

Chapter 2

Epidemiology and transmission
Clinical manifestations and diagnosis
Treatment
The following information is summarized from the manual "Buruli ulcer – management of Mycobacterium ulcerans disease," published by the World Health Organization (WHO) in 2001. For more detailed information, please read that manual, or contact WHO by e-mail at buruli@who.int, or visit the WHO web site at www.who.int/gtb-buruli.

Epidemiology and transmission

The prevalence of the disease is not accurately known. The disease exists or is suspected in over 30 countries, but the majority of cases occur in West Africa. Buruli ulcer is caused by a slow-growing, environmental mycobacterium called *Mycobacterium ulcerans*, whose toxin causes tissue necrosis.

The disease is more severe in impoverished people living in remote rural areas. Children under the age of 15 years make up more than 50% of those affected. Mortality due to the disease is low but morbidity (disability and deformity) is high. Some of the complications of the disease are secondary bacterial infection, extensive scarring, contractures, deformities to the limbs, amputations, and involvement of the eye, breast, and genitalia. In some areas, 20–25% of those with healed lesions are reported to have disability causing long-term socioeconomic burdens.

The disease occurs most frequently among people who live or work close to rivers and slow-moving bodies of water. The construction of irrigation systems and dams seems to have influenced the resurgence of the disease. The mode of transmission is unknown, although some evidence suggests that aquatic insects (*Naucoris* and *Dyplonychus*) may be involved, and that trauma to contaminated skin may be one of the means by which the organism enters the body.
the means by which the organism enters the body. Health education programmes encourage communities to identify the disease early by the detection of nodules, and to care for wounds and injuries by washing and dressing them. In addition, individuals are encouraged to protect their bodies against injury by wearing appropriate clothing and shoes or boots.

**Clinical manifestations and diagnosis**

The disease manifests itself as papules, nodules, plaques, ulcers, and oedematous areas of the skin (Figure 2.1). A new case is a person with no previous history of treatment for Buruli ulcer. A recurrent case is a person presenting within one year with a further lesion at the same site or at a different site. Recurrence rates after surgical treatment are 16% for persons presenting early and 28% for persons presenting late. Recurrence at the same site may be due to inadequate excision. Recurrence at a different site may be due to haematogenous or lymphatic spread.

Initially, there is a non-ulcerative phase which, if untreated, will usually progress to an ulcerated phase. Both phases end with a scar – the complications of which will depend on the location and extent of the lesion, and wound-management techniques. In addition, individual healing factors and the surgical technique used for the removal of necrotic tissues and skin grafting will influence the type and extent of scar formation (Figure 2.2).
Figure 2.2 Example of scars limiting function and causing deformity

Scarring following ulcerated lesions

- Limited eye closure (lid gap)
- Limited elbow extension and flexion
- Deviation of the trunk
- Deviation of the hand
- Deviation of the foot
- Limited knee extension and foot dorsiflexion
In a known endemic area, an experienced health worker can make a diagnosis of BU based on clinical observation that considers the following clinico-epidemiological features:

- The person lives in or has travelled to a known endemic area;
- Most cases are in children under 15 years of age;
- About 85% of lesions are on the limbs; lower-limb lesions are twice as common as upper-limb lesions.

In addition to the clinical diagnosis, at least one of the following laboratory findings is required to confirm the diagnosis of BU:

- Acid-fast bacilli (AFB) in a smear stained by the Ziehl-Neelsen technique;
- Histopathological study of a biopsy specimen showing typical necrosis and acid-fast bacilli;
- Positive polymerase chain reaction (PCR) test for *M. ulcerans*; and/or
- Positive culture of *M. ulcerans*.

**Treatment**

Recent research and clinical experience have shown that a combination of rifampicin and an aminoglycoside (streptomycin or amikacin) given for eight weeks is promising in the management of *M. ulcerans* disease. In early cases, it may be curative. In more advanced cases, such treatment probably reduces the area that will require subsequent surgical excision.

Prior to surgical management of the lesions, POD interventions such as correct antideformity positioning, splinting, controlling oedema, movement, and active exercising should be started — these interventions must not be delayed until surgical excision of the lesions.

Limited supplies of drugs, lack of surgical experience, inadequate surgical facilities, poor wound management, delays in skin grafting, prolonged hospitalization, high treatment costs, and the risk of recurrence after surgical treatment are the practical difficulties that may affect the provision and uptake of treatment.

**Review questions**

1. What causes Buruli ulcer?
2. In which countries is Buruli ulcer found?
3. How is Buruli ulcer transmitted?
4. How is Buruli ulcer diagnosed and classified?
5. What are the early signs of Buruli ulcer?
6. What is the treatment for Buruli ulcer?
Concepts in prevention of disability and rehabilitation

International Classification for Functioning, Disability and Health
Prevention of disability (POD) Rehabilitation Responsibility and teamwork

Chapter 3
buruli ulcer often starts as a nodule. Ulceration of the lesions and occasional involvement of the bone are seen in late cases. Following excision, soft tissues contract during the healing process. In most cases, muscles and joints are not directly involved but can become affected if soft tissue contractures develop, limiting movement and activity. These complications can limit an individual’s ability to carry out normal daily activities and restrict social participation.

The goal of rehabilitation is to maintain or restore function. This may require those affected to learn new ways of going about their activities and to adapt their environment or work instruments to enable participation. The International Classification of Functioning, Disability and Health, developed by the World Health Organization, helps to more adequately describe the impact of BU on body structure and function, as well as its impact on the individual’s activities and participation.

International Classification for Functioning, Disability and Health (IFC)

The ICF provides a framework for coding information about health and disability. Communications about health and health care across the world can use a language that is uniform and standard among various disciplines and sciences. The ICF focuses on the “consequences of a disease or other health condition” and describes the impact it has on the body, the individual, and society in relation to body functions and structures, activities, and participation (Figure 3.1).
Concepts in prevention of disability and rehabilitation

**Health condition (disorder or disease)**

- **Body function and structures**
  - mobility of the joints and muscle power
- **Activity**
  - preparing meals
- **Participation**
  - engaging in the sport of basketball

**Environmental factors**

**Personal factors**


Table 3.1

<table>
<thead>
<tr>
<th>FUNCTIONING COMPONENTS</th>
<th>DISABILITY COMPONENTS</th>
<th>CONTEXTUAL FACTORS</th>
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<tr>
<td>Body functions</td>
<td>Impairments</td>
<td>Environmental factors</td>
</tr>
<tr>
<td>The physiological functions of body systems (including psychological functions).</td>
<td>Problems in body function or structure, such as a significant deviation or loss.</td>
<td>The physical, social and attitudinal environment in which people live and conduct their lives. This includes: products and technology, natural environment and human-made changes to the environment, supports and relationships, attitudes, etc.</td>
</tr>
<tr>
<td>Body structures</td>
<td>Activity limitations</td>
<td>Personal factors</td>
</tr>
<tr>
<td>Anatomical parts of the body such as organs, limbs and their components.</td>
<td>Difficulties an individual may have executing activities.</td>
<td>Attributes of the person such as age, race, gender, social status, life experiences, education, character style, habits, copying styles, etc.</td>
</tr>
<tr>
<td>Activity</td>
<td>Participation restrictions</td>
<td></td>
</tr>
<tr>
<td>The execution of a task or action by an individual.</td>
<td>Problems an individual may experience in involvement in life situations.</td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement in a life situation.</td>
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</table>

The ICF includes personal and environmental factors that affect functioning (body functions, activities, and participation) and disability (impairments, activity limitations, or participation restrictions). More details about this classification can be obtained through the WHO web site: www.who.int/classification/icf.

In summary, the ICF is:
- a framework for reporting health information using a uniform and standard language;
- able to describe the consequences or impact of disease or a health condition on the person’s functioning or disablement;
- a classification for determining functioning and disablement; and
- able to classify impairments, activity limitations, and participation restrictions within the context of a person’s environmental and personal situation.

Prevention of disability (POD)

Disability in Buruli ulcer can be prevented or minimized through early diagnosis, antibiotic treatment, and surgical excision, together with adequate management of skin, soft tissues (tendon, ligament, muscle), and joints during the wound-healing process. POD in Buruli ulcer is a process by which actions are taken to prevent or minimize complications that can cause disability. This may include physical, socioeconomic, psychological, spiritual, environmental, and personal areas. (Figure 3.2)
Rehabilitation

The United Nations Development Programme uses the following operational definition of rehabilitation.

Rehabilitation includes all measures aimed at reducing the impact of disability for an individual, enabling him or her to achieve independence, social integration, a better quality of life and self-actualization.

Rehabilitation includes not only the training of disabled people but also interventions in the general systems of society, adaptations of the environment and protection of human rights.

Protection of human rights is an obligation for the authorities of each country, for its communities and for every citizen. Disabled people shall have the same rights to a life in dignity as others, and there must be no exceptions. Special attention may be needed to ensure the following: access to health and social services; to educational and work opportunities; to housing, transportation and to buildings; to information; to cultural and social life, including sports and recreational facilities; to representation and full political involvement in all matters of concern to them.

Responsibility and teamwork

POD is a process that involves the affected person, the family, the community, and all health professionals working together to prevent and minimize the problems associated with Buruli ulcer. It requires early and continuous intervention to maintain or improve quality of life. Empowerment of the person and the family is essential.

Review questions

1. What is the International Classification for Functioning, Disability and Health (ICF)?
2. How does BU impact functioning and disablement?
3. When can POD interventions start?
4. What is the aim of rehabilitation?
5. Who is responsible for POD and rehabilitation?
Assessment and documentation

Assessment of the person affected by BU and documentation of the findings

Chapter 4
Assessment of the person affected by BU is important for identifying problems and needs, which leads to planning interventions. Two models of assessment forms are included in Annexes 1 and 2. Annex 1 was developed with health workers in the Ashanti region of Ghana in 2003, and Annex 2 was developed later for Cameroon. These forms can be adapted to the local situation.

Careful assessment of each person’s problems will help the health worker choose which interventions are needed to best prevent disability. Documentation of assessment results will help the health worker to monitor interventions to see if the desired results are being obtained.

Routine periodic reassessments should be scheduled. During the physical assessment process, it is important to hear the person’s complaints and expectations of treatment. Following the assessment, the person should be informed of the results and proposed interventions (including the benefits, the risks, the amount of time for hospitalization, and special care requirements).

Treatment should be holistic, considering not only physical impairments and difficulties but also psychological functioning and social situation. Effective communication helps to minimize the anxieties of the person and the family, and helps them see the importance of their collaboration.

Assessment of BU patients and documentation of the findings

A POD patient assessment form was developed and initially tested during the Ashanti Region POD/Rehabilitation Workshop in 2003. This
example will be used in this manual to illustrate how to fill out an assessment form. The form (Figure 4.1) allows the health worker to document the person’s lesion sites, impairments, limitations with daily activities, and restrictions in social participation.

Following the identification of problems, the health worker chooses which interventions are indicated and describes the intervention to be implemented. This documentation helps in monitoring the results of the chosen interventions and in informing other health workers of problems and interventions.

Additional forms have been developed to monitor oedema in the upper and lower limbs (Annex 3). A range of motion (ROM) assessment form (Annex 4) was developed to document goniometric readings of the most frequently involved joints of the upper and lower limbs. The ROM form can be used to record passive and active measurements – the most helpful are passive measurements. Health workers may find the documentation of ROM is more easily done by drawing the angles of the joints on paper and dating each drawing. This approach helps the health worker and the affected person to see the changes in joint movement (Figure 4.2).

Figure 4.1 Buruli ulcer patient’s POD assessment form – Ashanti region, Ghana
Buruli ulcer patient’s POD assessment form – Ashanti region, Ghana

**General information**
Fill in the person’s name, clinical record number (No.), address to be used for future contact, the village or city where the person lives, the district and region, and the age at time of assessment. The sex (gender) of the person is identified by placing an X in the box marked M for male or F for female. The disease classification is marked with an X in the box labelled **new case** (i.e. no previous history of or treatment for Buruli ulcer) or **recurrent case** (i.e. presenting within one year with a further lesion at the same site or at a different site). Fill in the **level of education** completed and the **occupation** prior to being diagnosed with Buruli ulcer. In addition, include the current status: for example, if a student – is the individual still going to school or not? or if a worker – is the individual working or unemployed – or, more generally, has the individual been required to change occupation or to retire because of the disease?). Each assessment form should include the date the POD assessment was completed, including the day (dd), month (mm) and year (yy).

**Body chart design**
The location and extent of the Buruli ulcer lesions should be carefully drawn in. This information is important for determining the parts of body involved, information that is useful for interventions involving splints and pressure garments.
Location of lesion

An X is placed under R (right side), L (left side), or under both sides, at the location of the lesion (head and neck, thorax, back, abdomen, buttocks and perineum, upper limbs, lower limbs).

Impairments (problems and complications)

An X is placed under R (right side), L (left side), or under both sides, if a problem or complication is identified. Active (AROM) and passive (PROM) range of motion is most easily determined by the health worker. The angles of the joints are recorded on a separate piece of paper, using different colour marking pens for each assessment date (see example, Figure 4.2). Care needs to be taken that the same position is used each time. The results can be observed by the patient, so that progress can be seen.

Measurement of pain

Pain can be recorded on a numerical scale, using the following method. The person marks on a line from “no pain” to “maximum pain”, and the position of the mark is measured with a 10-centimetre ruler. Both the pain experienced at the time of the assessment, and the greatest pain experienced within the last 24 hours, should be recorded. The person should indicate with

- the pain level currently being experienced (current pain), and mark the line with an X to indicate the maximum amount of pain experienced within the last 24 hours (greatest pain). Maximum or severe pain is that pain which is constant and interferes with the person’s normal daily activities (see Figures 4.3.1, 4.3.2, 4.3.3 and Annex 5). A colour pain scale is usually more easily understood by both adults and children.
Measurement of wound size

Detailed measurements can be taken on separate pieces of paper to record wound size (Figure 4.4), areas and degree of sensory loss, and the degree of muscle weakness (functional motor test).

Oedema control measurement of the upper and lower limbs

The most accurate way to measure oedema is with a volumeter. The limb is submerged in a standard-size container with a standard quantity of water and the displaced water is measured. If a volumeter is used, care needs to be given to proper cleaning of the container between patients. This manual, however, describes a simpler technique using a measuring tape or a cord to record measurements. Periodic measurements are taken at the same locations, in order to permit comparison with earlier measurements. Additional assessment forms are included in this manual for recording oedema in the upper and lower limbs (Annex 3). Care must be taken not to position the measuring tape at an angle or pull the tape too tightly (Figures 4.5.1, 4.5.2 and 4.5.3).
Measurements can be taken using string and/or a measuring tape. Improvement can be monitored by comparing measurements.

**Figure 4.5.3** Drawing oedema measurements
Range of motion measurements

Range of motion (ROM) measurements are most accurately taken using a goniometer (Figure 4.6.1). Passive and active joint range of motion goniometric measurement forms can be found in Annex 4. Joint angles should be measured both passively (the health worker makes the movement of the affected individual’s joint to its fullest capacity) and actively (the individual makes the movement). Joint angles can also be measured and monitored with paper drawings; this technique is recommended for the field (Figure 4.6.2).

Documentation of activity limitations, participation restrictions, and other

Activity limitation

This section of the form should document the individual’s perceived difficulties with daily activities because of Buruli ulcer – described by either the individual or the caregiver. A direct assessment of functional limitation can be made using the Buruli Ulcer Functional Limitation Score (BUFLS) included in Annex 6.

