مركز الملك سلمان
للإغاثة والأعمال الإنسانية
KING SALMAN
HUMANITARIAN AID & RELIEF CENTRE

General guideline for prosthetics
And rehabilitation services

IRVD
International Wars and Disasters Victims
Protection Association - Alameen

General guideline for prosthetics And rehabilitation services

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Introduction

Introduction

Conflicts, wars, and natural disasters contribute to rising rates of disabilities of all types and leave lasting side effects for several generations. Among these, motor disabilities, particularly those resulting from amputations, have a significant impact on society. Rehabilitation services, which are specialized health services, play a crucial role in the recovery process and contribute to the rehabilitation of communities affected by humanitarian crises. They are considered one of the most important services in emergency response during humanitarian crises. Therefore, the guidelines have been issued to serve as a primary reference for the steps involved in the services provided in prosthetic and rehabilitation programs. This guide aims to clarify the general principles for operating prosthetic and rehabilitation centers, according to scientific references and technical standards endorsed by the world health organization, the international committee of the red cross, and other authoritative bodies in the field.

The guide emphasizes the necessity of establishing comprehensive policies and a regulatory framework for organizing the delivery of prosthetic and orthotic services, ensuring:

- **Quality:** by implementing strict standards to guarantee the effectiveness and safety of these services.
- **Safety:** by adhering to established safety standards and providing a secure environment for patients.
- **Effectiveness:** by designing personalized treatment plans for each patient to achieve the best possible outcomes.
- **Availability:** by expanding the scope of these services to ensure that all patients in need have access to them.

Furthermore, the guideline seeks to align with international standards in the field of prosthetics and orthotic services to ensure that patients receive the highest level of care available worldwide.

Technical team
International wars and disasters victims protection association (IRVD)

Chapter two

Introduction to king salman humanitarian aid and relief centre (KS relief) and international wars and disasters victims protection association (IRVD/ Al-Ameen)

مركز الملك سلمان للإغاثة والأعمال الإنسانية
KING SALMAN HUMANITARIAN AID & RELIEF CENTRE

King salman humanitarian aid and relief center (KS relief):

Historically, the kingdom of saudi arabia has taken on a pioneering humanitarian role in serving the international community around the world. The kingdom realizes the significance of this role in alleviating human suffering and ensuring that all people are given the opportunity to live healthy, dignified lives. To further emphasize their dedication to the service of all in need, the leadership of saudi arabia established king salman humanitarian aid and relief centre. The purpose of this important international organization is to provide humanitarian aid and relief to those in need outside of the kingdom's borders. The activities of the center were inaugurated in may of 2015 under the high patronage and guidance of the custodian of the two holy mosques, king salman bin abdulaziz, may god support him.

The center's activities are founded upon noble fundamental humanitarian goals and principles. Elements needed to carry out our programs include detailed monitoring of all aid, the highly coordinated and advanced transportation of aid through highly trusted un agencies and local and international non-profit organizations in the recipient countries.

Vision:

To become a leading centre for relief and humanitarian activities and to transfer our values to the world.

Mission:

Manage and coordinate relief activities on the international level to ensure the provision of aid to affected groups in line with the national interests.

Strategic objectives:

Organization

Build ksrelief into an efficient, flexible and active organization.

Build a team of high-performing, professional and expert personnel.

Humanitarian aid and relief work

Deliver ksa's external humanitarian aid, relief and charity.

Develop strong partnerships with leading humanitarian organizations.

Develop an effective process that ensures prompt response to humanitarian crises.

Increase the impact of ksa's aid with a view to make it sustainable through improved supervision, follow-up and evaluation.

Enablers

Attract and train volunteers to contribute to humanitarian aid and relief efforts.

Establish efficient fundraising models.

Build a strong network of supporters and donors.

International wars and disasters victims' Protection associations – IRVD / Al-Ameen

IRVD-Al-Ameen is an international non-governmental organization established in 2012 through a voluntary initiative by a group of doctors and academics dedicated to assisting communities affected by humanitarian crises worldwide. Classified as a non-profit international humanitarian organization, it is registered in the united states, turkey, sweden, and the united kingdom. implementing humanitarian programs through its regional offices registered under the international association in turkey, lebanon, iraq, djibouti, ukraine, and somalia, and under the name of Al-Ameen in syria, yemen, palestine, sudan, and egypt.

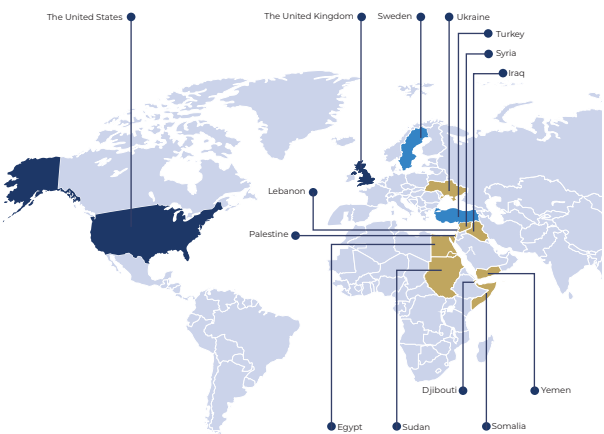
Vision:
Wellbeing for all humanity
Mission:
Supporting and enhancing healthcare and the well-being of people in need and communities affected by crisis through sustaining healthcare systems, education, and community programs.
Values:
Trustworthy : we have confidence in our colleagues, beneficiaries, and partners. We build, maintain, and strengthen trust through time to allow us and others to feel safe and comfortable.
Responsive : we are answerable and liable to our colleagues, partners, and the people we serve.
Accountable : we have the moral duty and responsibility to use our resources efficiently.
Integrity : we abide by our principles and values; we are honest in our daily work and services provided.
Transparency : we share information internally and externally to develop trust and respect. We openly communicate relevant information with concerned parties.
Principles:
Al-Ameen support all humanitarian principles agreed by the global community:
- Humanity
- Neutrality
- Impartiality
- Independence

Where we work

Al-Ameen officially licensed in many countries such as the united kingdom, sweden, the united states, and turkey. These main offices are officially registered with a charity status facilitating the advocacy activities, fundraising opportunities, and spreading our cause loudly everywhere we can.

Al-Ameen has been also involved in humanitarian responses as operational missions in turkey, syria, lebanon, yemen, somalia, palestine, sudan, iraq, ukraine, and djibouti over the past years. In these mission offices, Al-Ameen coordination teams operate in coordination and collaboration with local authorities, focusing on key humanitarian sectors, including health, nutrition, education, protection, food security, water and sanitation (wash), shelter and non-food items (nfis), civil society development, and capacity building.

Additionally, the organization has established local and international partnerships with leading donors and key international humanitarian actors, including: united nations office for the coordination of humanitarian affairs (ocha), world health organization (who), united nations children's fund (unicef), médecins sans frontières (msf), united states agency for international development (usaid), kuwait red crescent (krc), world food program (wfp), pulmont (usa), international relief and development (ird), democratic council (dc, usa), france expertise, save the children, and the strategic partner, the king salman humanitarian aid and relief center (ksrelief).



Chapter three

Concept of disability

3.1. Global definition of disability

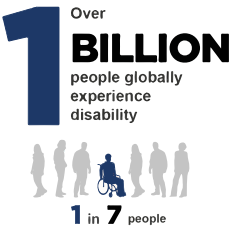
The term “persons with disabilities includes those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.” Article 1 of the convention on the rights of persons with disabilities, united nations general assembly.

Although the phrase “persons with disabilities” is sometimes used to refer to a specific segment of society it encompasses a highly diverse group of individuals with a wide range of needs. Two individuals with the same type of disability may experience it in vastly different ways. Additionally, some disabilities may be invisible, subtle, or difficult to detect.

> The washington group defines people with disabilities as individuals who are more likely than the general population to face limitations in performing specific tasks or engaging in activities due to impairments in basic functions such as walking, seeing, or hearing, even when conditions are improved using assistive devices, supportive environments, or available resources.

Therefore, the recommended approach to defining persons with disabilities using quantitative data collection tools is to focus on the level of difficulty individuals face in performing various activities, such as asking whether a person experiences difficulty in walking, climbing stairs, or communicating. Regardless of the type of impairment or the individual's self-perception of whether they have a "disability," the primary objective is to identify individuals who face difficulties in performing essential and fundamental activities.

The international classification of functioning, disability, and health defines disability as encompassing impairments, activity limitations, and participation restrictions. Disability is the interaction between individuals with health conditions (such as cerebral palsy, down syndrome, or depression) and the personal and environmental factors surrounding them (such as negative attitudes, difficulties in accessing buildings, public transportation, and lack of social support).



There are over 1 billion people with disabilities worldwide, representing approximately 15% of the global population (or 1 in 7 individuals). The number of people living with disabilities is expected to rise due to the aging population and the increasing prevalence of chronic health conditions. National patterns of disability are influenced by trends in health conditions, environmental factors, and other elements such as road traffic accidents, falls, violence, humanitarian emergencies like natural disasters and conflicts, diet, and substance abuse.

Disability disproportionately affects women, the elderly, and the poor. Children from poor households, indigenous populations, and ethnic minorities are at a much higher risk of experiencing disability, as are internally displaced persons or stateless individuals. Refugees, migrants, and prisoners with disabilities face specific challenges in accessing services. Disability prevalence is higher in low-income countries compared to high-income countries, and in 2013, the united nations general assembly noted that approximately 80% of persons with disabilities live in developing countries.

Despite the scale of this issue, there is a lack of awareness and scientific information related to disability problems. Few documents provide compilations and analyses of the ways countries have developed policies and responses to meet the needs of people with disabilities.

> According to the new international approach to the concept of disability and the international classification :of functioning, disability, and health (icf) established by the world health organization
> Disability refers to any condition in the body or mind that makes it difficult (weakness) for the affected" person to perform certain activities (activity limitation) and interact with the surrounding world (participation "restriction)

Weakness: refers to the impairment of a person's body structure or function, or mental performance; examples .include disabilities caused by the loss of a limb, blindness, or memory loss
Activity limitation: refers to difficulties a person may experience in performing daily tasks or actions, such as seeing, .hearing, walking, or problem-solving
Participation restrictions: these include limitations in daily life activities such as working, engaging in social or .recreational activities, and accessing healthcare and preventive services

3.1.1 general definition of disability

Disability refers to a total or partial permanent or long-term impairment in one's physical, sensory, mental, communicative, educational, or psychological abilities. This condition prevents the individual from fulfilling the ordinary demands of life and relying on others for assistance, or it requires the use of special tools or aids that necessitate training or rehabilitation for proper use.

3.2. Types of disability

These include: visual impairment, hearing impairment, intellectual disabilities, physical and mobility impairments, learning difficulties, speech and language disorders, behavioral and emotional disorders, autism, multiple and dual disabilities, and other disabilities that require special care. Each disability varies in severity from one individual to another, as well as its treatability. potential for treatment. Disabilities are generally classified into three main categories:

3.2.1 motor disability

Motor disability is divided into five types:

-- Cerebral palsy and stroke cases:

Cerebral palsy and stroke are both neurological disorders, but they have distinct causes and effects.

Cerebral palsy

It is a disorder resulting from brain damage during early development, often before birth. It leads to issues with movement, posture, and balance. People with cerebral palsy may experience involuntary muscle spasms, either increased muscle tone (spasticity) or weakness, and sometimes body deformities, uncontrolled movements, or unstable walking.

Stroke

A stroke occurs when blood flow to a part of the brain is interrupted, leading to brain cell death or damage. This can result in weakness or paralysis on one side of the body (e.g., in the arm, leg, or face), as well as difficulties with speech, understanding, and balance.

-- Muscular dystrophy:
Muscular dystrophy is a genetic condition that initially affects voluntary muscles in the limbs. Over time, it progresses to affect involuntary muscles, causing difficulties with walking, using the arms and shoulders, breathing, and spinal deformities such as scoliosis.

-- Amputation cases:
These occur when a part or the entire limb is lost due to disease, accidents, or injuries caused by landmines or unexploded ordnance.

-- Congenital deformities:
Congenital deformities are conditions that occur due to genetic or non-genetic factors, often during abnormal fetal development. These deformities can affect joints or bones and may result in shortened limbs or abnormal bone curvature.

-- Other conditions with varying diagnoses:
Other motor disabilities include conditions such as polio, osteoporosis, endocrine disorders, spinal cord diseases, chronic peripheral neuropathies, and other vascular diseases.