Participation restriction

This section of the form describes the problems that the individual perceives as being experienced with family, other relationships, school, work, and community because of Buruli ulcer. Assessment of participation restriction is possible by using the participation scale (P-scale), which is included in Annex 7.

Other

Explain any other problem or difficulty that the individual describes or that you observe.
Figure 4.6.2 Monitoring ROM with paper drawings

- Measure with goniometer
- Draw goniometer on paper
- Compare ROM changes
- Position and draw the ROM
- Comparison of goniometer, drawn angle and antideformity splint position
Assessment and documentation

Documentation of indicated POD interventions

Following identification of the problems, the health worker will decide on the POD interventions needed to resolve the impairment, activity limitation, or participation restriction that has been recorded. The intervention methods and frequency should be described.

By marking the “urgent” column of the form with an X, all staff will know that this intervention is of high priority to prevent or minimize impairment and disability. When the health worker initials and dates the form with the notation “successfully completed”, others will know that the intervention has been completed and is now no longer needed.

The assessor, other health workers, and the family should clearly know how to follow up and reinforce routine interventions and how to do them correctly (specific treatment techniques are described in Chapter 5 of this manual). This form should permit the supervisor and others to monitor the interventions.

Periodic assessment helps to determine if the condition of the person affected by BU is the same, better, or worse, and whether the chosen interventions are achieving the desired results. If improvement is not seen, either modification of the intervention or referral may be necessary.

The health worker should listen carefully to the complaints of the affected person and the family’s observations of his or her difficulties during activities of daily living. The health worker should ask whether the person may be experiencing difficulties in participation in school, job, or family and community activities because of the disease.

The results of interventions can depend on the following factors:
- accessibility to health services which include POD;
- the family’s socioeconomic situation and support;
- appropriately-selected and correctly-applied POD interventions;
- the knowledge and expectations of the person and the family about POD interventions;
- interest, motivation, and ability to learn; and
- skills and resources to practise what is taught.

Review questions

1. Why do you need to document the assessment findings and interventions?
2. How do you choose which intervention(s) to use?
3. How do others know which POD interventions are needed?
4. How do you know if the person affected by BU is getting better or worse?
5. What influences the outcome of the POD interventions?
Essential interventions to prevent or minimize disability

Chapter 5

Essential interventions 1, 2, 3, 4, 5, 6, 7, 8

Remember the essential interventions to be implemented early | Summary of common problems with the indicated intervention
Early and adequate implementation of POD interventions should prevent or minimize the disabling physical, psychological, and social effects of Buruli ulcer. The best ways to minimize the risks of skin and soft tissue impairments are by:

1. Diagnosing and treating the disease early;
2. Providing adequate surgical excision and skin grafting;
3. Providing adequate wound care, including appropriate non-restrictive dressings and adequate antideformity positioning; and
4. Promoting early movement and participation in everyday activities.

POD interventions should be chosen on the basis of the problems identified on the patient assessment form. Following the assessment, the affected person should be informed of the results and the proposed interventions.

Effective communication helps to minimize anxiety and promotes collaboration. Treatment should be holistic, considering not only physical impairments and difficulties but also psychological functioning and the social situation.

The following are the essential POD interventions that need to be implemented early:

1. Health education and self-care
2. Wound management
3. Oedema control
4. Scar management and control
5. Positioning and splinting
6. Management of pain
7. Exercise and activity
8. Adaptations in activities of daily living

**KEY POINTS**

- Early and correctly applied interventions can prevent or minimize the disabling physical, psychological, and social effects of Buruli ulcer.
- One of the most commonly observed problems at present is the incorrect positioning and splinting of the hand or foot after surgery or after a dressing change.
- The only time when active and passive movement of a joint must be stopped is during the period (5–10 days) after skin grafting.
- Prior to skin grafting and after the graft has taken, daily exercise of the affected part is essential.
- Complex interventions are generally needed when diagnosis is late and complications have already occurred. These interventions may require more specialized services.
- POD and rehabilitation achieve the best results when there is full and willing participation by the affected individual, the family, the community, and the medical health workers.
Common problems observed with interventions used to manage Buruli ulcer

Currently, much of the disability seen with Buruli ulcer is caused by the fact that most of the essential interventions are not being implemented, are being implemented too late, or are being implemented incorrectly. Training and supervision can ensure that health workers living close to the person’s home can perform the essential interventions. It is important that specialists and referral hospitals understand the importance of implementing these basic POD interventions and collaborate in teaching the staff of surrounding health centres.

Some of the common problems causing disability are:
- inadequate wound management causing delays in healing and increasing fibrosis;
- restrictive bandaging;
- poor antideformity positioning;
- pain;
- oedema;
- infection;
- excessively dry scars;
- hypertrophic and keloid scars;
- adhesions;
- fibrosis causing shortening of all types of soft tissue;
- restricted movement of the involved body part, including adjacent non-affected parts; and
- limited participation in self-care and ADL.

Figure 5.0.1 Complications of Buruli ulcer and the consequences of late and/or inadequate POD interventions
All of these problems contribute to the development of deformity and disability (Figure 5.0.1). Therefore, the control of pain, oedema, infection, and scarring during wound care, along with early interventions to maintain antideformity positioning, early joint movement and exercise, can prevent many of the deformities that contribute to disability and stigma. Health education can encourage those with BU to participate in their own self-care activities during prolonged hospitalization, improving self-confidence and responsibility for self. This approach also decreases apathy, depression, and fear.

The goal of POD in Buruli ulcer is to lessen deformity and disability (Figure 5.0.2). Essential POD interventions are addressed in detail below. At the end of this chapter, problems and impairments are listed with their treatment objectives and POD interventions summarized (Table 5.0.1).

### Prevention of disability (POD)

<table>
<thead>
<tr>
<th>POD GOALS</th>
<th>POD INTERVENTIONS</th>
<th>POD RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>control infection and necrosis</td>
<td>wound care – antideformity – positioning – elevation – compression</td>
<td>less disability</td>
</tr>
<tr>
<td>maintain or improve joint movement</td>
<td>lubricate skin – massage soft tissue – stretch joints through exercises and activity – participation in activities of daily living</td>
<td></td>
</tr>
<tr>
<td>minimize pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>control oedema</td>
<td></td>
<td></td>
</tr>
<tr>
<td>minimize scarring fibrosis adhesion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>participate in daily activities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Figure 5.0.2 POD goals, interventions, and results integrated within Buruli ulcer management](burululcer_ok_25/02/06_22:06_Page_30)
Health education bridges the gap between health information and behaviour. The person affected by BU must have the knowledge, skills, resources, and support to practise self-care every day. This practice will help to minimize impairments and disability. A quotation from Confucius reminds us that:

To hear is to forget,
To see is to remember,
To do is to know and understand.

Because affected persons have correct knowledge, it may not mean that they will change their behaviour to practise good self-care. Information is not sufficient for change, but change is dependent upon providing a learning experience.

The most effective way for the health worker to teach people about self-care is by doing it with them. Observation of those practising self-care, exercise, and other activities permits the health worker to know what has been learnt. It also permits adjustments or corrections to their programmes. The health worker will also know if the affected persons are practising at home – because if they are, they should show improvements when reassessed.

Empowering affected individuals to take responsibility for their POD programme will improve self-esteem and confidence. When people feel that they have little control, they also have a feeling of helplessness – frequently resulting in depression and apathy. Health education teaches knowledge and skills, which give affected persons more control over their own situations, thus reversing some of these negative feelings.
Summary of patient education in self-care

**Wound management and skin care**

- Clean, cover, and protect.
- Stretch and hold contracted skin in a good antideformity position at night and during the day when resting (splints).
- Lubricate (oil), massage, and stretch.

---

After the wound is cleaned and bandaged, a foam rubber protection is applied with casting material moulded under the axilla to obtain more shoulder abduction.

Padded wire splints can be adjusted regularly, to slowly stretch contractures.

Light pressure can be obtained early with elastic bandages. In difficult areas, foam rubber can also be used.

Light pressure can be maintained more easily with pressure garments.

■ Maintain constant light pressure over scar (with bandaging, pressure garments).
Essential intervention No. 1: Health education and self-care

Control oedema/swelling

- Elevate and adequately position the affected limb.
- Place in an antideformity position.
- Actively contract muscles with frequent hand opening/closure and foot plantar/dorsiflexion movement.
- Carry out ADL and exercises as independently as possible, avoiding long periods with the limbs down. Try to adapt exercises using activities which permit the limb to be used in an elevated position.
- Apply moderate pressure and avoid tight restrictive bandages which increase oedema.

The rolled elastic bandage is slowly stretched and unrolled at an angle covering two thirds of the previous wrap.
Manage adhesions and scars  Figure 5.1.3

- Lubricate, gently massage, stretch, and move.

- Stretch skin in the affected area within its full pain-free motion. Hold the fully-stretched positions for 30 seconds, repeating 3 times. Do 5–6 times per day.

- Be careful not to cause inflammation by being too forceful or by repeating the movement excessively. This will cause an increase in fibrosis (scarring).

- The person learns how to gently massage with oils that are locally available, keeping skin moist and flexible.

- The skin movement over the dorsum of the foot can be improved, permitting better toe flexion.

- Gently leaning towards the wall and holding that position for 30 seconds – with legs straight and heels flat to the ground – stretches both knees and feet.

(continued on next page)
Essential intervention No. 1: Health education and self-care

- Maintain constant pressure over scar areas with bandages or pressure garments for approximately 1–2 years following surgery.
- Use splints at night and/or during the day as instructed by health worker.

**Improve mobility through antideformity splinting and positioning**

Wrist supported in extension, and thumb abducted down with gentle pressure with the bandage on the fingers, improves the patient’s ability to flex the fingers and regain a grasp.

- Position the body part opposite the skin-contracting forces of the wound.
- Alternate splints and position as necessary, to maintain full range of motion.
- Learn how to put on and remove your own splint, and when it should be used.

Wrist flexion contracture is lessened with a plaster splint worn 24 hours. Wrist extension improves within 24 hours, and change is noted in the better wrist extension position of the new splint.
**Essential intervention No. 1: Health education and self-care**

**Improve joint mobility through exercise and activity**

Games stimulate participation and improve elbow movement.

- ADL, games, and active exercises can maintain or improve joint movement and minimize oedema, adhesions, joint contractures, and muscle weakness.

- Avoid sitting in bed or in chairs for long periods with the shoulders, elbows, hips and knees bent. Keep the foot supported and pointed upward when in bed.

- Self range-of-motion exercises can be taught at bedside and for use at home.

- Exercises can be done in bed using available materials (cloth).

![Incorrect](image1.png) ![Correct](image2.png)
Adapt/modify ADL and tools to promote better function and independence

- Enlarge handles on eating utensils and work tools.
- Use adaptations to make activities possible and easier.
- Use correctly-adjusted walkers, crutches, and canes.
- Use care during activities involving fire or heat and with clothing that may rub over newly-healed skin.
Essential intervention No. 1: Health education and self-care

Contact a doctor or health worker when necessary

This person relates that – within the last several months – he has noticed that his right hand seems to be progressively weaker and the fourth and fifth fingers feel strange. He has a scar adhesion compressing the ulnar nerve. Evidence is seen in examinations showing muscle weakness resulting in the 'clawed' deformity of the fourth and fifth fingers, weakness in the hand intrinsics, and sensory loss.

This person was referred to the surgeon for scar revision.

This affected person has a painful, excessively bleeding ulcer. He had previous BU lesions 40 years ago. Borders of this lesion are elevated and "mushroom"-appearing.

This person was referred to pathology for biopsy of possible cancer.

Observe yourself daily. If it seems that your condition is worse or if you have questions about your self-care, exercise, or activity programme, return to the health centre for advice. (Examples are an increase in pain, swelling or oedema, wound discharge which has a strong smell and is yellow in colour, joint tightness, thickening of scars, more difficulty in moving about and with activities, etc.)
Essential intervention No. 1: Health education and self-care

Be interested in knowing about other rehabilitation possibilities, such as correction of deformities, prosthetics and orthotics devices, educational opportunities, and vocational training.
Essential intervention No. 2

Wound management
The skin is the largest organ in the body, representing 15% of body mass. It has three layers. The external layer, or epidermis, has the primary function of protecting the body. The second layer is the dermis, which is made up of dense, elastic, fibrous, connective tissue (collagen) and which is where the blood vessels, nerves, sweat and oil glands, and hair follicles are found. The subcutaneous fatty layer is deepest, functioning principally as a thermal insulator, shock absorber, and reservoir for nutritional reserves.

In tissue repair, healthy cells must replace damaged cells through a process of either regeneration or replacement. Regeneration occurs when new cells are the same as the destroyed cells and normal function is restored. The process of replacement involves the production of a new type of tissue – called scar tissue – which usually results in loss of certain functions.

The body has excellent ability to repair itself, providing that nothing interferes in the repair process. Good hygiene, nutrition, rest, protection, and psychological support facilitate the healing process.

The healing process is often impeded by inappropriate wound-management techniques by doctors and health workers (iatrogenic factors). This includes misuse of topical antiseptics and antibiotics, poor application or removal of dressings, and allowing the wound to dry out. Specific examples are seen with trauma from using high-pressure irrigation, rough removal of dressings, or excessive pressure application with pressure wraps.

Other factors affecting wound healing include poor nutrition and smoking. People who have immune suppressive diseases such as diabetes or HIV, or who are using immune suppressor medications such as...
as steroids, may also experience a delay in wound healing (Table 5.2.1).

Skin repair can be either by primary closure (edges are brought together and sutured together) or by secondary closure (edges are wide apart and the wound fills in on its own). The healing process is complex, but a simplified explanation is given below (Table 5.2.2).

**Nutrition**

Diets should be high-calorie, high-protein, and rich in vitamins A and C – with consideration given to the cultural practices and dietary habits of the person affected. Families should be encouraged to prepare locally-available foods such as local nuts and grains, eggs, fish, and meat.

**Prevention of cross-infection**

Measures should be taken to prevent cross-infection, especially by HIV and hepatitis B viruses.

Gloves should be worn while dressing wounds, and must be replaced with a clean set between persons treated. Clean, single-use disposable gloves are preferred. A new set of sterile instruments should be used for each individual treated. Where dressings are not readily available, re-use of bandages and even some dressing materials may be unavoidable. Those responsible for washing bandages and dressings should be educated about how to handle the infected materials safely.

**Signs of infection**

Infection is suspected if the person complains of pain in the lymph glands of the axilla or groin. Redness, warmth, swelling, and yellowish exudates with an unpleasant odour are also signs of infection. These persons should be referred immediately for clinical assessment and systemic antibiotic treatment.

<table>
<thead>
<tr>
<th>Intrinsic factors</th>
<th>Extrinsic factors</th>
<th>Health worker iatrogenic factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition</td>
<td>Infection</td>
<td>Ischaemia</td>
</tr>
<tr>
<td>Ageing</td>
<td>Medication</td>
<td>Trauma</td>
</tr>
<tr>
<td>Chronic disease</td>
<td>Necrotic tissue</td>
<td></td>
</tr>
<tr>
<td>Circulatory disease</td>
<td>Psychological stress</td>
<td></td>
</tr>
<tr>
<td>Neuropathy</td>
<td>Immune suppression</td>
<td>Inappropriate wound-care management</td>
</tr>
</tbody>
</table>

**Table 5.2.1**
Factors that delay or impede wound healing
## Table 5.2.2
Phases of the healing process

<table>
<thead>
<tr>
<th>PHASE I</th>
<th>WHAT HAPPENS</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active/inflammatory</strong></td>
<td>Response: Inflammatory response; local vasodilation, fluid leakage into the extravascular space and blocking of lymphatic drainage</td>
<td>24–48 hours</td>
</tr>
<tr>
<td></td>
<td>Signs: Redness, swelling, heat, and pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Injury happens</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood clot:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- epidermis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- dermis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- subcutaneous fat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Injury cuts through epidermis and dermis (epithelium and connective tissue of the skin) and a blood clot forms. Chemical messengers are released immediately.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHASE II</th>
<th>WHAT HAPPENS</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Repair or proliferation</strong></td>
<td>Response: Two overlapping processes occur:</td>
<td>2 days – 1 month</td>
</tr>
<tr>
<td></td>
<td>- granulation tissue is formed (fibroplasia)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- wound contraction (scar formation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Signs:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- the pale pink tissues become bright red</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- the open area of the wound is reduced and the shape changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After about 1 week epithelium is growing around the wound. Fibroblasts are very active.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After about 2 weeks, the epithelium has grown around the wound completely.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>AFTER 1 WEEK:</strong></td>
<td><strong>AFTER 2 WEEKS:</strong></td>
</tr>
<tr>
<td></td>
<td>FIBROBLASTS</td>
<td>SCAB FIBROBLASTS</td>
</tr>
</tbody>
</table>
## PHASE III
**Maturation or remodelling**

- Tension and movement are important to increasing tensile strength
- Light constant compression helps smooth scar tissue

### WHAT HAPPENS

#### Response
- Collagenase is a regulator of the balance between collagen synthesis and collagen lysis (natural debrider). It organizes the collagen fibres laid down by the fibroblasts.
- Myofibroblasts are responsible for wound contraction during normal wound healing.
- During hypertrophic scarring, skin deformations depend on the inappropriate action of stress fibres that – for unknown reasons – persist even after the epithelialization of the wound.

#### Signs
- **Balanced:** elastic, smooth, strong fibres for the repaired scar tissue.
- **Unbalanced:**
  - hypergranulation – more synthesis from too much oxygen;
  - hypertrophic scars and keloids – inhibition of lysis.

#### DURATION
3 weeks – 2 years

---

**AFTER 1 MONTH:**
FRESHLY HEALED NEW CONNECTIVE TISSUE

**AFTER ABOUT 1 MONTH:**
THE WOUND HAS CLOSED, THE SCAB HAS FALLEN OFF AND THE GRANULATION TISSUE IS BEING CHANGED INTO CONNECTIVE TISSUE.
Wound care procedures

Wound-dressers (including surgeons, doctors, nurses, therapists, and family members) are a very important part of the POD team. Their skill can help the affected person use each joint in activities of daily living (ADL) during the healing process, to maintain mobility. Their understanding of correct antideformity positions is essential for preventing disability.

Many of the disabilities found in BU are related to inadequate wound-dressing procedures. This is particularly noted when the hand is immobilized in an extended flat position instead of an antideformity position (wrist extended, with metacarpo-phalangeal joints (MCP) flexed, interphalangeal (PIP and DIP) joints extended and the thumb abducted with minimal extension).

Poor positioning can lead to loss of function that is very difficult to correct. Therefore, special care is essential when positioning the hand.

Figure 5.2.1 Contrast of flat, non-functional hand positioning with an antideformity functional hand position

<table>
<thead>
<tr>
<th>MCP joints flexed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist extended up</td>
</tr>
<tr>
<td>Thumb abducted down and away from the hand</td>
</tr>
</tbody>
</table>

The hand is elevated but the flat position will make the hand non-functional, limiting grasp. The hand is elevated but positioned to permit the hand to grasp.
### Essential intervention No. 2: Wound management

<table>
<thead>
<tr>
<th>Color</th>
<th>Surface appearance</th>
<th>Phase of healing</th>
<th>Care</th>
</tr>
</thead>
</table>
| **RED**        | Pale pink to deep dark ‘beefy’ red                                                  | Inflammatory or proliferation phase | Clean with saline solution  
                 |                                                                                    |                              | Cover to protect and keep wound bed moist |
| **YELLOW**     | Pale ivory, various shades of yellow, green, brown  
                 | Proliferation phase                                                             | Clean with saline solution  
                 | Presence of ‘slough’ (dead but moist tissue)                                      |                              | Debride to reduce slough  
                 | Generates much wound fluid (exudate)                                              |                              | Use absorbent wound covering with much exudate, change  
                                                                                                                                                                                                 | before there is “strike-through”, and keep wound bed moist |
| **BLACK**      | Black/brown or tan (thick, hard, and leathery)                                     | Proliferation phase          | Clean with saline solution  
                 | Dead tissue that is dehydrated                                                   |                              | Debride eschar if blood supply is adequate and keep wound bed moist  
                 |                                                                                   |                              | Use absorbent wound covering with exudate and keep wound bed moist |

**Table 5.2.3**

Classification of wound by colour and treatment considerations

Best practice in wound care involves the following.

- The wound should be evaluated (Figure 4.4) and classified (Table 5.2.3) periodically to monitor change and adapt treatment accordingly.

- The wound should be thoroughly cleansed with saline solution (0.9%) without causing damage to the newly formed tissues. The saline should be warm – at about body temperature or 40 °C. If saline solution is not available, it can easily be made by using clean – preferably boiled – water and salt. Three tablespoons of salt should be combined with a litre of water. All the saline solution should be immediately used and not stored.

**Cleansing the wound** is done by gently spraying (with a pressure of 4–15 psi) the saline solution on the wound until most or all dead tissues are removed. The correct pressure can be achieved with a 35-ml syringe and 19-g angiocatheter or by squeezing a plastic bottle with a needle hole in it. Care should be taken not to cause tissue damage by using high-pressure irrigation, hard mechanical debridement, or harsh antiseptics (Tables 5.2.4 and 5.2.5). These will only destroy delicate new cells and delay wound healing. Additional mechanical or chemical debridement may be necessary to remove necrotic tissues but much care is needed. Wounds should be exposed for the shortest time possible as the exposure causes a drop in surface temperature and drying out of the wound bed, delaying new cell production.

- **The type of covering or dressing for the wound depends on the amount of wound exudates (drainage).** If there is much exudate, an absorbent dressing should be used and changed before there is “strike-through” (exudate is visible through the last dressing). Strike-through will cause microorganisms to enter the wound and a loss of heat – delaying new cell production. If the wound bed has little exudate or is dry, the application of sterile vaseline permeated gauze maintains a moist wound surface to facilitate healing.

### Table 5.2.4 The effects of commonly-used topical agents on wound healing

<table>
<thead>
<tr>
<th>TOPICAL ANTIMICROBIALS</th>
<th>TOPICAL ANTiSEPTIC AGENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infections should be treated with systemic antibiotics</td>
<td>Antiseptics are essential for hand-washing and preparation of the patient’s intact skin prior to surgery</td>
</tr>
<tr>
<td>Topical ointments are usually not needed; however, they can be used in special situations (i.e. silver sulfadiazine in burns)</td>
<td>Antiseptics are used to clean things (tanks, drains, etc.) – not open tissues</td>
</tr>
</tbody>
</table>

**Problems with topical antimicrobials**

- Can retard or delay healing
- Harmful cytotoxic effects
- Minimal antimicrobial effectiveness
- Sensitivity and local allergic reactions
- Causes emergence of antibiotic resistant strains of pathogens

**Problems with antiseptics**

- Can retard or delay healing
- Destroy bacteria and normal body flora
- Are irritating to the skin
- Have limited cleansing effectiveness
Essential intervention No. 2: Wound management

REMEMBER
About wound dressing

- Maintain a stable wound temperature by limiting the time the wound is exposed.
- Cleanse the wound well with saline solution (at body temperature) and remove necrotic tissue without damaging the new skin.
- Use the correct pressure to cleanse the wound with saline.
- Limit use of topical antiseptics and antibiotic ointments.
- Use a dressing which removes exudates.
- Avoid strike-through with wounds with excessive exudate by using good absorbent materials and changing the dressing frequently.
- Prevent the wound from becoming dry by using vaseline dressings.
- Moisten dry dressings before removing them.
- Keep the wound edges well-lubricated with vaseline.
- Place the body part in an antideformity position.
- Special care needs to be given to skin grafts with dressing changes restricted and antideformity positions maintained for 5–10 days.

The vaseline also reduces the chance that the gauze will stick to the wound bed causing damage when the dressing is removed. If the gauze does stick to the wound bed, saline solution can be applied until the gauze is freed easily from the wound. If the wound is infected, systemic antibiotics should be given, as antibiotic ointments have limited effectiveness. Covering the wound protects it from infection, injury, and drying out. There are many different products that can be used to improve wound healing (Table 5.2.6). The product used will depend on availability of the material and the accessibility of the health service to the affected person. The cost-benefits ratio should be calculated considering the time of both the patient and health worker, the number of hospital days, expenses involved in outpatient treatment, and materials.

- The affected part should be bandaged and splinted in the best antideformity position, avoiding the immobilization of adjacent body parts which are not involved. A carefully-applied light elastic bandage provides light compression to decrease oedema and hypertrophic scar formation. The bandage should not restrict movements or be too tight.

- The frequency of dressing change is dependent on the amount of exudate produced by the wound.
Table 5.2.5 Common types of topical agents, their effects and problems

<table>
<thead>
<tr>
<th>COMMON TYPES OF TOPICAL AGENTS</th>
<th>PROBLEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Povidone-iodine solution</strong></td>
<td>The literature regarding the effects of povidone-iodine is conflicting. Reasons for the discrepancies are related to the use of animal versus human models and differences in parameters of wound healing evaluated.</td>
</tr>
<tr>
<td>Useful antimicrobial agent to be used only on intact skin</td>
<td>Toxic to skin and mucous membranes</td>
</tr>
<tr>
<td>Useful antiseptic action to clean tanks and drains to prevent cross-contamination</td>
<td>Cytotoxic for fibroblasts responsible for healing</td>
</tr>
<tr>
<td>Destroys <em>Pseudomonas aeruginosa</em>, <em>Staphylococcus</em></td>
<td>Reduced wound epithelialization and tensile strength</td>
</tr>
<tr>
<td>Cadexomer iodine, a newer iodine compound, has less negative effects on wound-healing rates.</td>
<td>Questionable effectiveness in infected wounds</td>
</tr>
<tr>
<td></td>
<td>The active antiseptic agent released from the solution is inactivated by binding to serum protein, so any exudate weakens antiseptic effect</td>
</tr>
<tr>
<td></td>
<td>May cause iodine toxicity when used in large wounds over prolonged period of time</td>
</tr>
<tr>
<td><strong>Sodium hypochlorite solution</strong> (household bleach, Chlorpactin Dakin solution 0.45–0.5%)</td>
<td>Cytotoxic to fibroblasts at 0.5 % and delays epithelialization</td>
</tr>
<tr>
<td>Useful bactericide</td>
<td>Must protect intact skin around wound to prevent breakdown. With repeated exposure, the skin around the wound becomes irritated</td>
</tr>
<tr>
<td>0.25–0.5% is a useful antimicrobial agent in controlling sepsis when cleaning tanks and drains</td>
<td></td>
</tr>
<tr>
<td><strong>Acetic acid solution</strong></td>
<td>Does not significantly enhance the healing process</td>
</tr>
<tr>
<td>Effective against both gram-positive and gram-negative microorganisms</td>
<td>Changes the colour of the exudates, which can give a false assurance that the infection has been eliminated</td>
</tr>
<tr>
<td>0.5% removes certain pathogens such as <em>Pseudomonas aeruginosa</em></td>
<td>Local irritation to skin surrounding the wound border and in wounds with repeated exposure</td>
</tr>
<tr>
<td><strong>Hydrogen peroxide</strong></td>
<td>Non-selective debriding agent with little bactericidal action in wounds</td>
</tr>
<tr>
<td>Effective mechanical cleansing agent to loosen dried exudate or debris, but other techniques can be used</td>
<td>Harmful to newly forming granulation tissue</td>
</tr>
<tr>
<td></td>
<td>Toxic to fibroblasts</td>
</tr>
<tr>
<td></td>
<td>Deactivated when mixed with blood</td>
</tr>
<tr>
<td></td>
<td><strong>Should never be applied</strong> to closed wounds or to pack sinus tracks, as the gas build-up can cause air embolism</td>
</tr>
<tr>
<td></td>
<td><strong>Should not be used for forceful irrigation</strong>, as it can cause subcutaneous emphysema mimicking gas gangrene</td>
</tr>
</tbody>
</table>
### COMMON TYPES OF TOPICAL AGENTS

<table>
<thead>
<tr>
<th>COMMON TYPES OF TOPICAL AGENTS</th>
<th>PROBLEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potassium permanganate</strong></td>
<td>- Few know how to prescribe and teach others to use correctly.</td>
</tr>
<tr>
<td>■ Antiseptic agent</td>
<td>- If crystals are not dissolved completely, they will cause chemical burns to tissues</td>
</tr>
<tr>
<td></td>
<td>- Dries skin</td>
</tr>
<tr>
<td></td>
<td>- Cytotoxic</td>
</tr>
<tr>
<td><strong>Methylrosanilinium chloride (gentian violet)</strong></td>
<td>- Dries skin</td>
</tr>
<tr>
<td>■ Astringent</td>
<td>- Irritation to skin</td>
</tr>
<tr>
<td>■ Antifungal and antibacterial agent</td>
<td>- May permanently stain (tattoo) skin area</td>
</tr>
<tr>
<td>■ Use on closed, intact skin</td>
<td>- Possible cancerous effects if ingested, or used on mucous membranes or open wounds</td>
</tr>
<tr>
<td><strong>Neosporin ointment, Silvadene (silver sulfadiazine) and Furacin</strong></td>
<td>- Patients frequently become sensitive to Neosporin and Furacin, causing skin allergies</td>
</tr>
<tr>
<td>■ Topical bactericidal agents used to prevent excessive bacterial contamination and infection of wounds</td>
<td>- Furacin retards the rate of epithelialization, suggesting it may be cytotoxic to epidermal cells</td>
</tr>
<tr>
<td>■ Neosporin and Silvadene promote re-epithelialization</td>
<td></td>
</tr>
<tr>
<td><strong>Mercurochrome and Methiolate</strong></td>
<td>- Mercury toxicity with possible anaphylaxis (shock from allergic reaction) and aplastic anaemia.</td>
</tr>
<tr>
<td>■ Mercury compounds are commonly used for their bacteriostatic and fungistatic properties</td>
<td>- Toxic to epidermal cells</td>
</tr>
<tr>
<td>■ Antiseptic</td>
<td>- <strong>Not recommended</strong></td>
</tr>
<tr>
<td><strong>Soap</strong></td>
<td>- Dries out the wound</td>
</tr>
<tr>
<td>■ Cleansing effect and mild antibacterial action</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.2.6 Common types of wound dressings

<table>
<thead>
<tr>
<th>TYPES</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline-soaked gauze</td>
<td>Inexpensive – but labour-intensive to keep moist all the time; best for deeper wounds</td>
</tr>
<tr>
<td>Vaseline soaked gauze</td>
<td>Inexpensive – keeps the wound bed moist and prevents gauze from sticking to the wound bed; best for wounds with little exudate</td>
</tr>
<tr>
<td>Polyurethane films</td>
<td>Semipermeable – can stay on wound several days; best for keeping wound moist when there is little drainage; promotes granulation and epithelialization; protects skin breakdown</td>
</tr>
<tr>
<td>Hydrocolloids</td>
<td>Promotes autolysis – rehydrates and loosens eschar; can stay on wound several days; keeps wound moist when there is light drainage</td>
</tr>
<tr>
<td>Hydrogels</td>
<td>Fills deeper ulcers – removes slough and absorbs moderate drainage; must be changed daily</td>
</tr>
<tr>
<td>Alginates</td>
<td>Highly absorbent for heavy drainage – maintains moist environment and promotes granulation and epithelialization; requires a cover; usually changed daily; can be too drying</td>
</tr>
<tr>
<td>Dispersion dressings (bandages working on capillary action)</td>
<td>Highly absorbent for heavy drainage – but maintains moist environment; requires a cover; initially changed daily, then every 2–3 days</td>
</tr>
</tbody>
</table>
n Buruli ulcer there is much soft-tissue injury and damage resulting from both the disease and the surgical excision. Oedema is the result of tissue damage, and is part of the early inflammatory response. It is reported that after soft-tissue damage, extracellular volume increases by 30–50%. This fluid has a high protein content that infiltrates the tendons and other sub-cutaneous structures, leading to fibrosis and adhesions.