3.2.2 intellectual disability

Intellectual disability (or id) is a term used when a person has certain limitations in cognitive functioning and skills, including conceptual, social and practical skills, such as language, social and .self-care skills
Intellectual disability may occur with or without other psychological or physical disorders. One of the most common types is down syndrome, a congenital disorder caused by the presence of an extra chromosome in the body's cells. The likelihood of having a child with down syndrome .increases with maternal age

3.2.3. Sensory disability

Sensory disabilities can be visual or auditory.
Visual disability:
Includes total and partial blindness, affecting the following categories:
• **Blindness** (those with complete vision loss) requires the use of braille.
• **Low vision** (individuals who can see with the aid of visual aids).
Auditory disability:
Is a general term that covers a wide range of hearing loss, ranging from deafness to severe and mild hearing impairments. The signs may be visible or hidden, which can lead to difficulties in the child's life without knowing the cause, such as academic failure. A child might be labeled as mentally slow due to lack of interaction with others. Auditory disabilities are often associated with other conditions, such as: down syndrome, cerebral palsy, intellectual disabilities, autism, attention-deficit hyperactivity disorder (adhd), low activity levels, cleft lip and palate.

3.3 causes of disability:

- Genetic disorders, which may be due to inherited genes from one of the parents or caused by external factors.
- Certain diseases affecting the mother, or complications during pregnancy or childbirth.
- Complications from untreated diseases or failure to control the illness, such as:
  - muscular diseases and arthritis.
  - heart disease and stroke.
  - cancer.
  - diabetes.
  - neurological disorders.
- Acquired disability resulting from work injury or accidents.
- Ageing.
- Idiopathic diseases

3.4. Humanitarian priorities of the prosthetics and Rehabilitation program for beneficiaries and communities:

The services of the prosthetics program fall under specialized tertiary healthcare services. The importance of these services lies in their classification as essential healthcare services within the specific activities of the health sector. These include strengthening comprehensive trauma and injury care through the provision of phase management for psychological trauma and disability-related care (world health organization), and providing humanitarian health assistance that supports life, with a focus on the most vulnerable groups. These services aim to ensure access to life-saving services and high-quality humanitarian care, ensuring the enhancement of public services for individuals in need, with priority given to the most vulnerable groups, considering age, gender, and disability. This includes individuals with disabilities, who always require safe and dignified access to services.

Based on the new international approach to the concept of disability and the international classification of functioning, disability, and health (icf) by the world health organization, the humanitarian priorities of the prosthetics and rehabilitation program are to ensure that all individuals who need prosthetics, orthotics, and related services, including rehabilitation, have access to these services.

These priorities are based on the following principles:

- **Equity:** access to prosthetics, orthotics, and rehabilitation services must be available to everyone, regardless of race, gender, religion, or social or economic status.
- **Dignity:** prosthetics, orthotics, and rehabilitation services must respect the dignity and autonomy of the individuals who need them.
- **Efficiency:** prosthetics, orthotics, and rehabilitation services must be efficient, effective, and provide the best possible outcomes for the individuals who need them.

3.5. Impact of the prosthetics and rehabilitation Program on beneficiaries

The prosthetics and rehabilitation program specifically targets amputee patients, as well as individuals with various mobility disabilities. These conditions directly impact their daily lives, making it difficult for them to meet their personal needs, care for themselves, and work to support their families. This often leads to psychological distress, social isolation, and difficulty integrating into society. For young people, it can also prevent them from continuing their education due to fear of societal judgment and their struggles to adapt to their disability.

Individuals with disabilities are often stigmatized and discriminated against, and they are disproportionately affected by conflicts and natural disasters. These individuals face challenges such as family separation, loss of mobility aids, and difficulty accessing information and humanitarian assistance. Additionally, caregivers, often women within the family, are also at risk of stigma and discrimination.

Beyond physical suffering, psychological trauma is another significant issue, with many individuals experiencing persistent trauma from their past experiences. This can lead to nightmares, flashbacks, and post-traumatic stress disorder (ptsd) due to the threats and fear they encountered during conflicts.

The prosthetics and rehabilitation program offers hope by enabling individuals to reclaim their rights to a dignified, normal life. It transforms them from being burdens on their families and communities to productive individuals who can support themselves and their families and continue with their daily lives.

The use of prosthetics and orthotics restores the individual's ability to engage in daily activities, aids in rehabilitation, and enhances self-confidence, helping overcome barriers to social integration.

By providing specialized, integrated prosthetic and rehabilitation services, the program takes the crucial first step in reintegrating individuals with amputations and mobility impairments into society, allowing them to become contributing, productive members of the community.

The prosthetics and rehabilitation program has had a significant impact on the lives of beneficiaries by:

Enhancing independence

Prosthetics and orthotics enable individuals to walk and move independently, allowing them to participate in daily activities without assistance.

Reducing pain

Prosthetics and orthotics help alleviate pain and fatigue associated with their disabilities.

Improving quality of life

By enabling participation in social and sports activities, prosthetics and orthotics improve overall life satisfaction.

Boosting self-confidence

The use of prosthetics and orthotics increases self-esteem by giving individuals the ability to control their lives and achieve their goals.

3.6. Impact of the prosthetic and Rehabilitation program on society

The prosthetics and rehabilitation program plays a crucial role in fostering a more inclusive society by empowering individuals with disabilities. Its impact extends beyond the individual, contributing to the overall well-being of the community by enhancing opportunities for participation and equality.

3.6.1. Increase community participation: prosthetics and orthotics enable individuals to engage more actively in their communities, which can lead to improvements in both the economy and public health.

3.6.2. Reduce disability: prosthetics and orthotics aid in the recovery process for individuals with disabilities, potentially lowering healthcare costs in the long run.

3.6.3. Promote equality: by helping individuals with disabilities achieve greater independence, prosthetics and orthotics contribute to a more equitable society, where all members have equal opportunities.

Chapter four

Prosthetics and orthotics

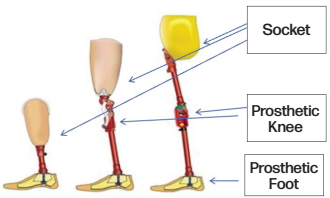
4.1. History and development of prosthetics

Capua leg is the oldest prosthetic limb the world has ever known, followed hundreds of years later by two prosthetic toe models that appeared in ancient egypt, and due to the huge number of victims during world war i, prosthetic limbs were produced for the first time on a large scale.
Wood was the first raw material used to manufacture the limbs, then plastic replaced it for its light weight and ease of manufacturing, and then the manufacture of limbs began to develop effectively in terms of shape and mechanics.

> Prosthetics & orthotics classified under the competence of motor rehabilitation, and the specialization aims to treat people who have been exposed to the loss of one of the upper or lower limbs of the body, as a result of accidents, diseases, remnants of war, ammunition or war mines of all kinds, in addition to treating patients with motor disability resulting from congenital malformations and paralysis.

4.2. Definition of prosthetics

Prosthetics are defined according to the world health organization (who) as :
"Devices designed to compensate for the loss of one or part of a limb, with the aim of restoring the motor functions and functional abilities of a person suffering from an amputation or congenital malformation."



Prosthetics aim to provide an effective replacement for an amputated limb, whether it is the upper limb (such as the hand or arm) or the lower limb (such as the leg or foot), thus helping individuals regain as much mobility and function as possible.
Although the types of prosthetics differ in terms of components, materials and different ways of working, they all serve the same goal, which is to support function, balance in order to restore the user's appearance as much as possible, quality of life and self-reliance.
Prosthetics consist of a socket, as well as a variety of components that cater to different needs, from simple movement to high-impact activities.
Recent advances in raw materials, socket design, and foot, ankle, knee, hand, wrist and elbow component technologies have significantly improved comfort and performance, allowing people with determination to attain many achievements, such as skydiving, mountaineering, full participation in sports, return to difficult jobs, and even military service.

4.3. Importance of prosthetics and rehabilitation :

Prosthetics

Prosthetics are an essential biotechnology in rehabilitation, providing people who have lost .a limb with a way to regain part of their motor functions and daily abilities
This field is one of the advanced aspects of medical technologies that seek to improve the quality of life of individuals and enhance their independence, as it constitutes the first step .towards restoring functional mobility

Rehabilitation for individuals

It is a set of interventions designed for the purpose of reducing disability and helping individuals to adapt to prosthetics optimally and use them effectively, and rehabilitation programs include a variety of activities and treatments aimed at:

- **Improving motor functional abilities:** rehabilitation programs aim to develop basic motor skills such as walking, jogging and carrying out daily activities independently, which promote self-reliance and contribute to improving the quality of life.
- **Psychosocial support:** psychosocial rehabilitation is a key pillar in adapting to prosthetics, as psychological support contributes to reducing negative emotions, and group sessions and social activities promote a sense of belonging and reintegration into society.
- **Enhance independence and self-confidence:** continuous training in the use of prosthetics enables individuals to achieve a level of self-reliance that increases their self-confidence, encourages them to actively participate in society, which reflects positively on their personal and professional development.
- **Positive impact on society:** prosthetics and rehabilitation programs have a significant and positive impact on society, including:

- **Improving quality of life:** prosthetics enable individuals to restore a more normal lifestyle, enhancing their quality of life and mitigating the psychological and physical effects associated with disability
- **Reducing unemployment and promoting economic inclusion:** through rehabilitation programs, individuals can effectively return to the labor market and contribute to the local economy, leading to lower unemployment rates and enhancing economic independence.
- **Promote social inclusion:** prosthetics and rehabilitation programs help individuals integrate into society and participate in social and cultural activities, thereby enhancing social cohesion.
- **Reducing the burden on the health system:** supporting the health and psychological status of individuals reduces the need for continuous medical care, which reduces the burden on the health system.

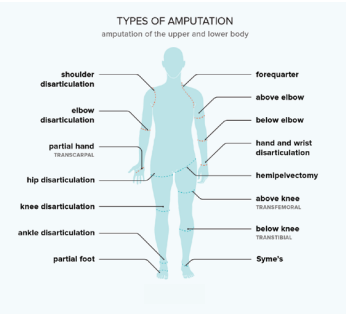
4.4. Amputation levels:

There are six main levels of amputation in the lower extremities:

– Partial foot amputation
– Ankle disarticulation amputation
– Below knee amputation
– Knee disarticulation amputation
– Above knee amputation
– Hip disarticulation amputation

And six main levels in the upper limbs:

– Partial hand amputation
– Wrist disarticulation amputation
– Below elbow amputation
– Elbow disarticulation
– Above elbow amputation
– Shoulder disarticulation amputation



4.5. Types of prosthetics & orthotics

4.5.1 prosthetics

Prosthetics are classified according to the level of amputation and the techniques used, in addition to the type of joint used for the knee, pelvis or foot, which can be mechanical, hydraulic or dependent on the silicon liner suspension with shuttle lock, valve vacuum system, active or passive vacuum system or self-suspension, in addition to other types.

The appropriate prosthesis is selected based on a clinical evaluation by the prosthetist, with multiple criteria including mobis, patient weight, stump shape and the environment.

The primary criteria for choosing prosthesis or orthosis are their suitability for the user's needs. That means that the choice depends on the ability of the device to meet the patient's requirements in terms of comfort, performance and function in his daily life in addition to the conditions of its use. This includes several factors, such as:

Geometric configuration (shape and alignment): the prosthesis must be compatible with the shape and geometric details of the body to ensure comfort and proper functionality.

Materials used: materials are selected based on their strength, flexibility, and suitability to the patient's needs.

Movement resistance: the prosthesis or orthosis must provide proper support without hindering normal movement.

Durability: the device must be able to withstand daily use and physical stress.

In the end, the prosthesis or orthosis is selected based on the balance of these criteria to maximize the effectiveness and comfort of the patient.

Based on the above, the prosthetics program at IRVD works to provide advanced devices with modern technologies, using high-quality materials that ensure the prosthesis according to the approved international standards according to the following types:

First: below knee prosthesis, classified into three categories

Mechanical prosthesis with Silicone liner and active or passive Vacuum (pneumatic) system

This system is characterized by the presence of silicone liner that enhances adhesion between the prosthesis and the stump, which reduces friction and improves stability, and the vacuum system both active and passive, provides more cohesion and stability to the limb and the addition of shock absorber systems enhances user comfort by reducing pressure on the stump and improving movement response to be smoother and closer to natural and the foot of this limb may be mechanical fixed or mobile.

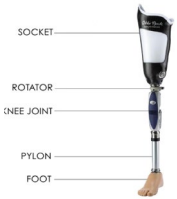
Mechanical prosthesis

This limb consists of socket and foot that is either fixed or movable, and the process of walking with this prosthesis takes advantage of the properties of the mechanical foot.

Semi-athletic prosthesis

This type of prosthesis consists of the same components as the previous two limbs but is provided with a special type of semi-athletic foot, which provides better flexibility and dynamics characteristics so that it helps improve walking and mobility, especially in rough terrain such as mountains or uneven ground, giving the user greater adaptability to diverse environments.

Second: above knee and knee disarticulation prosthesis:



Mechanical above-knee prosthesis

This limb consists of a simple mechanical knee that helps the user to navigate but at a constant speed and the movement of the knee in a swing phase is movement that is inconsistent with the body's forward progress.

Above knee hydraulic or pneumatic prosthesis

This type of prosthesis features the use of a hydraulic or pneumatic system to control knee movement, providing the user with smoother and more .consistent movement while walking

The system relies on airflow or oil to enable the knee to swing naturally, so that it adapts to the speed or slowness of walking in a way similar to the normal knee movement, and this type of prosthesis can be equipped with a semi-athletic carbon foot, which provides the user with more vitality and comfort in movement, in addition to lightweight and the ability to adapt to .rough terrain such as mountains or uneven ground

Above knee semi-intelligent prosthesis

This prosthesis combines the characteristics of a hydraulic prosthesis with the addition of a smart knee joint, so that the movement of the knee is in .harmony with the gait method of the user

This prosthesis can be equipped with a rotation adapter, which helps with cross-legged" manner, which can also be applied to all above knee .prosthesis

Moreover, a system (rivovit) can be added to control the size of the socket, allowing the user to adjust the pressure on the stump according to changes in the size of the stump as a result of conditions such as diabetes, vein stenosis, or pregnancy, and this system also provides the ability to adjust the pressure while walking or sitting, which enhances the stability of the .prosthesis and increases the user's ability to control and trust it

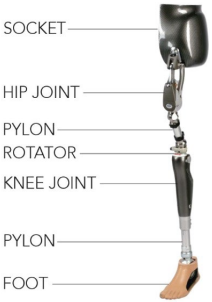
Third: hip disarticulation prosthesis:

Mechanical hip disarticulation prosthesis:

This prosthesis consists of a flexible socket and a rigid socket to provide comfort and harmony for the user while moving, and a simple mechanical knee that helps the user to walk, but at a constant speed, and the movement of the knee in swing phase is not consistent with the body moving forward with single-axis foot.

Hydraulic hip disarticulation prosthesis:

This prosthesis features knee movement supported by an oil flow system during the swing phase, which ensures movement more in harmony with the normal movement and allows the user to achieve a smoother gait.



Fourth: ankle disarticulation and partial foot prosthesis:

Silicone foot:

This type of prosthesis is cosmetic, provides a look similar to natural foot, and although it provides some functions related to walking, it is mainly used to improve the appearance in users.

Plastic prosthesis with carbon foot:

This prosthesis is more functional compared to cosmetic one, provides more natural movement in walking and contributes to the restoration of vitality in mobility, making it an ideal choice to restore the ability to walk.

Fifth: above elbow prosthesis

Cosmetic prosthesis:

This prosthesis aims to provide a cosmetic appearance rather than a functional one, so that it provides psychological support to the user instead of performing specific functions, the prosthetic fingers are moved by the user's sound side hand.

Functional prosthesis:

This prosthesis aims to help the user to pick up the objects by moving the shoulders, which leads to the opening and closing of the hand, a cosmetic glove is added so that the hand appears closer to normal.

Sixth: below elbow prosthesis

Cosmetic prosthesis:

This prosthesis aims to achieve a cosmetic appearance and psychological support for the user rather than functional, including a mechanical elbow joint equipped with a specific angled lock and controlled by the sound side hand.

Functional prosthesis:

This prosthesis aims to help the user to pick up objects by opening and closing the hand by using the shoulder movement. It has a mechanical elbow joint that can be moved either by the sound side hand to change its angle or by the shoulder movement that controls the flexion and extension of the elbow. In addition, a cosmetic glove is added that makes the prosthetic hand look closer to the natural hand.

Seventh: shoulder disarticulation prosthesis

Cosmetic prosthesis:

This prosthesis is designed to match the shape of the missing shoulder and arm, so that the amputated limb looks like the sound side limb. The main purpose of this prosthesis is cosmetics to provide psychological support to the user rather than functional. Helps compensate for lost arm weight, reducing the probability of spine tilting or pain. A mechanical attachment joint is added with a lock at a certain angle that can be controlled by the sound side hand, the position of the fingers is also adjusted by it.

4.5.2. Orthotics

Definition

Orthotoics are medical devices used to support, correct and rehabilitate injured or weak parts of the body. These devices play a vital role in rehabilitation, as they help restore functions and provide support during recovery and rehabilitation periods, and the braces are classified into lower, upper, .spinal, and cranial orthosis

Orthotics are an important basis in helping people with disability resulting from spinal cord injuries, motor and neuromuscular injuries and poor muscle control (spina bifida, inability to control leg .muscles, polio, osteoarthritis led to curvature)

According to the world health organization (who), orthosis is defined as "devices used to support, prevent or correct deformities or to improve the movement of injured or weakened parts of the body." These devices aim to provide external support to the organs and musculoskeletal system, .which helps in improving function and reducing pain and swelling

Orthosis are made from plastic (polyethylene – polypropylene) or metals such as iron, aluminum or stainless steel to straighten orthopedics and correct congenital deformities, these devices are used in cases of injuries that affect the spinal cord or brain and cause paralysis in limbs, these devices help to move the hand or foot and prevent side effects that may harm the patient if not :used, and there are different types of orthosis classified as follows

Upper limb orthosis

Upper orthosis are used to correct hand, elbow and shoulder deformities, support weak muscles and stabilize joints. Its goal is to enhance range of motion, accelerate fracture healing, correct hand deformities, reduce pain and improve appearance.

Main types of upper rectifiers :

Elbow wrist hand orthosis (ewho)		Shoulder elbow wrist hand orthosis (sewho)
Hand orthosis (ho)	Elbow orthosis (eo)	Wrist hand orthosis (who)

Lower limb orthosis

Lower limb orthosis is used to correct foot and lower limb joints deformities, support weak muscles, stabilize joints, treat loosening ligaments, as well as stabilize fractures. Their goal is to improve functions, accelerate fracture healing, promote balance and stability, achieve proper weight distribution, reduce pain and improve appearance.

Types of lower limb orthosis :

Supra malleolar orthosis (smo)	Foot orthosis (fo)
Hinged ankle foot orthosis (hinged afo)	Ankle foot orthosis (afo)
Ground reaction ankle foot orthosis (grafo)	Posterior leaf spring ankle foot orthosis (pls afo)
Dynamic ankle foot orthosis (dafo)	Patellar tendon bearing ankle foot orthosis (ptb afo)
Knee ankle foot orthosis (kafo)	Knee orthosis (ko)
Hip knee ankle foot orthosis (hkafo)	Knee ankle foot orthosis night splint (night kafo)
Dennis brown splint	Abduction brace
University of california biomechanics laboratory orthosis (ucbl)	

Spinal orthosis

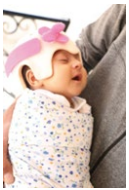
Splints are used to correct spinal deformities and stabilize fractures. These deformities and curvatures occur as a result of sitting incorrectly or due to unknown causes that appear between the ages of nine and fourteen, and sometimes at older ages. These splints aim to improve appearance, return the spine to the correct position, speed up the healing process of fractures, and reduce pain.

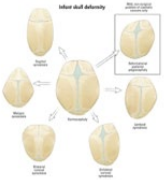
Types of spine braces

Sacral orthosis (so)	Lumbosacral orthosis (lso)
Thoracic lumbosacral orthosis (tlso)	Cervical orthosis (co)
Cervical thoracic orthosis (cto)	Cervical thoracic lumbosacral orthosis (ctlso)

Cranial orthosis

Effectively used to correct skull deformities in infants, these devices guide skull growth in a coordinated manner by applying light pressure to flat areas and providing room for growth in areas that need improvement in the early stages of childhood.





Types of cranial deformities :

There are several types of deformities that affect the shape of the skull and require therapeutic interventions, including:

Plagiocephaly

Is a deformity caused by flattening part of the skull, often due to constant pressure on a specific part, such as when sleeping continuously on one side.

Scaphocephaly

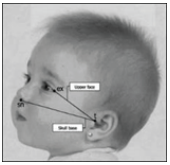
Occurs as a result of early fusion of the sagittal sutures, resulting in excessive skull lengthening.

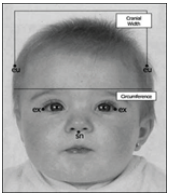
Brachycephaly

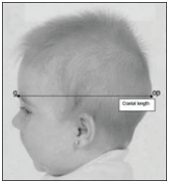
Is characterized by flattening the back of the skull and increasing its width compared to length.

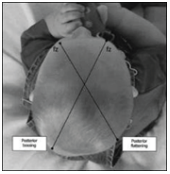
Stages of treatment by using orthosis :

Clinical evaluation and diagnosis: treatment begins with a careful examination of the skull using manual measurement techniques or three-dimensional imaging to determine the size and extent of the deformity. This examination helps determine the extent to which the deformity affects the shape of the skull and then decides on the appropriate type of treatment.









Patient name: _____ Today's date: _____

Date of birth: _____ ☐ M ☐ F Ethnic background: _____

Birth weight: _____ Birth length: _____ Number of weeks at birth: _____

☐ Full-term ☐ Premature – Time spent in neonatal intensive care: _____

Other congenital anomalies or medical conditions: ☐ None

☐ Congenital muscular torticollis ☐ Ear infections ☐ Scoliosis ☐ Developmental delays

☐ Congenital hip dislocations ☐ Equinovarus ☐ Genu varum

☐ Other _____

Maternal factors: ☐ First pregnancy? ☐ Abnormal uterus/pelvis? Age at delivery: _____

Unusual positioning in utero? ☐ No ☐ Yes – Explain _____

Delivery information: ☐ Single birth ☐ Multiple birth

☐ Head-down ☐ Breech ☐ Forceps ☐ Suction ☐ Other _____

☐ Cesarean ☐ Vaginal

Other: ☐ Reproductive assistance ☐ Drugs to prolong pregnancy ☐ Excess/lack of amniotic fluid

☐ Epidural or spinal ☐ Other delivery complications: _____

Preferred sleeping position: ☐ Back ☐ Tummy ☐ Side ☐ Mixed

Head shape at birth: ☐ Symmetrical ☐ Asymmetrical ☐ Wide ☐ Long ☐ Other _____

At what age did you first notice your child's head was abnormally shaped? _____

If applicable, do any of your other children have abnormally shaped heads? ☐ No ☐ Yes

Has repositioning been attempted? ☐ No ☐ Yes – At what age was it started? _____

Duration of the repositioning? _____ Still repositioning? ☐ No ☐ Yes

Does your baby have any neck tightness? ☐ No ☐ Yes – At what age was it noticed? _____

Is your child receiving therapy for this condition? ☐ No ☐ Yes For how long? _____

Using the scale below, please rate the severity of your child's head shape. Rating: _____

1	2	3	4	5
Normal	Mild Deformity	Obvious Deformity	Severe Deformity	Very Severe Deformity

Orthosis design

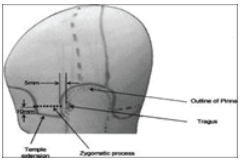
After taking measurements, a customized therapeutic helmet is designed using materials such as gypsum or digital wiping techniques, the design aims to ensure the complete compatibility between the device and the shape of the patient's head, so that it achieves the best pressure distribution on the flat areas of the skull.

Helmet installation

The helmet is mounted on the head so that the pressure is tightly directed on the protruding areas and provides room for growth in flat areas. The helmet is fine-tuned to achieve the best therapeutic result.

Follow-up and adjustment

The patient is examined regularly, usually every two to three weeks, to monitor progress and adjust the helmet if necessary, based on changes in the shape and size of the skull. This allows constant adaptation to growth and its proper correction.



The main benefits of using therapeutic helmets

Correction of deformities: the helmet contributes to the proper reshaping of the skull which restores the symmetry and balance of the shape of the head while maintaining the integrity of brain development.
Non-surgical alternative: therapeutic helmets are an effective, non-surgical alternative to correct skull deformities, reducing the need for surgical interventions.