Limb elevation is one of the most important methods of reducing oedema. Oedema makes movement painful and difficult, but active movement should be encouraged as muscle contraction serves as an effective pump to assist the return of the fluid to the circulation.

Passive motion is not recommended when there is excessive oedema, and aggressive passive motion can be harmful. Massage and compression can also be used to help return oedema fluid to the circulation. Compression needs to be done with great care so that pressure is not too great and movement is not restricted.

**Danger**

- Oedema can result in ischaemic necrosis because of an increase in extravascular pressure. The oedema will feel hard to the touch and not be very mobile. This may require emergency surgery to open the tissues to relieve the pressure.

**KEY OBJECTIVES**

- To know what causes oedema.
- To know which kind of oedema needs to be referred for emergency surgery and why.
- To know the effects of oedema on soft tissues and movement.
- To know how to decrease oedema in the upper and lower limbs.
Essential intervention No. 3: Oedema control

**REMEMBER**

- Elevation of the affected limb is crucial in controlling oedema in the initial stage of healing, as it prevents fluid pooling in the tissues.
- It is important to control oedema early to prevent difficulties with joint mobility and to minimize fibrosis and adhesions.
- Common techniques used to control oedema are elevation, compression, massage, and early active movement.
- Splints are usually needed to maintain body parts in good antideformity positions. They should be removed every 2 hours for approximately 1 hour of exercises and self-care tasks.

![Images of correct and incorrect positioning for oedema control](image)

**Figure 5.3.1** Positions to control oedema in the upper and lower limbs
Compression

Light compression can be applied with bandages during the initial phase of wound healing. Lightly-wrapped elastic bandages can be used when wounds are either open or closed. When wounds are closed, custom-fitted elastic pressure garments can be made, which are less bulky (see more details about pressure garments in the section on Scar management).

Compression not only helps to keep oedema down, but it causes the scars to become flatter and more flexible. Bandages and pressure garments should not restrict movement, and should permit exercises and activities to be done easily. Compression wraps should not be applied until approximately 5–10 days after grafting, when the graft appears to be well taken.

It may be necessary to rewrap compression bandages several times per day. Bandaging should be applied carefully, with consistent light pressure – starting from the fingers and wrapping up the arm, and from the toes wrapping up the leg (distal to proximal). The compression should extend far enough up the arm or the leg to avoid restricting venous return, which would cause more oedema. Wrapping should not squeeze fingers and toes tightly together, restricting movement and function. Fingers are best wrapped individually with a smaller-width bandage.

Bandages should be applied at a diagonal, covering one third of the previous layer wrapping from bottom to top (distal to proximal). Where there are concave spaces, such as thumb web spaces, foam can be inserted so that pressure is applied evenly. Bandages should not impede movement. The tips of the fingers and toes should be left free so that the blood-flow through the limb can be checked.
**Essential intervention No. 3: Oedema control**

**A summary of things that can be done to control oedema**

- Elevate the affected limb— a sleeve or sling secured to a drip stand can help support the hand or foot in elevation.
- Encourage active movement, by using the affected limb in daily activities.
- Avoid dependent (non-elevated) positions and strenuous activities.
- Use compression and dressing wraps to help mobilize oedema back into the circulation.
- Avoid additional injuries when doing daily activities.

**UPPER LIMB CONSIDERATIONS**

- The hand should be positioned at a level above the heart. (Remember: the wrist should be extended, metacarpal phalanges (MCP) joints flexed, PIP and DIP joints extended and the thumb abducted with slight extension).
- In bed, the arm should be supported on a pillow to prevent compression of the ulnar nerve at the elbow. A sling attached to a drip stand can also be used.
- A sling can be used to keep the hand up when standing or walking.
- When sitting, the hand needs to be supported in an elevated position, not hanging down.
- Avoid long periods of time sitting, standing, or lying down without any active movement.
- Several times per day, the hand elevated, it should be closed tightly and then opened. This opening and closing action should be repeated 20 times, as the muscle contraction will help venous return.
- Splints should be removed every 2 hours for approximately 1 hour, for exercises and self-care tasks.

**LOWER LIMB CONSIDERATIONS**

- The leg and foot should remain elevated when in bed, either by using pillows or a sling attached to a drip stand.
- A support or splint should be used to keep the foot dorsiflexed (up) preventing a foot drop position, which leads to tightness and contracture of the

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**Figure 5.3.3 Movement to reduce oedema in the arm and hand**

The person squeezes his hand tightly and then opens it with as much force as possible. The muscle action helps to keep oedema (swelling) down.
Essential intervention No. 3: Oedema control

Achilles tendon. Take care not to tuck bed sheets down too tightly, forcing the foot down.

- The foot can be supported when sitting by placing it on another chair. The foot should not be allowed to hang down.
- Avoid long periods of time sitting, standing, or lying down without any active movement.
- The feet should be moved up and down against resistance several times per day. Standing and pushing up on the toes and down again, helps to pump extra fluid out of the legs. The contraction of the muscles helps venous return.
- Splints should be removed every 2 hours for approximately 1 hour, for exercises and self-care tasks.
- Use crutches to encourage normal movement and facilitate ADLs.

**ATTENTION**

If there is an increase in swelling or pain, check:

- Is the limb being elevated properly all the time?
- Are the compression bandages too tight?
- Is the person actively moving or is someone passively moving the affected part?
- Are exercises done in a dependent position or for too long?
- Is there an infection that needs to be treated?
- Is there ischaemic necrosis which requires immediate surgery?

*Figure 5.3.4 Adapted positions for activities and exercise to reduce oedema in the arms and hands*
Essential intervention No. 3: Oedema control

The person moves the foot down and then up with as much force as possible. The muscle action helps to keep oedema (swelling) down.

Figure 5.3.5 Movement to reduce oedema in the legs and feet

Remember to exercise with the foot down for short periods of time. Alternate with activities or exercises that can be done with the feet up.

Figure 5.3.6 Adapted positions for activities and exercise to reduce oedema in the legs and feet
When a normal wound heals, the body increases vascularity to form granulation tissue for restoring the damaged skin. Granulation tissue contains fibroblasts, which are the cells that synthesize mucopolysaccharides and collagen fibres that are necessary for the development of new connective tissue.

Myofibroblasts are specialized fibroblasts that are responsible for wound contraction during normal wound healing. The alpha-smooth muscle actin within myofibroblasts becomes organized in filamentous bundles, called stress fibres. This allows the retractive movement producing wound contraction. The myofibroblast is a key cell for the connective tissue remodelling that takes place during wound healing and fibrosis development.

Scarring is the body’s normal wound-healing response, in which fibroblasts deposit layers of collagen. Contraction of the wound is an ongoing process influenced by myofibroblasts. Sometimes the formation of scar tissue occurs faster than the collagen is broken down, resulting in an excessive production and deposition of collagen called fibrosis. Repeated injury and repair cause the myofibroblasts to secrete an extracellular matrix (ECM) which leads to organ and tissue fibrosis. Excessive fibrosis causes stiffness and interferes with function.

Normal scar tissue progresses from being weak and easily broken down, to being red and prominent, to finally becoming thin and pale. As scar formation progresses during the remodelling phase, large bundles of collagen accumulate (Figure 5.4.1). The tissue shortening and collagen are then stabilized by synthesis of ECM by the myofibroblasts. As long as the scar appears redder than normal, remodelling is still under way.

Essential intervention No. 4

Scar management and control

KEY OBJECTIVES

- To know the characteristics of scar tissue as it progresses through the remodelling phase.
- To know the difference between a hypertrophic scar and keloid.
- To know how to identify whether a scar is immature or mature.
- To know how to care for the scar and adhesions with compression, massage, stretching, exercise, and progressive splinting.
- To know when pressure garments are indicated and when they are no longer effective.
The scar tries to blend in both cosmetically and functionally. This remodelling process takes from about three weeks to two years. The scar can be assessed by looking at the pigmentation, pliability, height, and vascularity. A mature scar is soft, pliable, flat, and has normal vascularity (does not blanch with pressure).

Remoulded skin is more fragile, having a tensile strength of about 70–80% of the original skin. When closure of the wound is initially achieved, the tensile strength is about 15% of the normal – meaning that the wound remains very weak. The new skin must be protected from injury. Trauma leads to oedema and increases the risk of infection that can lead to inflammation. Chronic inflammation can cause the skin to thicken and become less elastic (fibrosis).

Studies suggest that adding tension during the healing process increases the tensile strength of all soft tissue structures and bones. Splinting, serial casting, movement, and activity are ways of applying slow, long-duration stress on healing scar tissue to remodel it to a new position.

Prolonged uninterrupted immobilization leads to loss of tensile strength and disorganization of collagen fibre. The application of constant light pressure or stretch to a new scar while it is maturing is a simple way to minimize scar volume and force collagen fibres into a more orderly formation (Figure 5.4.2).
Hypertrophic scarring and keloids

Hypertrophic scars and keloids are abnormal responses to wound healing caused by hyperactive production of collagen. A hypertrophic scar is an overgrowth of skin involving only the wound area, which develops 6–8 weeks after skin re-epithelialization. It tends to be more common in areas of high tension and movement. The earlobes, anterior surface of the neck and chest wall are also common places for hypertrophic scars. Initially they are raised, red, and itchy, and will spontaneously flatten with time.

In hypertrophic scarring, there is an overproduction of collagen fibres. They twist around each other in a rope-like fashion, causing the irregular shape of the nodules (Figures 5.4.1 and 5.4.2). These collagen-filled nodules later develop into thickened, rigid scar tissue (fibrosis), which causes contractures. Hypertrophic scar bands can restrict movement and circulation. They are frequently seen near or over joints.

It has been known for many years that the application of controlled, consistent pressure to the surface of an immature hypertrophic scar will – in time – reduce the scar and leave a smooth, softer and pliable skin surface. In figure 5.4.2, the effect of pressure on healing scar tissue is illustrated.

Keloids are an overgrowth of the connective tissue involving the wound area, as well as the normal peripheral skin outside the wound area (they are larger than the initial wound boundary). They are grossly elevated and may be itchy, hard, and hypersensitive.

They can develop for up to a year after injury and persist indefinitely. There tends to be a genetic predisposition for keloid development. The treatment of keloids is difficult and frequently unsatisfactory.

**General treatment methods for immature scars**

In the ulcerated lesions of Buruli ulcer, extensive areas of the skin must frequently be excised and the open areas covered by skin grafts. Once healing of the grafted site (and also the donor site) has taken place, these sites often develop hypertrophic scars. If the development of scar hypertrophy is not controlled, crippling disfigurement is likely as a result of severe contractures and the unchecked formation of thickened scar tissue.

**REMEMBER**

**Hypertrophic scar**
- An excessive response to wound healing.
- Most common in areas of high tension and movement.
- Seen as an overgrowth of skin as it tries to heal.
- Raised, red, itchy and does not encroach on normal tissue.
- Begins to develop 6 to 8 weeks after skin re-epithelialization.
Uncontrolled or neglected antideformity positioning causes deformities that limit movement and function.

Figure 5.4.4 Deformities caused by scars and adhesions
Some of the interventions used for immature hypertrophic scars are compression, serial casting, surgery, and psychological support. Light compression can be obtained with elastic bandages when the wound is open or closed. However, bandages can be difficult to apply, cumbersome, and aesthetically not pleasing. After the wounds have healed, the use of custom-made elastic pressure garments facilitates constant compression until the scar has matured (12–18 months). These garments are less restrictive, but the person needs emotional support from the family and HCW to encourage compliance in using them.

The best results of compression are seen when pressure is applied 23 hours a day until scar maturity. In difficult areas such as the axilla, the elbow, the knee, the thumb web space, digital spaces, the neck, and nose, compression is obtained by using foam rubber inserts under the bandages or pressure garment (Figure 5.4.5). When using foam rubber, make sure that it does not irritate the skin and that the person does not have allergies to rubber products. If soft tissue contractures exist, they are treated with serial casting or splints (Figure 5.4.6). It is important to note that mature scars, which are usually older than one year, will not benefit from compression by either bandages or pressure garments.
Specific treatment method – pressure garments

Pressure garments have been used extensively in the treatment of scars after burn injuries, and these garments can also be applied to scars from Buruli ulcer. Pressure garments are custom-made garments constructed from elastic fabric (elastonet), which provide and maintain adequate pressure over scarred areas and yet allow normal movement of the body.

The type of garment is planned according to the position and extent of the scar. Sleeves, hand gauntlets, gloves, trousers, socks, vests, masks, and chin straps are made according to measurements for each individual. The pressure garments must be carefully measured and designed, to provide sufficient pressure without being too restrictive. They must be worn 23 hours per day for 6–18 months, or until scar maturation has been achieved.

The technique for making these garments is not addressed in this manual, but workshops can be held to teach local health workers and seamstresses how to measure, design a pattern, cut, stitch, fit, and teach the affected person how to wear and care for the garment. Periodic replacement is needed, depending on the person’s activities, weight, and growth – usually every 3–4 months.

IMPORTANT THINGS TO KNOW ABOUT PRESSURE GARMENTS

- Pressure garments can only be applied once the wound is closed – therefore, measurements can only be taken once this stage has been reached.
- Upon referral, the scar should be assessed to determine if it is immature or mature (scar colour or pigmentation, height, vascularity and pliability); only immature scars can be helped by a pressure garment.
- The wound size and location on the body are noted.
- The garment is planned, keeping the specific area of scarring in mind. For example, if the scar is over a joint, the area above and below the joint should also be incorporated. A good rule is to make the garment 5 cm longer on either end so that adequate compression is achieved.
- Circumferential measurements are taken according to established guidelines.
- All measurements are decreased by 20% and the pattern is drawn up for each specific body part.
- The fabric is cut out and stitched to specifications.
- The garment is fitted and adjustments are made. Extra care is taken to ensure that pressure is applied correctly. The garment should not be too restrictive and should allow full movement of the affected limbs.
- Once the garment fits correctly, a second set should be made.
The following instructions for wear and care should be provided:
- the garments should be worn 23 hours per day,
- every garment should be washed daily with a mild soap, rinsed well and dried in an airy room, or outside, but not in direct sunlight,
- if a wound breaks down, wearing of the garment should be discontinued for a few days until the wound has healed,
- the garment should always fit snugly, and the person should return to the health centre if it becomes too large or too tight due to weight loss or weight gain. The fit of the garment can also be affected by deterioration of the fabric. In this case a new set of garments should be made,
- generally the garments should be worn for 12–18 months or until scar maturation has been achieved.