Prosthetics and orthotics classification table:

Limbs type	Classification	Sub-classification
Prosthetic Limbs	Upper limb Prosthetics	Partial hand (ph)
		Wrist disarticulation (wd)
		Below elbow (be)
		Elbow disarticulation (ed)
		Above elbow (ae)
		Shoulder disarticulation(sd)
	Lower limb Prosthetics	Partial foot (pf)
		Ankle disarticulation (ad)
		Below knee (bk)
		Knee disarticulation (kd)
		Above knee (ak)
		Hip disarticualtion (hd)
		Hand orthosis (ho)
Orthotic Limbs	Upper limb Orthotic	Wrist hand orthosis (who)
		Elbow orthosis (eo)
		Elbow wrist hand orthosis (ewho)
		Shoulder elbow wrist hand orthosis (sewho)
		Other
	Lower limb Orthotic	Foot orthosis (fo)
		Ucbl
		Supra malleolar orthosis (smo)
		Solid ankle foot orthosis (afo)
		Hinged afo
		Pls afo
		Ground reaction ankle foot orthosis (grafo)
		Patellar tendon bearing ankle foot orthosis (ptb afo)
		Dynamic ankle foot orthosis (dafo)
		Knee orthosis (ko)
		Knee ankle foot orthosis with joint (kafo)
		Night kafo
		Hip knee ankle foot orthosis (hkafo)
		Dennis brown splint
		Abduction brace
		Other
	Trunk- spina Orthotics	Sacroiliac orthosis (so)
		Lumbosacral orthosis (lso)
		Thoracolumbosacral orthosis (tlso)
		Cervical orthosis (co)
		Cervicothoracic orthosis (cto)
		Cervicothoracolumbosacral orthosis (ctlso)
		Other
	Cranial orthotics	Cranial helmet
		Other

3.6. Components and raw materials used in the Manufacture of prosthetics & orthotics:

The helmet is mounted on the head so that the pressure is tightly directed on the protruding areas and provides room for growth in flat areas. The helmet is fine-tuned to achieve the best therapeutic result.

First: aluminum, titanium and stainless steel:

These materials are used due to their lightness and strength. Titanium is preferred in prosthesis that require high weight bearing and it is very essential in the manufacture of prosthetics and orthotics, it comes in several forms and types commensurate with the patient's condition, including (pilon, silicone lock, knee joints and ankle joints for orthotic).

Second: plastic

Plastic is used in the manufacture of many parts in prosthetics and orthotics due to its outstanding properties such as light weight, flexibility, and ability to withstand pressure and loading.
It is a heat-sensitive material, which becomes soft when heated to 180°c (324°f), and melts when heated above 200°c (360°f). This material is lightweight, so it floats on water. It is also easy to weld and has both flexibility and rigidity. plastics (such as polypropylene) for prosthetics and orthotics are available in the form of sheets of different thicknesses.

It consists of several different types, including:

1. Polypropylene homopolymer (pp-h)

They are monolithic plates that are very strong, rigid and have a low impact value. This means that extreme care must be taken during manufacturing and shaping to avoid brittle fractures.

Properties (convection oven)	
Forming temperature	185 °C / 365 °F
Heating time	2 – 3 minutes/mm
Density	0.91 g/cm³
Shrinkage	Approximately 7 %
Bonding	Inseparable bonding, even with wire and 250 °C / 482 °F hot air

Form as supplied:

ThermoLyn® Polypropylene Homopolymer

Processing temperature 215 °C / 419 °F (heating plate), 185 °C / 365 °F (convection oven), 185 °C / 365 °F (infrared oven)

Article number	616T20
Length	400 mm
Width	400 mm
Thickness	10 mm, 12 mm, 15 mm
Color	Natural colors

Article number	616T20
Length	2,000 mm
Width	1,000 mm
Thickness	2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 10 mm, 12 mm, 15 mm
Color	Natural colors

2. Polypropylene copolymer (pp-c):

It is a type of plastic that comes in the form of sheets with different sizes, combines the properties of polypropylene and polyethylene, characterized by strength, durability and ease of thermoforming, which makes it ideal for use in orthoses.

Properties (convection oven)	
Forming temperature	185 °C / 365 °F
Heating time	2 – 3 minutes/mm
Density	0.90 g/cm³
Shrinkage	Approximately 5 %
Bonding	Inseparable bonding (cannot be bonded with PP Homopolymer 616T20)

Form as supplied:

ThermoLyn® Polypropylene Copolymer

Article number	616T120
Thickness	2 mm, 3 mm, 4 mm, 5 mm, 6 mm
Sheet size (Length × width)	2,000 × 1,000 mm
Color	Natural colors

3. Polystyrene (ps)

This material is characterized by a high level of rigidity and safety against breakage. This plastic also has the characteristics of good transparency. Mainly used in test sockets.

Properties (convection oven)	
Forming temperature	170 °C / 338 °F
Heating time	2 min/mm
Density	1.01 g/cm³
Shrinkage	Approximately 1 %
Bonding	Inseparable bonding

Form as supplied:

ThermoLyn® rigid (polystyrene)

Colorless, for fabricating self-supporting test sockets (for temporary use), processing temperature 170 °C / 338 °F in convection or infrared oven

Article number	616T52
Sheet size (length × width)	400 × 400 mm
Thickness	8 mm, 10 mm, 12 mm, 15 mm

4. Ionomer

This material is characterized by good elasticity and transparency. Low shrinkage and working characteristics allow a wide mold shapes in prosthetics and orthotics by their flexibility even at body temperature. It also does not cause any skin allergies when using by beneficiaries.

Properties (convection oven)	
Forming temperature	165 °C / 329 °F
Heating time	2 min/mm
Density	0.95 g/cm³
Shrinkage	Approximately 3 %
Bonding	Inseparable bonding

Form as supplied:

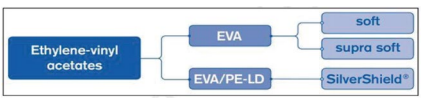
ThermoLyn® flexible (ionomer)

Colorless, for producing flexible inner sockets for lower limb prostheses, processing temperature 165 °C / 329 °F in convection and infrared ovens

Article number	5Z3	616T39
Sheet size (length × width)	400×400	1,200 × 800
Thickness	4.7 mm, 6.3 mm, 8.5 mm, 11.5 mm	4.7 mm, 6.3 mm, 8.5 mm, 11.5 mm

5. Ethylene vinyl acetates eva

This material is considered flexible and well transparent, useful for the production of flexible inner molds for prosthetics. It is mainly used for lower and upper prostheses. It has excellent surface quality and is comfortable to wear. It is an excellent choice for the inner socket for above knee prosthesis.



Properties (convection oven)	
Forming temperature	150 °C / 302 °F
Heating time	2 – 3 minutes/mm
Density	0.95 g/cm³
Shrinkage	Approximately 1 %
Bonding	Inseparable bonding

Form as supplied:

ThermoLyn® EVA/LDPE SilverShield®

- Antimicrobial thanks to SilverShield® technology
- Natural colors
- Thermoplastically moldable at 150 °C / 302 °F
- Highly flexible material
- Very low shrinkage
- For production of flexible inner sockets for prostheses
- Dermatologically tested

Order number	616T200=9	616T200=12	616T200=16
Sheet size (length × width)	400 × 400 mm	400 × 400 mm	400 × 400 mm
Thickness	9 mm	12 mm	16 mm
Color	Natural colors	Natural colors	Natural colors

► Other sheet thicknesses available upon request.
► **As a pressed plastic, this material exhibits low shrinkage**

6. Polyethylene

A plastic material, less flexible than polypropylene, and has a greater molecular weight. It is classified as semi-rigid; it is commonly used in lower, upper and spinal orthoses due to its ease of formation and heat adjustment.

Properties (convection oven)	
Forming temperature	165 °C / 329 °F
Heating time	2 – 3 minutes/mm
Density	0.96 g/cm³
Shrinkage	Approximately 8 %
Bonding	Inseparable bonding

Form as supplied:

ThermoLyn® Polyethylene 200 (PE-HD 200)

Hard polyethylene with low shrinkage, processing temperature of 180 °C / 356 °F (heating plate), 165 °C / 329 °F (convection oven), 165 °C / 329 °F (infrared oven)

Article number	616T95	616T19
Length	2,000 mm	2,000 mm
Width	1,000 mm	1,000 mm
Thickness	2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 10 mm, 12 mm	2 mm, 3 mm, 4 mm, 5 mm, 6 mm
Color	Natural colors	Skin colors

Article number	616T58	616T60	616T61
Length	2,000 mm	2,000 mm	2,000 mm
Width	1,000 mm	1,000 mm	1,000 mm
Thickness	3 mm, 4 mm, 5 mm, 6 mm	3 mm, 4 mm, 5 mm, 6 mm	3 mm, 4 mm, 5 mm, 6 mm
Color	Blue	Red	Yellow

Third: sponge materials

2. Pedilin

Flexible foam material with medium density that can be easily formed at temperatures of 130°c/266°f. This material has antimicrobial properties that contribute to reducing odors, and it is skin-friendly and characterized by its color close to the natural skin.

Article No.	617S203	617S206
Sheet size (length × width)	1,050 × 1,050 mm	1,050 × 1,050 mm
Thickness	3 mm, 4 mm, 5 mm, 6 mm, 10 mm	3 mm, 4 mm, 5 mm, 6 mm
Colour	skin colour	white

2. Plastazote

Flexible foam material with light density that can be easily molded at 110°c/230°f. It is characterized by its antibacterial effectiveness and its ability to reduce odors; it is characterized by a color close to natural skin. Suitable for soft liner at prosthetics, available in a variety of sizes.

Article No.	617S8
Sheet size (length × width)	1,000 × 1,000 mm
Thickness	2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 10 mm, 12 mm, 15 mm, 18 mm, 20 mm, 25 mm
Colour	skin colour

3. Superform

Flexible sponge material with high density that can be formed at 170°c/338°f, characterized by its resistance to pressure and high recovery, which makes it suitable for compensating for shortness between the two limbs and comes in different colors and sizes.

Article No.	617S131
Sheet size (length × width)	1,900 × 950 mm
Thickness	**2** mm, **3** mm, **4** mm, **5** mm, **7** mm, **10** mm, **15** mm
Colour	skin colour (**0**)

Article No.	617S132
Sheet size (length × width)	1,900 × 950 mm
Thickness	**2** mm, **3** mm, **4** mm, **5** mm, **7** mm, **10** mm
Colour	blue (**5**)

Fourth: mold manufacturing components (socket)

1- polyamide fibers (perlon, nylon)

They are fabric rolls that come in different sizes consisting of a mixture of fabric and plastic threads that are used in the manufacture of prosthetic molds.

2- glass fibers

It is a material composed of plastics reinforced with fibers made of glass and called fiberglass, spun glass or glass-reinforced plastic "grp".
This material acts at the same time as a binding agent, which gives it light weight and high durability.
It is mainly used in prosthetic sockets which contribute to providing additional strength while maintaining light weight.

3- carbon fibers

Carbon fiber is a very thin material lighter than aluminum, stronger than steel, characterized by durability and versatility, making it an ideal material for many industries. Carbon fiber is made up of synthetic organic polymers called polyacrylonitrile (pan), formed from long, tightly bonded carbon atoms.
Carbon fiber provides a high level of strength and rigidity with low weight and high chemical resistance, it is high temperature tolerance, non-fussible and biocompatible.
Thus, it became the ideal or preferred material in the manufacture of socket in prosthetics and orthotics.
As well as its use in carbon foot components that are characterized by their high properties of strength, durability and storage of strength such as (sports feet).

4- polyurethane risen (pur)

Resin is considered one of the natural solid or semi-solid amorphous organic materials that can be fused and flammable, which are usually transparent or semi-transparent and their color is yellow or brown, the initial composition of resin was developed in the thirties of the last century through the experiments of scientists on natural resin extracted from the bark of trees, then the transition to industrial production for an epoxy resin.

This material is exceptionally resistant to the effects of heat and direct flame and is also characterized by its ability to absorb shocks while maintaining surface insulation.

Resin is mainly used in the manufacture of inner sockets in prosthetics or orthotics as an alternative to internal sockets made of thermoplastic or silicone.

5- acrylic resin

It has a high resistance to chemicals. Because of radical polymerization process, it hardens more quickly with less dependence on ambient temperature. Composed of methyl methacrylate, colorless and transparent.

It comes in several types for different uses, including:

- sealing resin
- Orthocryl® lamination resin 80:20
- Resin soft
- Orthocryl®, extra soft
- C-orthocryl® sanitized®

Resin has the following characteristics and advantages because of advances in its industrial composition,

-- It comes in the form of a liquid that hardens after chemicals are added to it.
-- They are characterized by a short hardening time.
-- It is characterized by high flexibility and durability.
-- It provides good adhesion to the skin, ensuring comfort and good stability.
-- They have been dermatologically tested and have been shown to be free of any allergic effects.
-- Stable by its final nature.

Fifth: silicon:

Silicone is resistant to external factors such as pressure, heat, and light, making it ideal for use in prosthetics:

Silicone features:

It does not cause any allergic reactions.	Fits all sizes and measurements.
Available in different thicknesses and sizes.	It provides a natural appearance to the prosthesis Because of its harmony with other parts of the body.
It is characterized by its high resistance to external conditions.	Lightweight and easy to clean.

Silicone is used in skin-contact parts, such as socks or covers, where it provides high comfort and flexibility.

The innovative and non-allergenic medical silicone contains a low coefficient of friction that provides precise adhesion to the skin of the residual limb and is available in several types and sizes, including:

1. Silicone liner

It is a lining that contains innovative medical antibacterial silicone, it is described as a liner for the residual limbs with excess soft tissue, the silicone is characterized by its ability to easily adapt to any part of the human body.

The surface of the silicone has a low coefficient of constant friction (1/5 of ordinary silicone). It is hypoallergenic and gentle on the skin, as it is lightweight and contributes to the regulation of natural skin temperature.

1. Gel liner

It is a synthetic lining made of silicone and synthetic urethane that provides maximum protection for the residual limb with adhesion to the skin resulting in greater control of the prosthetic limb, providing through its softness, strength and cushioning, the greatest possible protection for the residual limb.
This product is recommended for both above knee and below knee amputees who are at moderate activity levels, the skin is in good condition and is looking for better prosthetic limb control.

Sixth: connections, suspension pieces and fixation

The term suspension refers to the method of better fixing the prosthesis to the residual limb to ensure good contact and articulation between the mold and the stump (such as suction, locking with a screw or vacuum).

These pieces are considered as a link between all parts of the prosthesis and come in different shapes, types and sizes to suit all age groups of amputees (men - women - children) in addition to some techniques that help in the suspension process between the mold and the stump (such as suction, locking with a screw or vacuum). Among the most important suspension systems used:

Vacuum system: an electric or mechanical vacuum pump draws air from the socket, which is the most effective way to fix the prosthesis in the residual limb.
The valve system pushes air outward when the residual limb is placed in the socket. The sleeve at the top prevents air from entering again, resulting in suction. A one-way valve can be inserted at the bottom of the socket to allow air to go out of it.

Lock system with screw: a silicone with a removable and adjustable stainless steel suspension pin is used, so that it is inserted into the shuttle lock installed at the end of the socket and can be easily removed by the user pressing to the release button for removing the pin.

Anatomical structure: suspension at the ends of bones, such as those in the knee, ankle or elbow, can be used to help stabilize the socket to the body.

Belts and straps: the belt or straps can be used to secure the prosthesis if the person cannot afford or finds it difficult to use vacuum, suction or pin devices.

Seventh: prosthetic and orthotic knee joints

The main types of knee joints:

Mechanical knee joint

The advantage of the mechanical knee is to help provide bending while standing, reduce pressure on the back and buttocks through the knee joints, and make the gait cycle smoother.

Pneumatic and hydraulic knee joint

Pneumatic or hydraulic prosthetic knee joints offer many advantages to beneficiaries they have lower limb amputations. These advantages can significantly improve the overall quality of life and mobility of amputees.

Orthotics knee joint

Orthotics knee joints are designed to provide support, stability and alignment to the knee joint. They are commonly used for people with knee injuries, osteoarthritis, ligament instability, or other conditions that require additional support.



Here are some of the main features and functions of orthotics knee joints :

Stability and Support

Orthotics knee joints are designed to stabilize and support the knee joint, helping to reduce excessive mobility, provide alignment, and prevent further injuries. They can be especially helpful for individuals with ligament injuries, such as anterior cruciate ligament (ACL) tears, or chronic knee instability.

Control Range of Motion

Some orthotic knee joints include mechanisms that allow for a controllable and adjustable range of motion. This feature is useful for individuals recovering from knee surgery or injuries and who need to limit certain movements during the healing process while gradually increasing mobility.

Pain relief

By providing support and reducing excessive mobility, orthotic knee joints can help relieve pain associated with knee conditions such as osteoarthritis or patellofemoral syndrome. Orthosis helps relieve pressure from the affected areas and distributes evenly.

Protection and prevention of injuries

Orthotic knee joints can provide protection and help prevent further injuries during physical activities and sports, can provide additional stability, especially in cases where ligament instability is a concern, reducing the risk of reinfection or worsening of existing conditions.

Rehabilitation support

Orthotic knee joints are often used during rehabilitation programs after knee surgery or injury. It can help control and direct the movement of the knee joint, allowing for the safe and gradual progression of exercise and strengthening the surrounding muscles.

Eighth : Leather belts and straps

It consists of durable leather materials and adhesive tapes that are formed according to the type of limb and the need for use.
The belt or straps can be used to place the prosthesis or orthosis for more stability and safety during use.

Ninth : Prosthetic foot

The prosthetic foot is an essential part of the formation of the prosthesis, helping the lower limb amputees achieve natural and balanced movement, and the prosthetic foot acts as a shock absorber to adapt to uneven terrain and provide forward lever power when the toes are off the ground.

Feet come in several different types and designs, including:

Sports carbon foot | Carbon foot | Dynamic foot | Single axis foot

Prosthetic feet are designed to replace the function of a lost foot. They are often used by individuals who have undergone lower limb amputations or who have congenital absence of the lower limb. The primary goal of the prosthetic foot is to restore movement, stability and balance while providing comfort and facilitating a natural gait pattern.

Here are some of the main functions and features of prosthetic feet:

Weight Bearing

Prosthetic feet are designed to withstand individual weight and provide support while standing, walking, running, and other activities, and the foot is usually made of lightweight materials such as carbon fiber, which helps reduce the overall weight of the prosthesis.

Shock absorption

The prosthetic foot should have the ability to absorb and mitigate the impact forces resulting from walking or running, reducing pressure on the residual limb, lower back, and other joints. To achieve this, various mechanisms, such as springs or hydraulic systems, can be integrated into the design of the prosthetic foot, to provide effective shock absorption and simulate the natural movement of the foot and ankle.

Energy storage and return

Prosthetic feet often include mechanisms to store and release energy during walking or running steps, which helps generate forward propulsion and maintain an efficient gait. This property contributes to reducing effort and improving movement efficiency, and feet that store energy, such as carbon fiber blades or feet with dynamic response, are an ideal choice for better balance and reduce fatigue while moving.

Stability and balance

Prosthetic feet contribute intrinsically to enhancing stability and balance during various daily activities. They are designed to provide a stable support base that enables the user to effectively maintain their center of gravity and reduce the risk of falls. The shape, fit, and stiffness of the foot are precisely designed to ensure optimal stability in line with the needs of natural movement and enhance safety.

3.7. Stages of Providing Prosthetic and Orthotic Services

First Stage: Identifying the Target Group

Collecting lists of the injured in coordination with the Ministry of Health, local health authorities, and social organizations. This involves reviewing beneficiaries' data by governorates, classifying cases of injury and their causes, developing a communication plan with the beneficiaries, contacting them to proceed to the next stage, and selecting beneficiaries according to a specific timetable to ensure effective and systematic service delivery.

Second Stage: Creating the Beneficiary File

Creating special files for each beneficiary during the first visit, conducting a technical and medical evaluation by the technical committee for each case, and developing treatment plans. Several factors are considered, such as the patient's health, psychological, and physical condition; the level and type of amputation; the characteristics of the remaining limb; the patient's goals, expectations, desires, and individual needs; as well as their environment, activities, profession, and hobbies to ensure the prescribed service is tailored appropriately.

Third Stage: Rehabilitation and Preparation

Providing rehabilitation services for amputation patients before fitting the prosthesis to improve their health and psychological well-being, alleviate pain, swelling, infection, and scars, strengthen muscles, increase flexibility, endurance, and balance, enhance mobility, and teach the patient how to cope with amputation and adapt to changes in their body and life. Additionally, preparing the patient to use the prosthesis and training them on its proper use and care.

Fourth Stage: Measurement and Manufacturing

Reviewing the patient's file, determining the final measurements of the limb, and selecting the necessary materials based on the patient's condition and needs. Then, initiating the manufacturing and production processes, including limb processing, modification, and assembly. The steps include:

Taking Measurements

- Using precision measuring tools such as elastic bands and digital scales.

- Drawing dimensions and determining critical points to ensure the prosthesis fits perfectly.

Gypsum Mold Modification

- Taking a negative gypsum mold of the residual limb.

- Processing the mold by wrapping gypsum rolls around the limb and smoothing it for accuracy and comfort.

Demo Template

- Creating a pilot mold from tough, transparent plastic to test modifications and correct errors before finalizing the mold.

Finished Mold Molding

- Molding the final socket using specialized materials like resin, reinforced with stockings and carbon fiber.

- Removing the gypsum mold after the resin hardens.

Quilting and Smoothing

- Smoothing the surface of the prosthesis to ensure comfort and prevent irritation.

Assembly and Calibration

- Assembling the parts and calibrating them in three stages: bench alignment, static alignment, and dynamic alignment to ensure proper fit and function.

Fifth Stage: Installation, Training, and Delivery

This stage involves fitting the patient's prosthesis, providing gait training, ensuring proper use of the limb, and maintaining service quality. This helps improve mobility, enables the patient to carry out daily, professional, and recreational activities, reduces pain, swelling, pressure, and deformity in the residual limb, enhances self-confidence, independence, social and psychological integration, improves aesthetic appearance, and alleviates feelings of inferiority or shame. The process includes:

Initial Training	Functional Training	Evaluation and Follow-Up
Teaching the patient how to wear and remove the prosthesis correctly.	Training the patient to use the prosthesis in daily activities.	Regularly assessing the patient's use of the prosthesis and making adjustments as needed.

Sixth Stage: Maintenance and Follow-Up

Maintenance and follow-up services after prosthesis installation are essential to ensure the prosthesis's efficiency and functionality and to prevent any problems or complications. This includes regular check-ups to ensure optimal performance. Maintenance may involve adjustments or replacements due to wear and tear, changes in the residual limb's size or shape, or environmental factors. The goal is to ensure the prosthesis remains comfortable, stable, and compatible with the residual limb.

Chapter Five

Rehabilitation

5.1. Concept of Rehabilitation

Rehabilitation is a vital process aimed at restoring and improving the functional, physical, and psychological abilities of individuals who suffer from disabilities or health conditions that affect their daily lives. It is an essential component of healthcare, enabling individuals to adapt to health challenges and achieve the highest level of independence and productivity.

WHO Definition of Rehabilitation

The World Health Organization (WHO) provides a comprehensive definition of rehabilitation, describing it as "a set of interventions designed to improve performance and reduce disability among individuals experiencing acute or chronic health conditions, including motor, psychological, neurological, and mental conditions." This definition highlights the multidimensional nature of rehabilitation, which extends beyond conventional medical treatment to include psychological, social, and professional support.

Comprehensive Dimensions of Rehabilitation

The WHO outlines several integrated dimensions of rehabilitation that collectively work toward enhancing the quality of life and promoting independence:

Medical Interventions
– Include necessary medical and surgical treatments to improve the individual's health.
– Focus on physical and pharmaceutical therapies to alleviate symptoms and enhance functional performance.

Psychological Interventions
– Provide psychological and emotional support to help individuals cope with their health conditions.
– Offer psychotherapy and counseling to enhance mental health and overcome emotional challenges.

Social Interventions
– Promote social integration through family and community support.
– Encourage social and community activities that facilitate active participation in society.

Vocational Interventions
– Ensure individuals can return to work or find new employment that aligns with their capabilities.
– Provide vocational training and workplace support to ensure successful adaptation and professional success.

The Importance of Rehabilitation in Healthcare

The WHO emphasizes the critical role of rehabilitation within healthcare, striving to:

- Achieve full or partial recovery by improving individuals' physical and psychological functions.
- Enhance independence by enabling individuals to perform daily activities independently.
- Improve quality of life through comprehensive support that enhances well-being.
- Foster social reintegration by helping individuals return to normal life and actively participate in society.

5.2. Rehabilitation for Amputees

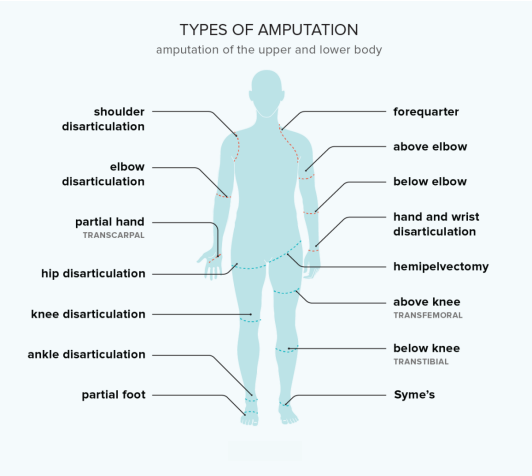
5.2.1. Limb Amputation

Limb amputation is a medical procedure undertaken in cases of severe injury, particularly in disaster and armed conflict situations, where individuals suffer extensive injuries necessitating amputation.

The decision to amputate is based on a comprehensive assessment of the patient's health condition, including vascular, nerve, and soft tissue evaluations, as well as environmental factors related to available medical facilities and post-operative care conditions.