A scar has reached maturity when it is soft, flat, pliable, and displays normal vascularity (does not blanch to pressure).

Some scars will benefit from the application of splints to maintain a specific joint position.

Compliance in using the garment will be dependent on support and encouragement by health workers and family.

---

**REMEMBER**

**Why pressure garments? When are they not useful?**

- Pressure garments are essential to smooth, soften, and maintain elasticity of the skin during the maturation process and to prevent hypertrophic scarring and the subsequent formation of contractures. Once the skin has gained elasticity, joint mobility is regained and severe contractures can be avoided.

- Pressure garments (Figures 5.4.7 and 5.4.8) are used in conjunction with other rehabilitation interventions such as massage, exercise, activity, and sometimes splinting.

- It is important to note that mature scars, which are usually older than 1 year, will not benefit from the application of pressure. Therefore, it is not necessary to make garments for persons with such scars.

- No pressure garments should be applied in the presence of open wounds. Foam inserts and crepe or elastic bandages should be used to apply pressure until the wounds are fully healed.

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**REMEMBER**

**Difference between immature and mature scar**

<table>
<thead>
<tr>
<th>Immature scars are:</th>
<th>Mature scars are:</th>
</tr>
</thead>
<tbody>
<tr>
<td>– usually less than one year old</td>
<td></td>
</tr>
<tr>
<td>– thick and firm</td>
<td></td>
</tr>
<tr>
<td>– elevated or raised in height</td>
<td></td>
</tr>
<tr>
<td>– not easily pliable</td>
<td></td>
</tr>
<tr>
<td>– red or pinkish in colour</td>
<td></td>
</tr>
<tr>
<td>– blanch with pressure</td>
<td></td>
</tr>
<tr>
<td>– usually more than one year old</td>
<td></td>
</tr>
<tr>
<td>– soft</td>
<td></td>
</tr>
<tr>
<td>– flat</td>
<td></td>
</tr>
<tr>
<td>– pliable</td>
<td></td>
</tr>
<tr>
<td>– display normal vascularity</td>
<td></td>
</tr>
<tr>
<td>(do not blanch with pressure)</td>
<td></td>
</tr>
</tbody>
</table>
Pressure garment construction  Figure 5.4.7

1. ASSESS THE SCAR. The wound must be closed and the scar immature.

2. PLAN AND MEASURE. The circumference is then reduced by 20% and the pattern made and cut out.
Essential intervention No. 4: Scar management and control

3. SEW, FIT, and EDUCATE about use and care of garment.

**Types of pressure garments**

- **Face**
- **Arm**
- **Hand**
- **Vest**
- **Leg**
- **Foot**
Specific treatment method – massage

There are many massage techniques, each having a specific purpose. In Buruli ulcer, massage is usually used in combination with exercise and compression. The primary use of massage in BU is to decrease adhesions of the skin to other soft tissues (such as ligaments, tendons, and muscles) and bones, which can restrict motion.

Oil is used in the manipulation of soft tissues. Massage can also help decrease oedema and desensitize hypersensitive scars (see additional information in intervention sections on Oedema control and Management of pain). It is important that the person affected by BU, the family, and health workers are taught how to manipulate the soft tissues without creating blisters or inflammation. Sometimes nearby joints and soft tissues require massage. Frequently, persons affected by BU will note that scars seem more flexible and that the scar is less itchy or painful after oiling and massage.
REMEMBER
About care of scars

- Oil-based creams and lubricants alleviate dryness and itching sensations.
- Very limited gentle deep massage should be performed on newly healed or grafted skin. Blisters can be easily created with superficial massage.
- Open wounds should not be massaged, although surrounding closed border areas can be.
- Restrictive fibrous bands should be mobilized to free both movement and circulation. Friction massage is done transversely across the grain of the fibres.
- Light constant compression should be used with immature scars until they mature.
- Light constant compression is achieved with bandages, pressure garments, inserts, and splints.
- Protect immature scars from exposure to the sun, as they will burn and blister easily.
- Protect immature scars from injuries caused in daily activities from friction or by rubbing from clothing.
- Avoid aggressive, repetitive type exercises and activities.
Essential intervention No. 5
Positioning and splinting
Positioning correctly to manage oedema has been described earlier in this manual. Correct positioning will also maintain full joint movement and encourage good function. Positioning of body parts during the wound-healing process is usually in the opposite direction to the forces created by contracting skin (anti-deformity position). For example, an ankle with a dorsal wound needs to be positioned for half of the time in plantar flexion position – to stretch out contracting dorsal skin – and half of the time in neutral position – to avoid Achilles tendon shortening.

This positioning may be accomplished by using the body and limbs correctly during daily activities and exercise, avoiding prolonged periods in postures and positions that would encourage deformities. For example, lying in bed with the knees flexed and the feet dropped down would encourage knee flexion deformities and tightening or shortening of the heel cords (Achilles tendon). Hands held flatly with wrists flexed create a deformity that will make grasping, holding, and manipulating objects difficult or impossible.

During exercise and activity, the person should adopt a position that will help prevent deformities. Correct positioning facilitates proper use of the limbs during activities of daily living.

**KEY OBJECTIVES**

- To know how to position for oedema, for function, and to prevent deformity.
- To know the principles of splinting and when splinting is indicated.
- To know how to correctly make a splint for the axilla, elbow, wrist, hand, knee, and foot.
- To know how to teach other health workers, persons affected by BU and their families, and how to use splints correctly.
Essential intervention No. 5: Positioning and splinting

Figure 5.5.1 Positions that cause deformity versus positions that minimize deformity

- **Incorrect**
  - The hand is positioned flat on the splint.
  - The hand is up – good, but the hand is flat – incorrect.
  - The BU lesion is on the upper arm. Do not immobilize parts that are not involved.

- **Correct**
  - The hand position has been corrected to enable wrist extension, thumb abduction, MCP joint flexion and finger extension. This facilitates a better grasp position.
  - The hand is correct when it is placed in an antideformity position. This position facilitates grasp.
  - The incorrect splint has been removed and exercise started to decrease the joint stiffness caused by the splint.

(continued on next page)
Splints

At times, outside support splints must be used to adequately position the body and limbs, in order to prevent deformities or to facilitate function. Splints are an invaluable tool in assisting the health worker to prevent the deforming forces of wound contraction. Many local materials such as wood, wire, metal, cardboard, plaster, papier-mâché, coconut shells, yarn or thread, spindles, cones, plastic containers, rubber tubing, foam, and elastic can be used. It is important to identify materials that are locally available and learn to use them adequately.

The main objectives of using splints in Buruli ulcer management are to:

- maintain or improve the position of a body part before and after surgical excision of the ulcer;
- improve soft tissue length and joint mobility;
- immobilize a body part to protect it for the first 5–10 days following skin grafting or during an acute infection (usually only a few days), or to protect an area where there are exposed tendons; and
- facilitate function for activities of daily living.

Splinting principles

- Splints should be adapted to each individual situation and adjusted according to response and progress.
- The splint should be moulded or shaped to the correct size.
- Splints should only immobilize involved joints and leave the adjacent joints free for movement.

Figure 5.5.1 (continued)
Joints should be immobilized in the best anti-deformity position.

Stretch from splints should be gentle and prolonged.

Close observation and care is needed to areas having a decrease or loss of sensation.

Splints should not cause pain, oedema, or pressure wounds. If this happens, the splint should be modified immediately. If the reddened area from the pressure does not go away within 15 minutes, adjustments in the splint are needed. If the person is at home or the health worker is not available to make adjustments, the splint should be removed and discontinued until the person sees the health worker.

When possible, splints should be worn during rest periods during the day and at night, but taken off for daily exercises and activity.

The only occasions when a splint should remain in place for a longer period are:
- after skin-grafting, when the splint must stay in place for 5–10 days;
- for 2–3 days when an acute infection occurs.

In all other circumstances the splint must be removed for an hour or two each day to mobilize the joints.

The person or caregiver should understand the function and care of the splint and should be able to demonstrate how to put the splint on and remove it.

Splints are indicated for the following situations.

Oedema. Certain joints such as the wrist, the metacarpo-phalangeal joints of the hand, the thumb and the ankle should always be placed or held in a good antideformity position when there is oedema or swelling (Figure 5.5.2).

Figure 5.5.2 Wire splints are lightweight, adjustable, and free the hand to be used for activities of daily living.
Essential intervention No. 5: Positioning and splinting

- **Skin grafts.** Skin grafts should be protected and movement prevented in the area of the graft for 5–10 days. The length of time for immobilization should be determined by the surgeon. The skin graft may fail because:
  - the graft is applied to a wound bed, without good granulation tissue;
  - infection occurs;
  - wound care (dressing changes) is started too early after the grafting; or
  - mobilization is started too early.

- **Difficulties with joint mobility.** Many mobility problems can be prevented by encouraging the person to move the joints early (i.e. while waiting for initial surgery and skin grafting) and participate in activities of daily living while in the hospital. However, if there is difficulty, splints can be used in conjunction with exercise and activity to improve joint mobility.

- **Soft-tissue contractures.** Soft tissue contractures (shortening) can reduce joint mobility and cause deformity by retracting body parts such as fingers and toes. These deformities can make everyday activities difficult and stigmatize the person affected by BU within the family and community. Joint mobility and soft-tissue lengthening can be achieved by using progressive serial casting or splinting. A slow, gentle traction is placed on the joint and its surrounding structures, stretching the skin, soft tissues and other extra-articular structures. This stretching influences new cell division, elongating the new cells being formed in the contracted structures. Care should be taken not to use excessive tension causing pain and inflammation that will result in further tissue damage and increase the contracture of the soft tissues.

- **Combined soft-tissue contractures and joint stiffness.** Serial splinting can be done to obtain the maximum movement possible. However if joint stiffness and soft tissue contractures are great, reconstructive surgery may be indicated. Such surgery should be followed by an aggressive splinting and exercise programme.

- **Acute infection.** Wounds that are infected should be treated with systemic antibiotics and rested. The part that is infected should be immobilized with a splint during the acute phase so that the infection does not spread. This is particularly important in the hand and foot.

- **Tendon exposure.** If tendons are exposed, splints are used to place joints in an antideformity position and to reduce stress on the fragile structures. Every attempt should be made to keep the tendons and surrounding structures moist. Humidity is maintained with saline and vaseline gauze dressings. Saline soaks are used throughout the exercise programme of active and gentle passive motion. Tendon necrosis is noted if the tendon has no shiny appearance and has a dark coloration. At this time, efforts must be focused on maintaining joint mobility in anticipation of future reconstructive surgery.
Essential intervention No. 5: Positioning and splinting

Figure 5.5.3 Useful splints to prevent or correct soft-tissue contractures
Pain is not a major feature of Buruli ulcer in the early stages of the disease, but unfortunately, some of the complications can be very painful. Oedema, infection, scars, and forced mobility are frequent causes of pain. Immediate attention should be given to treat the problem so that pain can be reduced or minimized. The amount of pain registered on the assessment form should be less after interventions. Remember pain makes the person anxious and less able to cooperate. Repeatedly causing pain can change the response of the central nervous system to pain, permanently affecting a person’s ability to perform their daily activities.

While exercise and movement should not cause severe pain, other essential interventions such as dressing changes may be painful. In such cases, measures should be taken to avoid or alleviate the pain as much as possible, for example by:

- soaking the dressings in saline before removal; and/or
- simple analgesics, such as paracetamol.

**Hypersensibility**

Sometimes the skin becomes hypersensitive (very sensitive to touch, or feelings of “pins and needles” or “crawling ants”). Clothing can be uncomfortable. This hypersensitivity in scars or other areas can be decreased with massage and activity.

**KEY OBJECTIVES**

- To know what causes pain in BU.
- To know that causing pain during POD interventions definitely does not lead to better or quicker results.
- To know how to manage pain.
- To know how to identify persons with protective sensory loss and teach them how to protect themselves from injury.
Specific desensitizing exercises can introduce textures that are less unpleasant, progressing slowly to textures that are very unpleasant. This desensitization takes time, with short sessions of 5–10 minutes each, 4–5 times a day. The affected person or caregiver can be taught these exercises at the bedside or at home.

**Sensory loss**

Scars, adhesions, or wounds which are close to a nerve can occasionally cause the person not to feel – or to have less sensation in – the affected areas. A progressive loss of sensation with or without muscle weakness may indicate that the nerve is being compressed. This should be referred immediately to the surgeon.

A loss of protective sensation makes it difficult for the person to know if he is damaging the body or limb. Self-care must include teaching the person to take special care of these affected areas so that they are not injured. Specific ways to evaluate the degree of sensory loss have not been addressed in this manual.

**REMEMBER**

- Pain serves only as a warning of damage to the body; it should never be taken as a sign ‘that the treatment is effective’.
- Loss of sensation requires daily inspection and protection to prevent injury.
- A progressive loss of sensation and/or muscle weakness may indicate that the nerve is being compressed by a scar or adhesion. These symptoms should be referred immediately to the surgeon.

**Essential intervention No. 6: Management of pain**

Figure 5.6.1 Peripheral nerve compression caused by scar on ulnar nerve

“Clawing” of the fingers due to muscle weakness.

Injury to the fifth finger due to decrease in sensation.

Comparison of the normal left hand to the right hand with the ulnar nerve compression.
Essential intervention No. 7
Exercise and activity
Exercises and activities are indicated when there is a risk of developing a contracture or when there is a potential problem with soft tissues, joint movement, or muscle weakness (see Annexes 8 and 9). The primary objective of exercise and activity in Buruli ulcer is to maintain or improve soft tissue length and joint range of motion (ROM). Much care is needed not to cause further tissue damage from using aggressive, repetitive type exercises and activity. This will lead to additional formation of fibrosis and limit function.

The second objective of exercise and activity is to strengthen muscles. Exercise and activity also help reduce stress and adhesions, as well as improve circulation and promote a sense of well-being. They can be organized individually or in groups, and can be located in a therapy room, at the hospital bedside, on the hospital grounds, or at home.

Activities of daily living and games are excellent methods of getting exercise, which help not only the physical but also the psychological and social aspects of the person’s life. Because more than 50% of the persons affected by Buruli ulcer are under 15 years of age, interventions should be appropriate for children – for example, by turning the interventions into games in order to encourage normal development and provide learning opportunities.
Essential intervention No. 7: Exercise and activity

Figure 5.7.1 Exercises and activities can prevent disability and promote development (stimulate educational opportunities and participation)
Games are good for exercise and development (Visual Health Information)
Active exercise involves using the person’s own affected joints and muscle contraction to perform the exercise. This type of exercise can be adapted to include more repetitions and more resistance as the muscles get stronger. Weights can be made from bags filled with sand, rice, beans, etc. Greater degrees of motion can also be included as joints become more mobile and less stiff.

Active-assisted exercise involves using the person’s own affected joints and muscle contraction to perform the exercise with the assistance of either the unaffected side or another person – usually when the person is unable to move the affected part through the total range of movement. This exercise may become more difficult as the person tries to move against gravity or resistance.