Amputation involves both upper and lower limbs, with the level of amputation determined by factors such as the ability of the stump to heal, the patient's general health, and the suitability of prosthetic fitting. The expected functional outcomes of amputation are also assessed to ensure the highest level of independence and effective prosthetic use.

The degree of amputation varies depending on the level of injury, requiring a precise rehabilitation plan tailored to the patient's needs and medical conditions.



5.2.2. Pre- and Post-Amputation Rehabilitation Stages

1- Pre-Surgery Assessment Phase:

Medical Evaluation : Examination of the patient's general health, vital functions, and laboratory tests.

Psychological Evaluation: Assessing the patient's mental state, including anxiety and depression, and providing necessary psychological support.

Social Evaluation: Understanding the patient's social environment, including family and community support.

2- Psychological Preparation for Surgery:

Providing the patient with detailed information about the procedure and post-amputation expectations.

Using counseling sessions to reduce anxiety and offer emotional support.

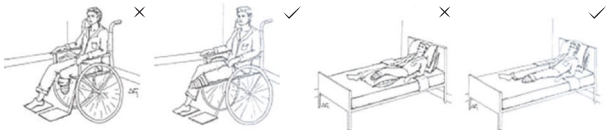
3- Post-Surgery Immediate Phase

▪ **Medical Care:** Immediate post-surgery care involves pain management, wound care, and infection prevention.

Pain management through analgesics and relaxation techniques.

Regular wound monitoring, cleaning, and dressing changes.

Strict hygiene measures and antibiotic use if necessary.



Keep the knee in a flexible position while sitting.

Keep the knee in an extended position while sitting.

Place a pillow under the knee while sleeping.

Keep the knee in an extended position while sleeping.

▪ **Early Functional Assessment :** Assessment of the Patient's Functional Status Post-Surgery to **Determine Mobility and Ability to Perform Daily Activities:**

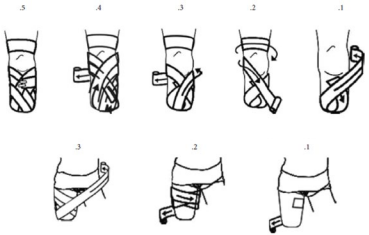
Mobility Assessment : Evaluating the range of motion of the remaining limb and other joints.

Strength Assessment : Measuring the strength of the remaining muscles and other limbs.

Balance Assessment : Testing the patient's ability to maintain balance while standing and moving.

5.2.3. Pre-Prosthetic Fitting Preparation Stages

This phase consists of multiple steps and procedures aimed at improving the patient's physical fitness, enhancing psychological well-being, and providing essential knowledge about using the prosthetic limb. Below are the detailed steps of this phase:



Physical Rehabilitation

This phase includes exercises to improve the patient's physical fitness, strength, and flexibility:

- **Muscle Strengthening Exercises:** Training to enhance the strength of the remaining muscles and other limbs.
- **Flexibility Exercises:** Exercises to improve the range of motion of the remaining joints.
- **Balance and Coordination Exercises:** Training to improve balance and coordination between different movements.

Psychological and Social Rehabilitation

Providing continuous psychological and social support to ensure the patient adapts well to the new condition:

- **Psychological Support Sessions:** Individual and group counseling sessions to help the patient adjust.
- **Social Support:** Encouraging the patient to participate in social activities and receive support from friends and family.

5.2.4. Prosthetic Limb Fitting Phase

This phase includes several steps and procedures aimed at improving the patient's physical fitness, enhancing their psychological well-being, and providing the necessary knowledge about using the prosthetic limb.

- Below are detailed explanations of each of these steps:

1.Comprehensive Patient Assessment

Medical Assessment

- **General Health Evaluation:** Conducting a comprehensive health examination to ensure there are no complications or medical conditions that could affect the prosthetic fitting process.

Psychological Assessment

- **Mental Health Evaluation:** Assessing levels of anxiety, depression, and psychological stress in the patient.
- **Psychological Counseling :** One-on-one counseling sessions with a psychologist to help the patient cope with emotional and psychological changes.

Functional Assessment

- **Mobility Evaluation :** Measuring the range of motion in the remaining joints and identifying any movement restrictions.
- **Muscle Strength Assessment :** Evaluating the strength of the remaining muscles and other limbs to determine necessary muscle-strengthening programs.
- **Balance and Coordination Assessment :** Testing the patient's ability to maintain balance and coordinate different movements.

2. Physical Rehabilitation

Muscle Strengthening and Physical Fitness

- **Muscle Strengthening Exercises:** Intensive training to enhance the strength of the remaining muscles and other limbs.
- **Flexibility Exercises:** Training to improve joint flexibility and range of motion.
- **Cardiovascular Endurance Exercises:** Workouts designed to enhance overall physical fitness and stamina.

Balance and Coordination Training

- **Balance Exercises:** Training to improve the ability to maintain balance while standing and moving.
- **Coordination Exercises:** Exercises to enhance coordination between different movements and improve functional performance.

3. Psychological and Social Rehabilitation

Psychological Support

- **Psychological Support Sessions:** One-on-one counseling sessions with a psychologist to help the patient adapt to emotional and psychological changes resulting from limb loss.
- **Stress Management Techniques:** Teaching the patient stress management techniques such as deep breathing, relaxation, and meditation.

Social Support

- **Family Support:** Involving the patient's family in the rehabilitation process, providing guidance and support to help them assist the patient effectively.
- **Community Engagement:** Encouraging the patient to participate in social activities and connect with other individuals who have undergone similar experiences.

Patient and Family Education

- **Patient and Family Education:** Providing comprehensive information on prosthetic fitting, usage, and maintenance.
- **Initial Training:** Teaching the patient how to properly wear, remove, and care for the prosthetic limb.

4. Physical Preparation for Prosthetic Fitting

Skin and Residual Limb (STUMP) Care

- **Skin Care :** Maintaining skin health at the amputation site to ensure it is suitable for prosthetic use.
- **Residual Limb (STUMP) Massage :** Using massage techniques to improve circulation and reduce swelling in the residual limb.

5. Final Evaluation and Preparation

Prosthetic Selection

Selecting the most suitable type of prosthetic limb based on the patient's needs and lifestyle:
- **Prosthetic Type:** Choosing between cosmetic and functional prosthetic limbs.
- **Prosthetic Size:** Ensuring the prosthetic limb is a perfect fit for the patient's residual limb.

Readiness Assessment for Prosthetic Fitting

- **Final Medical Evaluation:** Conducting a thorough clinical examination to confirm the patient's readiness for prosthetic fitting.
- **Final Psychological Evaluation:** Assessing the patient's psychological preparedness for receiving and using the prosthetic limb.

Final Preparation

- **Initial Prosthetic Trial:** Conducting a preliminary trial of the prosthetic limb to ensure proper fit and comfort.
- **Initial Training:** Beginning basic training on prosthetic usage to prepare the patient for the next stage.

Training on Prosthetic Use

Training the patient to efficiently use the prosthetic limb

- **Wearing and Removing the Prosthetic Limb:** Teaching the patient how to properly wear and remove the prosthetic limb.
- **Balance and Walking Training:** Helping the patient maintain balance and walk effectively using the prosthetic limb.
- **Using the Prosthetic Limb in Daily Activities:** Training the patient on how to use the prosthetic limb for daily tasks and activities.

5.2.5. Post-Prosthetic Fitting Phase

Care and Maintenance

Proper maintenance and ongoing care of the prosthetic limb are essential aspects of the rehabilitation process:

- **Cleaning and Care :** Teaching the patient how to clean and take care of the prosthetic limb.
- **Routine Maintenance :** Emphasizing the importance of regular maintenance for the prosthetic limb.
- **Adjustments :** Making necessary modifications to ensure patient comfort and optimal prosthetic function.

Continuous Support and Follow-Up

This phase includes providing ongoing psychological and social support for the patient and their family:

- **Psychological Counseling Sessions:** Offering counseling sessions to help the patient adjust to changes.
- **Social Support:** Encouraging participation in community activities and providing necessary social support.
- **Providing Information:** Offering educational resources and training sessions for the patient and their family on managing daily challenges.

Encouraging Social and Professional Integration

This stage aims to support the patient in reintegrating into society and the workforce:

- **Training and Rehabilitation Programs:** Providing training programs to help the patient return to work or acquire new skills.
- **Encouraging Social Activities:** Promoting participation in social and community activities to enhance quality of life.
- **Supporting Professional Integration:** Offering necessary support to help the patient enter the job market and achieve financial independence.

5.3. Goals of Early Rehabilitation for Amputees

The early rehabilitation process for amputees aims to achieve a comprehensive set of objectives that contribute to improving the patient's quality of life and enhancing their ability to adapt to their new condition. These goals require individualized treatment plans tailored to each patient's needs and capabilities. Below is a detailed breakdown of the early rehabilitation objectives:

1. Medical Goals

Physical Healing and Wound Recovery

- **Wound Healing:** Ensuring proper wound healing to prevent infections or complications.
- **Pain Management:** Implementing effective pain management strategies post-amputation.
- **Complication Prevention:** Taking preventive measures to avoid complications such as ulcers and infections.

Maintaining Skin Health

- **Skin Care:** Preserving the skin's health at the amputation site is essential to ensure comfortable and effective prosthetic use in the future. This includes preventing ulcers and skin infections.
- **Monitoring Skin Changes:** Regularly assessing any skin changes and addressing them promptly to prevent future issues.

2. Functional Goals

Restoring Mobility and Functional Ability

Improving Mobility: Enhancing joint range of motion and strengthening muscles to improve movement capabilities.
Developing Balance: Training the patient to maintain balance through appropriate exercises and activities.
Using the Prosthetic Limb: Teaching the patient to efficiently use the prosthetic limb in daily activities.

Enhancing Independence

Performing Daily Activities: Educating the patient on how to carry out daily activities such as dressing, eating, and household chores using the prosthetic limb.
Independent Mobility: Improving the patient's ability to move independently using the prosthetic limb.

3. Psychological Goals

Supporting Psychological Adaptation to Amputation

Adjusting to Changes: Helping the patient cope with the physical and emotional changes resulting from amputation.
Reducing Anxiety and Depression: Providing psychological support to minimize feelings of anxiety and depression.
Building Self-Confidence: Strengthening the patient's self-confidence and ability to face new challenges.

Enhancing Emotional and Social Support

Family Support: Providing necessary support to the family to help the patient adapt to their new condition.
Participation in Social Activities: Encouraging the patient to engage in social activities to strengthen emotional and social support.

4. Social Goals

Improving Quality of Life

Achieving Independence: Enabling the patient to attain a high level of independence in daily life.
Community Engagement: Encouraging the patient to participate in community activities and contribute to society.

Enhancing Social Integration

Support Networks: Establishing social support networks to provide assistance and guidance to the patient.
Community Awareness: Raising awareness in society about amputation and rehabilitation issues to support patient inclusion.

5. Vocational Goals

Returning to Work

Vocational Rehabilitation: Offering training programs to prepare the patient for returning to work or learning new skills.
Professional Integration Support: Providing necessary support to help the patient find suitable employment and integrate into the workforce.

Developing Job Skills

Learning New Skills: Teaching the patient new skills that align with their health condition and physical abilities.
Providing an Accessible Work Environment: Collaborating with employers to ensure a suitable work environment for the patient.

6. Educational Goals

Increasing Awareness and Knowledge

Educating the Patient and Family: Providing necessary information about the rehabilitation process and its goals.
Training Courses: Conducting training sessions on how to use and maintain the prosthetic limb.

Enhancing Community Knowledge

Workshops and Seminars: Organizing workshops and seminars to raise community awareness about amputation and rehabilitation.
Media Awareness Campaigns: Utilizing media to disseminate information and support the community.

7. Preventive Goals

Preventing Complications

Continuous Evaluation: Conducting regular assessments to monitor the patient's health and prevent complications.
Rapid Intervention: Providing immediate medical interventions when any signs of complications arise.

Promoting Overall Health

Physical Activity: Encouraging the patient to engage in regular physical activity to maintain overall health.
Healthy Nutrition: Guiding the patient to adopt a balanced diet to promote wound healing and maintain optimal weight.

5.4. Rehabilitation Methods

A. Physical Therapy

Physical therapy is one of the most critical rehabilitation methods, aiming to improve mobility, reduce pain, and enhance recovery after injuries or surgeries. It includes:

Therapeutic Exercises: Used to improve strength, flexibility, and endurance, including aerobic exercises, resistance training, and stretching.
Heat and Cold Therapy: Heat helps relieve muscle spasm and increase blood circulation, while cold therapy reduces swelling and pain.
Ultrasound Therapy: Used to promote deep tissue healing and reduce pain.
Massage and Manual Therapy: Helps improve blood flow and reduce muscle tension.
Electrical Stimulation: Stimulates muscles to improve motor control and function.

B. Occupational Therapy

Occupational therapy focuses on enhancing the ability to perform daily activities and promoting independence. It includes:

Developing Life Skills: Such as dressing, eating, and bathing.
Adapting to the Environment: Modifying home and workplace environments to suit the individual's abilities.
Training on Assistive Devices: Such as wheelchairs, adaptive devices, and assistive tools.
Improving Fine Motor Skills: Through targeted activities that enhance hand and finger coordination and strength.
Providing Psychological and Social Support: Helping individuals adapt to lifestyle changes and build self-confidence.

C. Psychological Therapy

Psychological therapy is a crucial aspect of rehabilitation, assisting individuals in coping with emotional and psychological challenges. It includes:

Cognitive Behavioral Therapy (CBT): Helps individuals change negative thoughts and behavioral patterns that may hinder recovery.
Supportive Psychotherapy: Provides emotional support and helps individuals adapt to life changes.
Group Therapy: Allows individuals to share experiences with others facing similar challenges, fostering mutual support.
Stress Management Training: Teaches stress management techniques such as meditation and deep breathing.
Family Interventions: Helps family members understand their role in supporting the patient and adapting to changes.

D. Role of the Rehabilitation Team

The rehabilitation team plays a crucial role in the recovery process for amputee patients. It consists of a group of specialists who work together to achieve therapeutic goals and enhance the patient's quality of life. This team operates in an integrated manner to ensure the provision of comprehensive, individualized, and effective care. Below is a detailed breakdown of each team member's role:

1. Prosthetist

Prosthetic Design

Measurement and Design: Measuring and designing the prosthetic limb to suit the patient's needs and requirements.
Testing and Adjustments: Evaluating the prosthetic limb and making necessary modifications to ensure comfort and proper fit.

Training on Prosthetic Use

Wearing the Prosthetic Limb: Teaching the patient how to properly wear and remove the prosthetic limb.
Functional Use Training: Training the patient to effectively use the prosthetic limb in daily activities.

2. Physical Therapist

Enhancing Strength and Flexibility

Muscle Strengthening Exercises: Providing exercises to strengthen the muscles around the amputation site and improve movement capacity.
Flexibility Exercises: Offering exercises to increase joint and muscle flexibility.

Improving Balance and Coordination

Balance Training: Teaching techniques to improve balance while standing and walking.
Coordination Training: Training the patient to coordinate different movements for smooth and natural mobility.

3. Occupational Therapist

Training on Daily Activities

ADL (Activities of Daily Living) Training: Educating the patient on how to perform essential daily activities such as eating, bathing, and dressing.
Environmental Adaptation: Training the patient to adapt to their home and work environments to use the prosthetic limb effectively.

Providing Assistive Devices

Assistive Tools: Identifying and providing assistive devices that facilitate daily tasks.
Adaptive Techniques: Teaching the patient how to use adaptive techniques to enhance independence.

4. Psychologist

Psychological Support

Psychological Evaluation: Assessing the patient's mental health and identifying psychological challenges related to amputation.
Psychotherapy: Conducting therapy sessions to support the patient in coping with psychological and social changes.

Adaptation Techniques

Relaxation Techniques: Teaching stress management techniques such as deep breathing and meditation.
Adaptation Training: Providing strategies to help the patient cope with psychological and social challenges resulting from amputation.

5. Social Worker

Social Support

Assessing Social Needs: Evaluating the patient's social and economic needs and providing appropriate support.
Family Support: Offering guidance and assistance to the family on how to care for and support the patient.

Care Coordination

Connecting with Community Resources: Providing information and guidance on available community resources for patient support.
Coordinating Healthcare Services: Collaborating with healthcare and community organizations to ensure the patient's needs are met.

Chapter Six

Technical Performance Evaluation Policy Guide

6.1. Introduction

Evaluating the performance of technical staff is a crucial step in enhancing the quality of services provided in the field of prosthetics and orthotic devices. This evaluation aims to improve the efficiency of technicians and enhance their skills, thereby positively impacting the quality of work and achieved outcomes. This guide outlines the adopted evaluation methodology, ensuring the application of best standards.

Evaluation Objectives

1- Improving Technical Staff Performance: Enhancing the technical team's capabilities in manufacturing prosthetics and orthotic devices, aligning their efficiency with required quality standards.
2- Encouraging Professional Development: Promoting professional growth by encouraging technicians to acquire new skills and increase their technical and managerial competencies through comprehensive training programs.
3- Ensuring Quality and Effectiveness: Enhancing manufacturing quality and precision of final products, ensuring adherence to quality standards for maximum operational efficiency.
4- Compliance with Regulatory Standards: Verifying that technicians' work aligns with regulatory and professional standards to ensure full compliance and avoid quality or safety issues.
5- Supporting Administrative Decision-Making: Providing management with accurate information about the technical staff's performance to guide decisions on contract renewals and development plans.
6- Setting Measurable Goals: Establishing clear, measurable objectives for the technical team to track progress effectively.
7- Providing Constructive Feedback: Offering regular, clear, and precise feedback to technicians to strengthen their strengths and address areas for improvement.
8- Ensuring Continuous Professional Development: Creating individualized development plans based on evaluation results and providing necessary training and support to enhance efficiency and achieve professional excellence.

Performance Evaluation Timeline

End of Training Evaluation

Conducted at the conclusion of training programs to assess the extent to which technicians have benefited from the training.

Final Evaluation

Performed at the end of a project to evaluate overall technician performance, measure goal achievement, and assess adherence to professional standards.

Evaluation Tools

To ensure precise and effective evaluation, various practical tools are employed, including:
1- On-the-Job Performance Assessment: Observing technicians' actual performance during manufacturing and fitting operations to assess competency and adherence to quality standards.
2- Practical Skill Tests: Conducting hands-on tests to measure technicians' proficiency in specific tasks such as measurement-taking, assembly, and necessary adjustments.
3- Outcome-Based Evaluation: Assessing produced prosthetic and orthotic devices based on quality standards, including manufacturing accuracy and compatibility with beneficiaries' needs.
4- Individual Evaluation Interviews: Holding one-on-one sessions with technicians to discuss performance and provide detailed feedback on strengths and areas for improvement.
5- Beneficiary Satisfaction Surveys: Gathering feedback through surveys to evaluate the technical department's performance and enhance service quality.
6- Periodic Reports: Preparing regular reports to document performance trends and facilitate ongoing monitoring.
7- Error Documentation and Response Assessment: Tracking errors and evaluating how technicians address and correct them to enhance work quality and compliance with safety standards.

Evaluation Committee

The evaluation committee comprises the Technical Director, Project Manager, and Human Resources Officer, each contributing to specific aspects of the evaluation process to ensure thoroughness and accuracy:

Technical Director: Assesses technical skills, practical performance, and adherence to professional quality standards.
Project Manager: Evaluates time management, goal achievement, teamwork, and communication effectiveness with beneficiaries.
Human Resources Officer: Assesses organizational commitment, professional behavior, and documents performance while identifying training needs and career development opportunities.

This integrated committee approach provides a comprehensive overview of technicians' performance from technical, managerial, and behavioral perspectives, supporting informed decisions regarding development, renewal, and training.

Technical Evaluation Criteria

The evaluation process includes 13 key criteria, with a total score of 100 points, offering a clear picture of technicians' performance and quality. The criteria are as follows:

Technical Knowledge (20 points): Evaluating understanding of prosthetic and orthotic manufacturing principles.

Beneficiary Assessment and Device Selection (10 points): Ability to assess the beneficiary's condition and determine the appropriate device.

Preparation of Measurement Equipment and Workspace (10 points): Evaluating setup of the workspace and required measurement tools.

Accuracy in Measurement Taking (10 points): Assessing proficiency in obtaining precise measurements per required standards.

Measurement Evaluation and Adjustments (5 points): Ability to review and refine measurements.

Mold Creation According to Technical Standards (5 points): Designing and crafting appropriate molds for prosthetics and orthotics.

Manufacturing in Compliance with Standards (5 points): Evaluating the execution of prosthetic and orthotic manufacturing in line with quality requirements.

Assembly and Calibration of Components (5 points): Assessing the assembly and adjustment of parts to meet beneficiary needs.

Equipment and Tool Usage and Maintenance (10 points): Evaluating technicians' skills in handling and maintaining tools and machinery.

Technical Experience in Prosthetics and Orthotics (5 points): Measuring the depth of expertise in the field.

Communication and Team Interaction (5 points): Assessing interpersonal skills with beneficiaries and colleagues.

Innovation and Professional Growth (5 points): Encouraging creative problem-solving and professional advancement.

Commitment, Attendance, and Follow-Up (5 points): Evaluating dedication to work and consistency in follow-ups.

Competency Rating Based on Final Score

Weak: 0 to 49 points
Acceptable: 50 to 69 points
Good: 70 to 85 points
Excellent: 86 to 100 points

Post-Evaluation Actions

Good or Excellent Rating: Recommendation for contract renewal.
Weak Rating: Termination of the contract.
Acceptable Rating: Implementation of a technical improvement plan by the Technical and Project Management teams.

Performance Improvement Plan

For technicians scoring at the "Acceptable" level, the improvement plan includes:
1- Developing a professional advancement plan based on evaluation results.
2- Providing continuous training and support to enhance skills and competencies.
3- Offering guidance and recommendations to improve quality.
4- Monitoring implementation and measuring performance improvements.
5- Preparing periodic progress reports for project management.

Trainer Performance Evaluation

Trainers are integral to the training process and are evaluated by trainees based on the following criteria:

- Punctuality and adherence to schedules.
- Effective delivery of technical knowledge.
- Use of diverse and engaging training methods.
- Encouragement of trainee participation.
- Clarity and comprehensibility of training material.
- Comprehensive coverage of training topics.
- Practical demonstration of expertise.

The evaluation is conducted through a digital form completed by trainees at the end of each session, ensuring high-quality training outcomes and continuous professional development for technical staff.
This guide serves to ensure that training and evaluation objectives are met at the highest levels of efficiency and quality, contributing to the continuous improvement of prosthetic and orthotic services.

6.2. Prosthetics and Orthotics Evaluation Policy Guide

This guide covers the four main areas of prosthetics and orthotics services: policy (management, financing, and information), products (prosthetic and orthotic devices), workforce (human resources), and service delivery.

6.2.1. Management, Financing, and Information

Stakeholders and Their Roles:

a. Persons with Disabilities and Their Representative Organizations: These organizations can participate on behalf of persons with disabilities in program planning, implementation, monitoring, and evaluation. Often covering a wide geographical area, they help identify potential beneficiaries and refer them accordingly. With proper training and guidance, these organizations can collaborate with service providers in counseling, follow-up, collecting beneficiary feedback, and impact assessment.

b. National, Regional, and Local Governments: Governments are responsible for promoting the availability and use of high-quality assistive devices and technologies, including prosthetics and orthotics. While they do not have to provide services directly, they must regulate, finance, promote, and support them. Governments should create an enabling environment for service success in both the public and private sectors and coordinate relevant stakeholders. A national committee for prosthetics and orthotics services or a similar entity within health, rehabilitation, and assistive technology coordination structures can be established.

c. Civil Society Organizations (CSOs): CSOs play a crucial role in supporting prosthetics and orthotics services by working with local communities, raising awareness, and increasing access to treatment among diverse populations. They also influence policy-making and implementation.

d. Public and Private Prosthetics and Orthotics Service Providers: In addition to direct service provision, these providers are responsible for collecting essential data for national planning.

e. Healthcare and Rehabilitation Service Providers: These services are crucial for the successful delivery of prosthetics and orthotics, forming an integral part of the broader healthcare and rehabilitation system. Representatives from healthcare and rehabilitation services must be involved in all stages of planning and service development.

f. Training Institutions and Academic Organizations: National and regional training institutions ensure the availability of a skilled workforce in prosthetics and orthotics. Academic institutions also lead and support research. Training institutions should participate in workforce and sectoral planning to align training efforts with labor market needs. In countries without dedicated prosthetics and orthotics schools, nearby academic institutions can be utilized.

g. Professional Associations: These associations comprise prosthetists, orthotists, physiotherapists, physicians, nurses, and other key professionals essential for planning, developing, and strengthening prosthetics and orthotics services. Regional and international associations can provide additional support.

h. Manufacturers and Suppliers of Components, Materials, and Consumables: Manufacturers and suppliers must research, develop, and produce high-quality, cost-effective components and materials, ensuring availability and providing training on their usage.
i. International Organizations and Agencies: The international community involved in prosthetics and orthotics should contribute to advocacy, international coordination, information exchange, and providing technical and financial support for product development.
j. Funding Agencies: To ensure affordable prosthetics and orthotics services for all, reliance on out-of-pocket payments alone is insufficient. In most countries, sustainability depends on funding from governments, international or local humanitarian organizations, community-based groups, and other sources.