Passive exercise is done either by another person or by the person affected, using his or her unaffected side to move the affected limb. Passive exercise aims at maintaining or improving joint movement and stretching soft tissues, but does not strengthen the muscles. It is most effective when combined with serial splinting. Movement should be started slowly and be done gently to avoid trauma from overstretching. Such trauma will cause inflammation of healing tissues and pain, reducing the person’s desire to participate.

Isometric exercises allow muscles to contract without movement of the limb. They can be beneficial following grafting where immobilization is used with specific body parts until the graft takes (5–10 days). If pain increases and continues for more than 30 minutes after an exercise or activity, adjustments must be made by reducing the weight, the number of repetitions or the length of time for the exercise.

From the outset – when BU is first diagnosed – it is important to develop an appropriate programme of exercises that can be done by the person or a caregiver 5–6 times a day, 7 days a week. This will help decrease oedema and adhesion formation. It will also improve function and give the individual and the family a sense of responsibility for the rehabilitation process, both in the hospital and at home. Expensive and sophisticated exercise equipment is not needed for good results. The selection and adaptation of the exercise and activity is the most important part of getting such results. Therapy should be functional and fun.
Essential intervention No. 7: Exercise and activity

Exercises by body part and lower-extremity amputation (Visual Health Information) Figure 5.7.3

- **Head and neck**
  - [Images of exercises for head and neck]

- **Elbow, forearm and wrist**
  - [Images of exercises for elbow, forearm, and wrist]
Essential intervention No. 7: Exercise and activity

Trunk or lumbar and shoulder
Essential intervention No. 7: Exercise and activity

Hand, finger and thumb
Essential intervention No. 7: Exercise and activity

Hip, leg and knee
Essential intervention No. 7: Exercise and activity

Ankle, foot and toes
Exercises for lower extremity amputations

(continued on next page)
Essential intervention No. 7: Exercise and activity

Exercises for lower extremity amputations (continued)
Summary of joint mobilization and strengthening principles

ACTIVE MOBILIZATION requires the individual to contract his or her own muscles.

**Goals**
The goals are to reduce adhesions, prevent muscle weakness, or restore muscle strength and endurance. In addition, this mobilization promotes active personal involvement.

**Precautions**
Care needs to be taken to mobilize slowly, limiting repetitions, length of time or weight, and resistance given during the exercise or activity. All these components should be increased slowly to prevent pain and inflammation. If pain or inflammation is caused, then one or more of these components needs to be adjusted.

**Technique**
- If full movement is not possible because of muscle weakness, no weight or resistance should be applied to the exercise or activity. Some assistance to complete full movement may be needed.
- If the full movement can be made independently but not repeated 10 times, then no resistance or weight should be added to the exercise or activity.
- Once the movement can be made 10 times against gravity, then weight and resistance can be added to the exercise or activity.
- Adaptations or modifications may be necessary to permit the person to do the exercise or activity alone.

PASSIVE MOBILIZATION involves movement of the joints by an external force. Stretching can be done manually or achieved with splinting. Stretching exercises, combined with splinting the joint in its newest position after the exercise, is the most effective intervention when there are soft tissue contractures. Manual stretching exercises alone are not as effective for joint mobilization when soft tissues have contractures.

**Goals**
The goals are to prevent joint stiffness or restore joint movement affected by soft tissue contractures.

**Precautions**
Care needs to be taken to mobilize slowly and position carefully, in order to prevent damage to the soft tissues – which causes pain and inflammation. Aggressive passive mobilization that forces the joint and causes pain results in unnecessary trauma to joints and newly-healed tissues. Contractures are made worse. In addition, the pain causes the person to become more anxious and lose the ability to relax and cooperate.

**Technique**
- Movement is done slowly and smoothly, following the planes of movement.
- Hold the body parts proximal to the joint that will be moved.
- Mobilize slowly and smoothly, gently holding this position to its full extent for the count of 20–30 seconds. There should be no pain.
Essential intervention No. 8
Adaptations in activities of daily living
Essential intervention No. 8
Adaptations in activities of daily living

Adaptations are changes to the physical environment that enable people to carry out their day-to-day activities – often called activities of daily living (ADL) – despite the difficulties they are experiencing with Buruli ulcer. These adaptations are made using local materials to develop, improve, sustain, or restore the person’s ability to provide their own care in hospital or at home.

Such changes can help the individual to engage in a wide range of meaningful occupations related to self-care, work, play, and education. Not only is this active movement beneficial in reducing oedema, controlling adhesions, and improving joint motion, but it also gives the person a sense of self-control and independence that will reduce feelings of helplessness.

Some useful adaptations to consider

- Enlarged or modified handles on items such as eating utensils, toys, pencils, keys, exercise equipment, and work tools to facilitate grasping and manipulation.
- Extensions on objects, equipment, and tools to aid reaching when movement is limited.
- Clothing styles with few or no closures – closures can be made simpler by using larger buttons, hooks, or velcro straps.
- Crutches, wheelchairs, and other devices to facilitate mobility.

KEY OBJECTIVES

- To know why adaptations are used.
- To know when to encourage the use of adaptations.
- To know how to provide the appropriate adaptation and use it safely.
Special considerations when using adaptations

- Adaptations are used to improve independence and facilitate function.
- Adaptations of exercise and activity are used to improve ROM, strengthen weak muscles, and develop gross and fine motor skills.
- Training in the use of the adaptation can assure that it is used appropriately and that it is modified according to the interest and needs of the person.
- Adaptations can call attention to a person's disability and therefore may not be desired by the person.
- Adaptations should be discontinued when no longer needed.

**REMEMBER**

Essential interventions to be implemented early

1. Health education and self-care
2. Wound management
3. Oedema control
4. Scar management
5. Positioning and splinting
6. Management of pain
7. Exercise and activity
8. Adaptations in activities of daily living

If an intervention is needed and you are unable to provide it, the affected person should be referred to the closest centre that can provide it. Complex problems requiring complex interventions should be referred to specialized services, and details on this topic are presented in Chapter 7 of this manual. Discuss these situations and difficulties with your supervisor.

**Figure 5.8 Adaptations and modifications to prevent disability, and to promote function and independence**

A weak or unstable thumb can cause difficulty in picking up things. The use of this splint with a velcro strap facilitates writing and other prehension activities.

Work tools are made safer to hold, and grasp is facilitated, when handles are made larger and softer. Braided cloth and bicycle inner tubing are shown in this picture.

Correctly-fitted crutches allow those in the hospital to walk and participate in ADL.

This young boy does not have crutches, but he has found a stick to use to help him walk around his community.
# Summary of common problems with indicated interventions

A summary of the common impairments or problems seen in Buruli ulcer is given in the table below, together with treatment objectives and indicated interventions.

<table>
<thead>
<tr>
<th>PROBLEMS</th>
<th>TREATMENT OBJECTIVES</th>
<th>POD INTERVENTION INDICATED</th>
</tr>
</thead>
</table>
| **1. SKIN DRYNESS AND COMPLAINTS OF ITCHING** | • Reduce skin dryness and improve skin flexibility  
• Prevent skin cracks | • Soak with moist compress for 10–15 minutes and lubricate skin with oil  
• Inclusion and integration of involved limb in ADL |
| **2. OEDEMA** | • Reduce swelling  
• Reduce pain  
• Maintain good anti-deformity position  
• Improve movement | • Elevation  
• Good posture and positioning during the day and at night  
• Splinting  
• Active exercise  
• Compression  
• Inclusion and integration of involved limb in ADL |
| **3. WOUNDS** | • Manage open wounds adequately to avoid damage to new skin  
• Prevent infection  
• Manage pain  
• Promote wound healing without causing or increasing disability | • Remove old bandages carefully by soaking off adherent bandages with water or saline solution  
• Clean wound bed thoroughly with saline solution or water. Lightly pressurized water aids cleaning (spray-water hose, syringe, plastic water-bottle with spout, etc.)  
• Debride necrotic tissue when necessary  
• Treat infection with systemic antibiotics and rest  
• Use analgesics when needed  
• Adequately cover to protect and maintain a moist wound bed (vaseline soaked gauze) and permit function  
• Use light compression bandages that do not limit function  
• Adequately position and splint  
• Carefully massage healed areas and adjacent structures  
• Active exercise and movement  
• Inclusion and integration of involved limb in ADL |
### Essential interventions to prevent or minimize disability

<table>
<thead>
<tr>
<th>PROBLEMS</th>
<th>TREATMENT OBJECTIVES</th>
<th>POD INTERVENTION INDICATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. SOFT-TISSUE CONTRACTURES</td>
<td>• Stretch soft tissues resulting in improved joint range of motion</td>
<td>• Moist compress and skin lubrication with oil</td>
</tr>
<tr>
<td>(LIGAMENT, TENDON)</td>
<td>• Prevent deformities</td>
<td>• Good posture and antideformity positioning during the day and at night (splints)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Non-painful passive mobilization and stretching for 5–20 minutes followed by splinting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inclusion and integration of involved limb in ADL</td>
</tr>
<tr>
<td>5. JOINT CONTRACTURES</td>
<td>• Improve joint range of motion</td>
<td>• Non-painful passive and active mobilization and stretching</td>
</tr>
<tr>
<td></td>
<td>• Stretch muscles</td>
<td>• Provide antideformity positioning and/or splints at night</td>
</tr>
<tr>
<td></td>
<td>• Prevent deformities</td>
<td></td>
</tr>
<tr>
<td>6. SCARS</td>
<td>• Decrease thickness and rigidity of hypertrophic scar</td>
<td>• Moist compresses and lubrication of skin with oil</td>
</tr>
<tr>
<td></td>
<td>• Improve soft tissue flexibility and mobility</td>
<td>• Massage</td>
</tr>
<tr>
<td></td>
<td>• Decrease adhesions</td>
<td>• Compression</td>
</tr>
<tr>
<td></td>
<td>• Prevent and/or decrease soft tissue and joint contractures</td>
<td>• Good posture and positioning during the day and at night</td>
</tr>
<tr>
<td></td>
<td>• Prevent deformities caused by skin and soft tissue retraction</td>
<td>• Splinting</td>
</tr>
<tr>
<td></td>
<td>• Improve independence in ADL</td>
<td>• Active mobilization with or without resistance (exercise and activity)</td>
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<tr>
<td></td>
<td></td>
<td>• Inclusion and integration of involved limb in ADL</td>
</tr>
<tr>
<td>7. ADHESIONS</td>
<td>• Mobilize skin</td>
<td>• Moist compress and lubricate skin with oil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Massage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Active mobilization of skin</td>
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<td>• Compression</td>
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*Continued on next page*
## Essential interventions to prevent or minimize disability

### Table 5.8.1

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<thead>
<tr>
<th>PROBLEMS</th>
<th>TREATMENT OBJECTIVES</th>
<th>POD INTERVENTION INDICATED</th>
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</table>
| 8. FIBROSIS               | • Control the amount of fibrosis                                                    | • Prevent wound complications  
|                           |                                                                                      | • Early closure of open wounds  
|                           |                                                                                      | • Maintain a prolonged stretch to the skin of both open and closed wounds by positioning or splinting 5–20 minutes 3 times during the day and maintain prolonged stretch at night  
|                           |                                                                                      | • Maintain compression throughout the wound-healing process (approximately 2 years)  
|                           |                                                                                      | • Limit forceful repetitive movements during the first 2 years of wound healing  
| 9. PAIN AND SENSORY PROBLEMS | • Decrease hypersensitivity (pain response) to touch  
|                           | • Prevent injuries to skin with sensory loss                                         | • Progressive desensitizing exercises  
|                           |                                                                                      | • Observation and protection of area with sensory loss  
|                           |                                                                                      | • Inclusion and integration of involved limb in ADL  
| 10. WEAKNESS              | • Improve strength and endurance                                                   | • Active exercise and activity  
|                           |                                                                                      | • Inclusion and integration of involved limb in ADL  
| 11. PAIN                  | • Decrease pain                                                                      | • Treat cause (antibiotic for infection, elevation for oedema, desensitization exercises for painful sensation to touch, etc.)  
|                           | • Decrease protective responses that encourage deformity                             | • Use analgesics during extensive wound debridement and when starting exercise and activity programme  
|                           | • Increase participation in exercises and ADL                                       | • Exercise and activity which is not forced but adapted for each patient  
| 12. DIFFICULTIES WITH ADL | • Increase independence in ADL                                                      | • Encourage daily participation in ADL  
|                           | • Improve self-confidence                                                            | • Adapt tools and environment to facilitate ADL  
|                           | • Decrease sense of helplessness                                                    | • Decrease fear and protective responses  
|                           |                                                                                      | • Psychological support to both patient and family  

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## Essential interventions to prevent or minimize disability

<table>
<thead>
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<th>PROBLEMS</th>
<th>TREATMENT OBJECTIVES</th>
<th>POD INTERVENTION INDICATED</th>
</tr>
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</table>
| 13. Poor self-esteem and self-confidence – fear, apathy and depression | • Decrease feelings of helplessness  
• Improve self-esteem and confidence to take ownership of health situation | • Enable patient to do ADL  
• Enable patient to participate in decisions about treatment and priorities  
• Combined exercise and activity |
| 14. Restrictions in participation – stigma and functional ability | • Improve functional ability and participation  
• Enable children to continue their school studies during hospitalization  
• Reduce stigma | • Educate the community, family, and health workers about the disease, its transmission, and treatment  
• Improve the patient’s ability to actively participate in ADL and make decisions about treatment goals  
• Adapt environment or tools to facilitate function  
• Provide education to children in the hospital  
• Refer to specialized services |

### Review questions

1. When and why should POD interventions be started?
2. How do you know which interventions should be used?
3. What are the most common problems seen in Buruli ulcer programmes that contribute to deformity and disability?
4. What essential interventions can prevent or minimize disability in BU?
Social and psychological considerations

Chapter 6

Social and psychological issues | Stigma | Motivation | Inclusion and participation
Social and psychological considerations

Communication can help the health worker identify socio-economic and psychological problems and difficulties by taking the time to listen carefully to both the person affected by BU and the family, in the hospital or outpatient clinic. Asking questions can help to clarify the person’s situation, feelings, and interests. This questioning can be carried out individually, or within groups of persons affected by BU.

It is important that privacy and confidentiality are respected. Remember to listen, and avoid giving too much advice. Encourage the person and family to explore possible solutions and – if needed – direct them to appropriate resources.

Social and psychological issues

These issues are very important in Buruli ulcer. Some of the common problems are segregation, stigmatization, dependency, economic difficulties, depression, loss of self-worth and dignity, and fear. The challenge is to provide care which encourages the person to manage his or her own life, and to participate actively in family, school, work, play, and community activities.

Referral to community-based rehabilitation (CBR) programmes may be needed. CBR aims to restore dignity, increase economic independence, reduce stigma, and achieve integration. CBR programmes should be holistic, encourage participation, be sustainable, integrated, gender-sensitive, and sensitive to special needs.

**KEY POINTS**

- Persons affected by BU may experience isolation, stigmatization, dependency, economic difficulties, depression, loss of self-worth and fear.
- The stigma of the disease can be decreased through health education programmes that improve knowledge and understanding about the disease and its treatment.
- Motivation can be improved by involving affected persons in solving their own problems and empowering them to be in charge of their own daily care and exercises.
- Motivation is greater when the person has good skills, a sense of self-control, a support system and the opportunity to see someone else who has successfully overcome BU problems.
- The inclusion and participation of persons affected by BU in school, work, family, and community activities should be encouraged.
- The stigma of the disease can be decreased through health education programmes that improve knowledge and understanding about the disease and its treatment.
The following are three ways to encourage and restore dignity to persons affected by BU and their families.

- **Recognize** that the impact of Buruli ulcer on the individual and family is great. It has physical, psychological, social, and economic effects.
- **Respond** to the concerns of the person affected by Buruli ulcer, empowering his or her participation in making decisions and choosing interventions. This approach restores dignity and self-respect.
- **Reach** out to families and communities where Buruli ulcer is a problem. Help them understand the disease, how it is treated, and how to support the affected person through the rehabilitation process, so that full integration is achieved.

**Stigma**

Stigma is the reaction of society towards people with certain characteristics (for example, a deformity or an ulcer) which are perceived as abnormal and undesirable; the result is that such people are deprived of the same social inclusion and human rights as are enjoyed by others. Fears and misunderstanding about the disease can cause a person affected by Buruli ulcer (and the family) to be isolated or neglected by communities and health workers. Such discrimination can result in persons with the disease hiding or denying the problem, delaying early diagnosis and treatment. Fearful health workers may neglect to give the care needed to prevent or minimize disability.

*Figure 6.1 Encourage educational activities*

- Children can continue their education while in the hospital.
- Encourage the children to complete their education.
- Girls should be encouraged to complete their education.
- Women and men may need to learn new technical skills that enable them to work in order to increase the family income.
Fear, devaluation, and social inequality can also be a response to the physical deformities and scars that remain after medical and surgical treatment of the disease. These physical signs visually mark the individual and depart from societal standards of beauty. The disease may be viewed as a sign of a curse, or a punishment for some sin committed. Deformities may also lead many to believe that the person is unable to participate in activities and normal family, educational, and community life. These people may be viewed as a burden to themselves, their families, and their community. This stigma creates social and economic difficulties.

Overcoming stigma is an essential step to the integration of people affected by BU within the general health services and to restoring normal relationships with their family and community. Stigma decreases as we:

- identify the fears regarding the disease, and then respond specifically to the expressed fears and risks – involve doctors, social workers, educators and religious leaders in the programme to help minimize stigma and alleviate fears and anxiety (one of the major fears is that the disease can be transmitted to others, but as far as we know, the disease is never transmitted directly from one person to another);
- improve knowledge and understanding about the disease – include key health workers, community leaders, and persons affected by Buruli ulcer in campaigns to inform the community about the disease; education can decrease ignorance and prejudice, and the community’s participation facilitates rehabilitation;
- provide effective treatment for the disease; this develops confidence that the disease can be dealt with;
- increase self-confidence of persons affected by BU by empowering them to be in control; awareness, understanding, knowledge, skills, and encouragement will improve self-esteem and motivation;
- involve and empower HCWs to do their jobs more effectively; and
- develop support groups that will encourage participation and advocate for the needs of persons affected by Buruli ulcer.

**Figure 6.2 Empower the person to participate**

The child can eat with his right hand although there is a severe deformity. Allow him to feed himself.

Educate the community about the disease and help affected persons return to their education and community activities.
Motivation

The diagnosis of Buruli ulcer may lead to feelings of helplessness, anger, depression, and apathy. The affected person may not show any interest in interventions to prevent disability.

Most affected persons are children, and it is important to plan creative and imaginative exercises that are fun. Exercises and specific movements as part of an interesting activity have more meaning to affected persons, and will help them to be motivated to participate. Participation in such activities helps them see a goal which has been successfully accomplished, which reduces their sense of helplessness.

Motivation can be improved by involving affected persons in solving their own problems and empowering them to be in charge of their own daily care and exercises. Motivation is greater when the person has:

- knowledge that impairments and disability can be prevented or minimized;
- developed good skills for self-care at the hospital and at home;
- developed a sense of self-control over his/her own life;
- support from health workers, family, and community;
- an opportunity to see someone with similar Buruli ulcer problems actively participating with their family, in school, work, and in other community activities.

Inclusion and participation

Education

More than 70 percent of Buruli ulcer occurs in children under 15 years of age. Prolonged hospitalization can interfere with both their schooling and family lives. Arrangements should be made to ensure that children continue their schooling during hospitalization.

An important part of the educational process in the hospital comes from the selection of age-appropriate games to help their development and stimulate interpersonal relationships. Areas for play can be designed, and the play equipment can be constructed and adapted from locally available materials.

Family, work, and community life

Health education programmes can help inform the person, the family, the employer, and the community about the disease and how it is treated. When possible, the person should be treated as an outpatient and given home programmes for POD to reduce the physical and economic burden on the family. This will also facilitate their return to, and inclusion in family, school, work, and community life.
Social and psychological considerations

Parents and family are taught how to help and encourage the physically-challenged person.

The community is taught how to enable inclusion and acceptance of the affected person in their community.

Figure 6.3 Facilitate participation in family and community life

Review questions

1. What are the most common social and psychological problems of children and adults affected by Buruli ulcer?
2. What causes stigma and how can stigma be reduced?
3. What helps motivate the individual, the family, and the health worker?
Chapter 7

Referrals to specialized services

Referral procedures
If you are unable to provide a necessary intervention, then the person should be referred to the appropriate professional within the health centre or referred to the closest health unit able to provide the intervention. Training, supervision, and management can assure that persons affected by BU are identified and that a functioning referral process is present. Specific criteria and procedures should be established for referrals.

Some of the common problems requiring referral are:

- oedema not responding to interventions (compression, elevation, exercise);
- wound complications (infection, excessive bleeding, or breakdown of a scar);
- extensive or complicated ulcers (for example, involving tendons);
- osteomyelitis;
- loss of a body part (eye, breast, hand, leg, or foot), requiring a prosthesis;
- new or recurrent lesions;
- other severe medical or socioeconomic problems;
- need for amputation;
- need for reconstructive surgery;
- need for fabrication of a special orthosis or prosthesis;
- need for pre- and post-prosthetic training;
- need for special adaptations to improve independence.

**KEY POINTS**

- Referral to a specialized service is needed when complications or problems are not resolved with the basic POD interventions or activities described in this manual.
- Criteria and procedures for referral need to be clearly defined.
- A summary of the problems and treatment already given should be sent to the referral centre, which should then return a summary of findings, treatment, and recommended follow-up activities.
Refer problems needing special services or interventions

- Pain, wound, nerve and bone complications
- Limitations in joint movement
- Loss of body part

(continued on next page)
Referrals to specialized services

Figure 7.1 continued

Referral procedures

Monitoring the individual helps to assess whether or not interventions have achieved the desired results. If not, the interventions may need to be modified or a referral may be required. Adequate documentation, with comparison of the results on individual assessment forms, facilitates this process.

If referral is needed, the following checklist of procedures is helpful:

- Selection and referral must be based on established referral criteria.
- Know the requirements of the referral centre or professional (such as a summary of the affected person’s current situation, copies of assessment forms, a pre-arranged consultation time, payment for services).
- Try to schedule a specific day and time for the consultation before sending the person there.
- Have contact information for the affected person, the referring health unit, and the referral centre, with a copy of the contact information provided to each.
- The referring health unit should summarize the individual’s medical and therapeutic situation and specify the reason for the referral. Copies can be sent to the referral centre and carried by the person being referred. A copy of this information should be kept in the individual’s health record.
- A request should be made for the referral centre to provide a summary of their assessment and recommendations. If services are provided, they should be described.
Follow-up procedures should be communicated clearly, both to the individual and to the referring health unit.

Referral should not be used to lessen workloads or compensate for poorly-organized services. All efforts should be made to develop and implement the essential POD activities within the health services managing Buruli ulcer. Appropriate training and consistent supervision, together with provision of adequate materials, should permit POD implementation. If the essentials are provided, prevention of disability is possible and costly referrals can be prevented. This means that both the financial cost and time lost for the affected person, the family, the health system, and the community can be reduced.

Table 7.1 summarizes the essential POD activities defined by health workers in the Ashanti region in 2003. The health workers also defined the problems and needs that would require referral to another specialist within their own health service or an outside referral centre.

### Table 7.1 Summary of essential POD activities and problems that may need to be referred

<table>
<thead>
<tr>
<th>Essential POD activities to be done at local health facilities</th>
<th>Problems and needs that may be referred to specialty services or professionals</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Patient education, self-care and ADL</td>
<td>- Oedema not responding to interventions (compression, elevation, exercise)</td>
</tr>
<tr>
<td>- Oedema control</td>
<td>- Wound complications (infection, excessive bleeding, abnormal or unusual appearance of wound, unstable scars)</td>
</tr>
<tr>
<td>- Scar management and control</td>
<td>- Extensive or complicated ulcers</td>
</tr>
<tr>
<td>- Positioning and splinting</td>
<td>- Osteomyelitis</td>
</tr>
<tr>
<td>- Management of pain and sensory problems</td>
<td>- Surgical amputation</td>
</tr>
<tr>
<td>- Exercise and activity for ROM and strengthening weak muscles</td>
<td>- Loss of a body part (eye, breast, hand, leg, foot, etc.)</td>
</tr>
<tr>
<td>- Adaptations in ADL</td>
<td>- Pre- and post-prosthetic training</td>
</tr>
<tr>
<td>- Referral to special service or professional</td>
<td>- Fabrication of special orthoses and prostheses</td>
</tr>
<tr>
<td></td>
<td>- Special adaptations to improve independence in ADL</td>
</tr>
<tr>
<td></td>
<td>- New or recurrent lesions</td>
</tr>
<tr>
<td></td>
<td>- Other medical or socioeconomic problems</td>
</tr>
</tbody>
</table>

**Review questions**

1. When should people affected by BU be referred to specialized services?
2. What criteria and procedures are needed before the referral is made?
3. What information is needed in return from the referral centre?
Organizing and implementing POD

Chapter 8

Things to remember
Suggestions from health workers
Factors that facilitate or impede the implementation and practice of POD
Organizing and implementing POD

Good leadership and the delegation of responsibility and tasks are needed to help orchestrate the various components and personalities involved in POD. Organizing and implementing POD within Buruli ulcer control activities requires the commitment of managers and technical staff to work together. This process starts with a clear vision of what POD means in Buruli ulcer treatment. Objectives need to be clear and essential activities defined. The implementation of these essential activities will depend on a careful plan that is periodically updated as implementation progresses.

Training and supervision will help develop the knowledge, skills, and support needed to implement these essential activities. Periodic meetings between the management and technical team can address difficulties and update procedures and practices. Case presentations and discussions help the team to respect and listen to the observations and contributions of each team member. Inclusion of the persons affected by BU and their families in the discussions can empower them to more active participation in addressing difficulties encountered with Buruli ulcer.

Management is a skill that helps to get things done through people. The manager not only organizes and encourages the team, but also decides what to do next. The three main components of management are planning, implementation and evaluation.

Management begins with planning, which should lead to implementation. Planning is a continuous process during implementation. Evaluation also occurs during implementation, and should lead to further planning. The management structure will depend on the existing structures within each country, which may have either a centralized or decentralized programme.

KEY POINTS

- Good leadership, efficient organization, and delegation of tasks and responsibilities are needed for the integration and implementation of POD activities within a BU control programme.
- Specific training workshops and on-the-job training under supervision help health workers develop the knowledge and skills needed to successfully carry out POD interventions.
- Commitment, creativity, knowledge, skills, resources and support facilitate the inclusion of POD in the treatment of BU.
REMEMBER

- POD is an integral part of Buruli ulcer control.
- Early implementation of essential POD activities can prevent disability.
- Good leadership, management and technical support are needed.
- The success of POD will depend on teamwork between the management and technical staff.
- Involve the individual and their family.
- Plan short- and long-term goals and activities, which are periodically revised.
- Delegate responsibilities and tasks.
- Develop staff (training can be formal or informal).
- Implement activities based on priorities and a plan.
- Supervise to ensure that POD activities are effectively and efficiently implemented.
- Monitor programme activities.
- Evaluate the programme to determine if its objectives have been met and to provide a basis for further planning.

Suggestions from health workers

In 2003, health workers in the Ashanti region of Ghana felt that the following suggestions were important to POD implementation.

- Training should use a participatory method of teaching, to develop both knowledge and skills, utilizing problem-solving situations with people affected by BU.
- Supervision or follow-up by specifically-identified POD technical consultants should be provided for 1–3 months after training, to provide support needed to resolve difficulties encountered in implementation.
- If a difficulty is encountered, health workers should actively seek help by contacting a technical support person.
- Supervision should include the following:
  - monitoring documentation;
  - observing persons being assessed and treated;
  - interviewing persons affected by BU, families and other health workers to identify satisfaction, problems, or difficulties;
  - updating knowledge and skills as needed.
- Use equipment and materials which are easily accessible and can be used in both the hospital and home.
- Health workers do not need sophisticated equipment and materials; rather, they need creativity to adapt interventions to meet the needs of the person affected by BU.
Factors that facilitate or impede the implementation and practice of POD

The implementation and practice of POD activities within Buruli ulcer control programmes and within referral centres can be facilitated or impeded by predisposing, enabling and reinforcing factors. The adapted PRECEDE health education model (Figure 8.1) can be used for planning and evaluating interventions at both the individual and the programme levels.

If one or more of these factors is a problem, POD will not be successfully implemented. During the implementation phase, specific areas may need to be targeted for intervention. A description of these factors is briefly summarized below.

**Predisposing factors** provide the motivation to implement POD activities. This involves knowledge, beliefs, attitudes, and culture. If the individual, the family, the manager, and/or the health worker do not feel it is important or necessary, they will not be motivated to learn the skills to do the tasks.

**Enabling factors** develop the ability, skills, and resources to carry out POD activities. If the affected persons, their families, and the health workers understand the importance of a specific intervention but do not have the necessary time, skills, or materials, they will not be able to carry out the intervention (for example, exercise, massage, or adaptation) correctly. Time, skills, materials, and supplies are essential for getting good results with POD interventions.

**Reinforcing factors** provide the support and reinforcement for POD activities. The health worker may understand the importance of POD and have the skills to carry out the interventions, but may become discouraged and apathetic because of health policies and management that do not allow time or provide supplies and materials for POD to be implemented. The programme manager’s support and encouragement ensures that an effective and efficient POD programme is implemented and integrated within the BU control programme. Affected persons may become discouraged because health workers or family members are too impatient to allow them to perform the activities and exercises on their own.
Organizing and implementing POD

1. PREDISPOSING FACTORS
   - Knowledge
   - Beliefs
   - Values
   - Attitudes
   - Culture
   - Confidence

2. ENABLING FACTORS
   - Health worker's skills
   - Patient and family's skills
   - Resources: equipment, material and supplies
   - Accessibility to services
   - Government laws, policies, guidelines, etc.

3. REINFORCING FACTORS
   - Family
   - Peers
   - Teachers
   - Employers
   - Other health workers
   - Community and community leaders
   - Health policy makers

Figure 8.1 Factors that facilitate or impede the implementation and practice of POD in Buruli ulcer control programmes

Review question
- What facilitates or impedes the implementation of essential POD activities in Buruli ulcer control programmes?


Schaaf A. *Pressure garments and how to make them*. South Africa, Groote Schuur Hospital Teaching Board, 1980. [Can be obtained from the Occupational Therapist, P.O. Box 145, Rondebosch 7700, South Africa.]

Bibliography


Visual Health Information. Copyrighted exercise images used by permission from Visual Health Information, 11003 “A” St South, Tacoma, WA 98444, USA.


Useful web sites

Visual Health Information (VHI): www.vhikits.com

WHO Buruli Ulcer: www.who.int/buruli

WHO International Classification of Functioning, Disability and Health (ICF): www.who.int/classification/icf

WHO Disability.: www.who.int/nmh/a5817/en/
ANNEX 1
Buruli ulcer patient’s POD assessment form developed in Ashanti Region, Ghana

Name:  
No.  
Sex: M F  
Age:  
Classification: New case Recurrent case  
City/village:  
District:  
Region:  
Level of education:  
Date of POD/Rehabilitation evaluation (dd/mm/yy):  
Occupation:  

Body chart
(describe location and extent of lesion)

Location of lesion (X = Yes)

R  L

Head and neck (HN)
Thorax (Th)
Back (BK)
Abdomen (AB)
Buttocks and perineum (BP)
Upper limbs (UL)
Lower limbs (LL)

IMPAIRMENT
(Problem/complication) (X = Yes)

R  L
1. Open wound
2. Wound infection
3. Pain
4. Oedema/swelling (measure)
5. Hypertrophic scar/keloid scar
6. Adhesion
7. Soft tissue contracture (measure)
8. Joint contracture (measure)
9. Deformity of body part
10. Amputation/loss of body part
11. Muscle weakness
12. Loss of sensation
13. Other

ACTIVITY LIMITATION, explain (difficulty with self-care/other activities):

PARTICIPATION RESTRICTION, explain (family, school, work, play, social, etc.):

OTHER, explain:

*See measurements (oedema & joint range of motion – ROM) documentation on other pages/visit*
<table>
<thead>
<tr>
<th>Non-surgical interventions</th>
<th>Describe specifics (include type, frequency, time, etc.)</th>
<th>Urgent</th>
<th>Successfully completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Patient education in self-care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Wound care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Oedema control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Scar management and control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Positioning/splinting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Management of pain and sensory problems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. ROM and strengthening weak muscles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Adaptations in Activities of Daily Living (ADL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Referral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# ANNEX 2

## Buruli ulcer patient's POD assessment form developed in Cameroon

**Rehabilitation for the prevention of disabilities from Buruli ulcer – Initial evaluation Form**

<table>
<thead>
<tr>
<th>Date of evaluation:</th>
<th>Patient's name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of birth:</td>
<td>Sex:</td>
</tr>
<tr>
<td>Town/village:</td>
<td>Occupation:</td>
</tr>
<tr>
<td>District:</td>
<td>Level of education:</td>
</tr>
<tr>
<td>New case</td>
<td>Recurrent</td>
</tr>
</tbody>
</table>

### Impairments

- Oedema
- Contracture of capsules and ligaments
- Contracture of muscles and tendons
- Atrophy of muscles
- Adhesion of muscles and tendons
- Loss of feeling (except graft)
- Pain
- Itching
- Hypertrophy
- Skin contractures
- Skin adhesion
- Open wound
- Area of infection
- Amputation/deformity
- Other:

### Case history

- Dates and circumstances of onset of condition:
- Date of arrival at hospital:
- Prior treatment? If yes: other health centre/traditional medicine? (underline whichever)
- Social and family circumstances (family, dependants in the village, carer at hospital, referee to assist with rehabilitation?) (underline whichever)
- Difficulties encountered since onset of the condition (physical, in the family, social, psychological, financial):
- What does the patient understand about his/her condition and its treatment?

### Hospital treatment:

- Dressing alone
- Excision, date:
- Antibiotic treatment
- Graft, date:

Rehabilitation:

Name ofgressor:
**ANNEX 3**
Patient oedema control evaluation forms and locations for measurements for upper limb and lower limb

### Upper limb oedema control evaluation form

<table>
<thead>
<tr>
<th>LOCATION OF MEASUREMENT (measure in millimetres – mm)</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Metacarpal phalanges (MCP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Wrist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 2 fingers above the wrist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 2 fingers below the elbow bend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. 2 fingers below the axilla</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Lower limb oedema control evaluation form

<table>
<thead>
<tr>
<th>LOCATION OF MEASUREMENT (measure in millimetres – mm)</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Metatarsal phalanges (MTP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Ankle around the heel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 4 fingers below knee bend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 4 fingers above knee cap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. 4 fingers below groin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Measurements can also be made with disposable string and then drawn onto a different piece of paper for comparisons.
## ANNEX 4 - Patient range of motion (ROM) evaluation forms

### Patient range of motion (ROM) evaluation form

### 4A: Upper limb range of motion (ROM) evaluation form

<table>
<thead>
<tr>
<th>Date</th>
<th>SHOULDER</th>
<th>ELBOW</th>
<th>FOREARM</th>
<th>WRIST</th>
<th>FINGER MCP</th>
<th>FINGER PIP</th>
<th>FINGER DIP</th>
<th>THUMB MP</th>
<th>THUMB IP</th>
<th>THUMB web space – abduction (MCP)</th>
</tr>
</thead>
</table>

*Listed are the most frequently affected joints in Burn patient.*

(A = Active; P = Passive)

Note: Move arm through range of motion to determine joint motion. Ensure patient is comfortable and that the movement is pain-free. Measurement should be taken in millimetres.
### 4B: Lower limb range of motion (ROM) evaluation form

**Patient's name:**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Flexion</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIP</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>Extension</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Abduction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>External rotation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KNEE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Flexion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Extension</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FOOT</strong></td>
<td><strong>Plantar flexion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Dorsal flexion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(A = Active; P = Passive)

*Listed are the most frequently affected joints in Buruli ulcer*

*Note: Joint measurements can be drawn on paper if measurements with a goniometer are not possible/available.*
ANNEX 5
Pain scale

Objective
To measure the degree of pain perceived by a patient within the last 24 hours.

Material
- Piece of paper with a 10-centimetre line drawn on it, with the left side labelled “No pain” and the right side labelled “Maximum pain”.
- Pencil or pen.
- 10-centimetre ruler.

Procedure
- Explain to the patient that the scale is to understand the degree or amount of pain he/she has during the day and night.
- Show him that the left side of the scale represents no pain and the right side represents severe pain.
- Explain that severe pain means that the pain is so great that he/she cannot do anything.
- Ask the patient to show you on the line the amount of pain he/she is now experiencing (current pain).
- Place a mark (●) on the line where the patient is pointing with a pencil or pen.
- Next, request the patient to indicate the greatest amount of pain he/she has experienced within the last 24 hours (greatest pain).
- Place an X, with a pencil or pen, on the line where the patient is pointing.
- To find the values, measure from the “No pain” mark to the marks the patient has made for current pain and for greatest pain. Note the values in centimetres.

Figure 4.3.1 Numerical Pain scale indicator

Figure 4.3.2 Numerical Color Pain scale indicator for adults

Figure 4.3.3 Numerical Color Pain scale indicator for children

<table>
<thead>
<tr>
<th>KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current pain</td>
</tr>
<tr>
<td>Greatest pain within the last 24 h</td>
</tr>
</tbody>
</table>
### ANNEX 6
Buruli ulcer functional limitation score (BUFLS)

Direct assessment of functional limitation

<table>
<thead>
<tr>
<th>Functional activity</th>
<th>Score 0</th>
<th>Score 1**</th>
<th>Score 2***</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upper extremity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eating with hand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting with a knife</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using pen (writing/drawing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding a cutlass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking from a cup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dressing (putting on/tying shirt)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combing hair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pouring from a pitcher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lower extremity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking fast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking slow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squatting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kneeling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Both extremities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifting an object</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Using a cutlass</td>
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<td>Hoeing</td>
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<td>Breast</td>
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<td>Breastfeeding a baby</td>
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<td>Head (eye)</td>
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<td>Sight</td>
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<td>Genitals</td>
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<td>Fertility and sexual function</td>
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1. Children younger than 6 years of age will not be scored for these activities.
2. 0 points indicate no functional limitation when performing the activity.
3. 1 point indicates functional limitation to a certain degree, but not full limitation.
4. 2 points indicate full functional limitation: no ability to perform the activity.
### ANNEX 7
P-Scale (Participation Scale)

<table>
<thead>
<tr>
<th>Number</th>
<th>PARTICIPATION SCALE</th>
<th>Not specified, not answered</th>
<th>Yes</th>
<th>Sometimes</th>
<th>No</th>
<th>Irrelevant</th>
<th>I don't want to</th>
<th>No problem</th>
<th>Small</th>
<th>Medium</th>
<th>Big</th>
<th>SCORE</th>
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<tbody>
<tr>
<td>1</td>
<td>Do you have equal opportunity as your peers to find work?</td>
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<td>2</td>
<td>Do you work as hard as your peers do? (same hours, type of work, etc.)</td>
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<td>Do you contribute to the household economically in a similar way to your peers?</td>
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<td>4</td>
<td>Do you make visits (travel) outside your village as much as your peers do? (except for treatment e.g. bazaars, melas, nearby villages)</td>
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<td>5</td>
<td>Do you help other people (e.g. neighbours, friends or relatives)?</td>
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<td>6</td>
<td>Do you take as much part in casual recreational/social activities as do your peers? (e.g. sports, chat, meetings)</td>
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<td>7</td>
<td>Are you as socially active as your peers? (e.g. in religious/community affairs)</td>
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<td>8</td>
<td>Do you visit other people in the community as often as other people do?</td>
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<td>9</td>
<td>Are you comfortable meeting new people?</td>
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<td>10</td>
<td>Do you have the same respect in the community as your peers?</td>
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<td>11</td>
<td>Do you move around inside and outside the house and around the village/neighborhood just as other people do?</td>
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<td>No</td>
<td>Irrelevant</td>
<td>I don't want to/ I don't have to</td>
<td>No problem</td>
<td>Small</td>
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<td>12</td>
<td>Compared to your peers...</td>
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<td>In your village, do you visit all the public places/common places? (including schools, shops, offices, market and coffee)</td>
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<td>13</td>
<td>Do you have opportunity to take care of yourself (appearance, nutrition, health, etc.) as well as your peers?</td>
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<td>14</td>
<td>In your home, do you do household work?</td>
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<td>15</td>
<td>In family discussions, does your opinion count?</td>
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<td>16</td>
<td>In your home, are the eating utensils you use kept with those used by the rest of the household?</td>
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<td>17</td>
<td>Do you take part in major festivals and rituals as your peers do? (e.g. weddings, funerals, religious festivals)</td>
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<td>18</td>
<td>Do you feel confident to try to learn new things?</td>
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Comment: ________________________________

Name .............................................. Age: .............. Gender .........

Reason for the assessment ...........................................................

Interviewer ........................................ Date of interview: ...........

Grades of participation restriction

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<th>No significant restriction</th>
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<th>Moderate restriction</th>
<th>Severe restriction</th>
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<td>0 – 12</td>
<td>13 – 22</td>
<td>23 – 32</td>
<td>33 – 52</td>
<td>53 – 90</td>
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</table>

Disclaimer: the Participation Scale is the intellectual property of the Participation Scale Development Team. Neither the Team nor its sponsors can be held responsible for any consequences of the use of the Participation Scale.
Administering the P-Scale

The programme will need to decide who will administer the scale. The questions should be asked the way they are written. Only explanations given in the “question by question” (Q/Q) session should be used if the question itself is not clear. At times the interviewers may use different terms to explain a question but they should never go out of the scope defined by Q/Q. Before the actual scale interview is started, the interviewer should build rapport with the respondent and make the respondent feel at ease as much as possible. Where possible, the interview should be done in private and by a same-sex interviewer. Once the scale interview has started, it should not be interrupted to answer other questions, give explanations that do not relate to the scale, or to discuss other topics. If the respondent wishes to elaborate, ask a question, or discuss another topic, the interviewer should insist in a friendly, but firm, manner that the scale interview needs to be completed first and that (s)he will then come back to the other questions or concerns of the respondent. This is very important.

Response options

**Not specified/not answered**
“I won’t tell you”, or “I forgot to ask”.
Use this response when the client does not give an answer, for example when they are too embarrassed to do so. It may also be used when the interviewer forgets, or for some other reason does not ask the question.

**Yes**
“There is no difficulty”.
Use this response when there is no participation restriction, or a negligibly mild one.

**Sometimes**
There are problems with this sometimes or with some people.

**No**
There are problems with this.

**Irrelevant/I don’t have to/I don’t want to**
Affected persons may answer a question with “no” but say that it is nevertheless irrelevant for them. For example, they may not travel outside their village, in which case the answer is “no”, but it may be irrelevant for them because they have no relatives or family living outside the village. They may say that they don’t travel outside their village because their children go to the bazaar and they therefore don’t have to leave the village. This response can also be used when patients do not expect to be able to do this, e.g. questions about marriage for children. This response may also be used when there is an issue due to caste, gender, etc., rather than disease – for example, in a culture where women are excluded from community leadership positions, regardless of their health status.

Patients may also say that they don’t want to leave the village or have no interest in doing so. Interviewers must note that there is a difference between patients saying they don’t want to because they have no interest in something, and not wanting to do something because of fear or paranoia which is self-stigmatization.

**Problem assessment**
If “No” or “Sometimes”, the importance of the participation restriction must be assessed.

**It is not a problem**
There is a participation restriction, but it does not matter to the client either practically or emotionally. This can include situations where the client has fully adapted. Be careful to distinguish between this situation and that in which the client did not ever have expectations of participating.

**It is a small problem**
(in time or intensity) (mild restriction)
There is now a participation restriction. It matters to the client either practically or emotionally. But it is only a small problem because it does not happen often or is not a big difficulty.

**It is a medium problem**
(in time or intensity) (moderate restriction)
There is now a participation restriction. It matters to the client either practically or emotionally. It has an effect on his/her life.

**It is a big problem**
There is now a participation restriction. It matters to the client either practically or emotionally. (S)he has not found an appropriate way of coping and it is a big problem, which may have resulted in a major life change.
Marking the responses and computing the total score

The scale is pre-coded and the scores to each response are already assigned in the response boxes. During the interview, the responses are marked in the appropriate boxes by encircling the corresponding number or by ticking the corresponding box and subsequently encircling the correct problem score. Boxes not applicable to a particular question are shaded. After the interview, the score for each item is transferred to the “Score” column and added up. The sum score is then written in the box marked “TOTAL”. Because the item scores will each be between 0 and 4, the sum score would be somewhere between 0 and 72. The current recommended cut-off for ‘normal’ (= not having significant participation restrictions) is 12. People scoring more than 12 would be classified as having participation restrictions and would therefore need further evaluation to determine the need for, and feasibility of rehabilitation assistance of some kind.

The cut-off of 12 is based on the data collected during the development process. Among the control subjects interviewed, 95% scored 12 or less. However, a different cut-off may be more appropriate locally. Data on what is ‘normal’ in a given area may be obtained by carrying out a small normative study, in which at least 30 control subjects (people without a stigmatized condition or disability) are interviewed. In general, choosing a higher cut-off will increase the specificity and lower the sensitivity; lowering the cut-off will do the reverse. A high sensitivity will result in more people appearing to be in need of rehabilitation interventions (having participation restrictions). A high specificity will ensure that only those with significant participation restrictions are identified as having problems. The choice of cut-off will depend on the scores obtained among control subjects and on the resources available for offering rehabilitation assistance. If resources are plentiful, one can choose a lower cut-off and offer assistance to a larger number of people; if resources are scarce, one may increase the cut-off and only offer assistance to those with more severe problems. It is important to enter the score along with the decision whether or not to evaluate the person for rehabilitation assistance.
Exercises for lower extremity amputations