6.2.2. Products

The following standards define the suitability of prosthetic and orthotics technologies, including components, materials, and manufacturing methods:

User-Related Standards:

Products should be:

- Comfortable, with a well-adapted interface between the body and the device.
- Functionally effective.
- Easy to wear and remove.
- Safe for the user.
- Durable and long-lasting.
- Aesthetically acceptable in shape, finish, and color.
- Biocompatible, causing no allergic reactions.
- Lightweight in most cases.
- Acceptable to the majority of users and adaptable to their needs, considering cultural appropriateness and environmental factors (moisture and wet conditions resistance, suitability for local terrain).

Economic Standards:

- **Products should be affordable for both the system and individuals.**
- **Cost-effective technical solutions should:**
  1- Be clinically effective.
  2- Streamline production processes and speed up manufacturing.
  3- Avoid requiring highly advanced or expensive tools and machinery.
  4- Require minimal maintenance.
  5- Generate minimal waste.
  6-Use locally available or easily importable components and materials.
  7-Support sustainable development by encouraging local business organization and using local markets for components and materials.

Technical Standards:

- Prosthetics and orthotics technologies must be **proven safe and effective** and adhere to **international standards.**
- Products should be mechanically and biologically sound.
- Devices must be **durable and long-lasting.**
- They should be easy to **adjust, maintain, and repair,** preferably allowing user-performed maintenance.
- The knowledge and skills of prosthetists and orthotists must be sufficient to implement technologies and methods, with affordable and accessible training available if needed.
- Work processes should not pose risks to practitioners.
- Materials should be **easy to store.**

Priorities for these standards may vary depending on the context, but all should be considered when making product-related decisions.

6.2.3. Workforce

The key workforce categories in the prosthetics and orthotics field include:

Prosthetics and Orthotics Experts

These experts oversee the technical team, assess user needs, determine the best treatment options, define precise technical specifications for devices, take measurements, and develop device models. They must have a comprehensive understanding of manufacturing processes to effectively supervise and guide technicians. Continuous professional development is necessary for leadership roles and service model improvements.

Technicians and Assistant Technicians

Technicians and their assistants manufacture prosthetics and orthotics according to specifications set by prosthetics experts, working under their supervision. Their duties include:

Preparing materials, assembling components, and fine-tuning the final product for delivery.
Understanding materials, technical procedures, and safety standards.
Providing maintenance and repair services.
Consulting prosthetics experts when necessary for quality control and adjustments during rehabilitation, production, and fitting stages.

6.2.4. Educational Standards

Professional standards for prosthetists and technicians are accredited by national bodies and the International Society for Prosthetics and Orthotics (ISPO). These standards serve as a reference framework for policymakers and regulatory bodies in education and course development. ISPO provides educational and training guidelines for prosthetics and orthotics professions, widely adopted by governments and non-governmental agencies. To guide curriculum design and development, ISPO has compiled an information package that includes learning objectives for different courses, curricula, final examination arrangements, and standards for training program evaluation and international recognition.

6.2.5. Workforce Planning

Workforce planning is essential to ensure an adequate number of qualified professionals for service delivery while avoiding resource wastage or worker shortages. Workforce planning involves four steps:

A. Identifying Service Needs: Estimating service demand, geographical distribution, and types of required services, considering factors such as population growth, the rise in non-communicable diseases, and conflict-related cases.

B. Determining Workforce Requirements: The number of required professionals is estimated based on service needs and local conditions. A mid-sized country typically requires 1-3 prosthetists per million people and 5-10 technicians per million people, with higher ratios in conflict zones or regions with a high prevalence of non-communicable diseases.

C. Assessing Existing Workforce Characteristics: Conducting a comprehensive workforce review, including age, gender, and experience levels.

D. Identifying Training Needs: Addressing the gap between available professionals and required numbers, ensuring gender balance, and making training affordable and accessible to graduates within the service system.

6.2.6. Service Provision

Service providers must ensure equal opportunities in accessing services, regardless of social or economic status. This includes:

A. Financial Accessibility:
All individuals who require prosthetic and orthotic services should be able to access them without financial hardship. The cost of products and services should be affordable for everyone, including vulnerable groups.

B. Physical Accessibility:
Service units should be designed to accommodate individuals with mobility impairments, many of whom use wheelchairs or crutches. All areas accessible to users, including waiting rooms, treatment sections, and restrooms, should be easily reachable. Ramps or elevators should be installed where steps present a physical barrier. Additionally, service units should allocate sufficient parking spaces for users.

C. Geographic Accessibility:
Services should be available to all users, regardless of their location. In most countries, this requires establishing a network of service units strategically distributed across the country or decentralizing service delivery. Service users and caregivers may also need financial support to cover transportation and accommodation costs when accessing services.

D. Social Accessibility:
Services should be provided equitably, with respect for cultural and religious differences.

E. Linguistic Accessibility:
Information materials should be available in the user's local language, and sign language interpreters should be provided when necessary.

F. Organizational Accessibility:
Service hours and waiting times should be suitable for all users, including those traveling from remote areas or working during the day.

6.2.7. User Policy

To ensure that prosthetic and orthotic services are user-centered, service providers should have a written user policy in the local language. This policy should outline how users and caregivers are treated during service interactions and how their rights are upheld. All staff must maintain:

A. A User-Friendly Environment: Service units should be fully accessible and user-friendly. Waiting areas should be clean, quiet, comfortable, well-ventilated, and maintain a pleasant temperature, with an adequate number of seats.

B. Respect: The relationship between service providers and users should be based on dignity, empathy, mutual respect, integrity, and trust, ensuring users' values, needs, and preferences are considered. Staff should conduct themselves professionally and courteously, communicate effectively with users, and listen attentively. Employees should dress appropriately in accordance with local cultural norms.

C. Punctuality: Services should be provided promptly without unnecessary delays, adhering to agreed-upon appointment schedules.

D. Safety: User safety must be ensured at all stages of treatment and in all areas within the service unit. Safety measures should be in place to protect users from injury during treatment and training on prosthetic and orthotic use.

E. Privacy and Confidentiality: Privacy should be maintained throughout all treatment stages and within all service unit sections. Any personal information collected by service providers should be treated as confidential and not disclosed without user consent. Users' approval must also be obtained before using their photos or videos for promotional materials, publications, case studies, or other purposes.

F. Information: Users and caregivers should receive complete information about the treatment process, proposed interventions, evaluation outcomes, and the purpose and function of recommended prosthetics and orthotics. They should also be informed about alternative treatments, associated costs, expected results, long-term benefits, potential risks, and complications through an informed consent process.
Service staff should advise users and caregivers on timelines and expected waiting periods. For long-term success, users should be clearly informed about follow-up care, product maintenance, and where and when to seek repair services when needed. Information should be readily accessible, such as being printed in large fonts and local languages.

G. Decision-Making: Users should have the final say in decisions regarding their treatment. Service providers should assist them in making informed choices before approving the final treatment plan. Under no circumstances should users be forced to accept a specific intervention. They should have the freedom to choose among available options, including components, materials, and designs. Participation should always be voluntary.

H. Access to Clinical Records: To provide users and caregivers with complete information about their treatment and enable active participation in their care and decision-making, service providers must grant full access to all information related to their care, including clinical records, both during and after treatment.

I. Complaints and Suggestions: Service providers should establish a system that allows users and caregivers to give feedback on the services they receive and how they were treated. This should include a mechanism for expressing concerns, complaints, and suggestions anonymously.

6.2.8. Material Evaluation

Objectives of the Material Evaluation Policy Guide:

This guide aims to establish a comprehensive framework for evaluating materials used in prosthetic manufacturing, ensuring they meet the highest standards of quality and safety. The objectives include:

- Improving the quality of prosthetics provided to patients.
- Ensuring user safety and comfort by utilizing biocompatible and physically suitable materials.
- Adhering to international and local standards to ensure product certification and compliance with health regulations.

Material Selection Criteria:

A. Physical Properties:

Materials used in prosthetic manufacturing should possess physical properties that ensure optimal performance and durability, including:

- Strength and Durability: Materials must withstand mechanical stress and continuous loading without damage.
- Lightweight and Flexibility: Materials should be lightweight to minimize user effort while maintaining sufficient flexibility for natural movement.
- Wear Resistance: Materials must resist friction-induced wear and prolonged use.

B. Chemical Properties:

Prosthetic materials must have high chemical compatibility to prevent harmful reactions with the body, including:

- Resistance to Chemical Reactions: Materials should resist reactions with human perspiration and other substances.
- Biocompatibility: Materials must not trigger allergic reactions when in direct contact with body tissues.
- Long-Term Chemical Stability: Materials should maintain their chemical and physical properties over extended use without degradation.

C. Biological Properties:

Materials should be biologically safe, ensuring they do not cause irritation or allergies, including:

- Non-Irritating to the Skin: Materials should be smooth and non-irritating for user comfort.
- Resistance to Infections and Microbes: Materials should resist bacterial and microbial growth for hygiene and safety.
- Safe for Human Use: Materials must be completely safe, free from toxic or harmful substances.

Material Selection Criteria:

A. Research and Initial Selection:

The evaluation process begins with researching and selecting available materials, including:

- Market Study: Gathering comprehensive data on available materials, including technical specifications and previous applications.
- Consultation with Experts: Collaborating with biomaterials and biomedical engineering specialists for recommendations.
- Review of Scientific Studies: Analyzing recent research and studies on potential materials to determine suitability.

B. Laboratory Testing:

Materials undergo rigorous lab testing to assess performance under different conditions, including:

- Strength and Durability Testing: Measuring material resistance to mechanical loads and stress.
- Flexibility and Elasticity Testing: Evaluating how materials retain their shape after pressure exposure.
- Wear Resistance Testing: Determining material durability against friction and repeated use.

C. Biocompatibility Assessment:

Following lab tests, materials undergo biological evaluation to ensure compatibility with the human body, including:

- Tissue Reaction Testing: Examining the response of living tissues to direct material contact.
- Allergy and Irritation Testing: Confirming that materials do not cause allergic reactions or skin irritation.
- Microbial Resistance Testing: Assessing material resistance to bacterial and microbial growth.

D. Clinical Evaluation:

This phase involves studying real-world applications and gathering user feedback, including:

- Clinical Case Studies: Monitoring and evaluating users who wear prosthetics made from new materials.
- Patient Feedback Collection: Directly assessing user comfort, performance, and any issues.
- Performance Evaluation in Daily Use: Analyzing how materials function in real-life settings.

Continuous Monitoring and Improvement:

A. Data Collection and Analysis

Data is collected and analyzed from the use of materials in prosthetic manufacturing to continuously improve the process. This includes:

- Monitoring the performance of materials used in prosthetics: Collecting data on the durability and effectiveness of materials over time.
- Analyzing data for insights and recommendations: Using data to evaluate performance and identify areas for improvement.

B. Updates and Enhancements

Based on the analyses, the material evaluation process is regularly updated and improved. This includes:

- Updating standards and procedures based on data and feedback: Modifying evaluation criteria and testing procedures based on findings and recommendations.
- Enhancing evaluation processes based on technical and scientific advancements: Incorporating the latest technologies and innovations to improve evaluation methods.

C. Training and Professional Development

Technical staff must receive continuous training on the latest standards and technologies, which includes:

- Training technicians on the latest evaluation standards: Organizing specialized training courses and workshops.

Partnerships and Collaboration

A. Collaboration with Research Institutions

Partnerships with research institutions are essential for improving material evaluation. This includes:

- Building partnerships with universities and research centers: Collaborating with academic institutions for joint research projects.
- Working with specialized institutes in biomaterials: Engaging with specialized institutes to develop and enhance the materials used.

B. Collaboration with Suppliers

Collaboration with suppliers is essential to ensure access to high-quality materials. This includes:

- Selecting reputable suppliers with high standards: Ensuring partnerships with reliable and accredited suppliers.
- Working together to improve material quality: Collaborating with suppliers to enhance material quality and meet user needs.

Documentation and Quality Policies

A. Process Documentation

All stages of the material evaluation process must be accurately and systematically documented. This includes:

- Recording all stages of the evaluation process: Keeping detailed records of each evaluation step.
- Maintaining test results and reports: Documenting test results and reports for future reference.

B. Quality Policies

Quality policies are a fundamental part of the evaluation process to ensure compliance with international standards. These policies include:

• Implementing Total Quality Management (TQM) standards: Adopting comprehensive quality standards to ensure continuous improvement in all aspects of the process.

• Adhering to international standards such as ISO and ASTM: Ensuring that all materials and technologies used comply with recognized international standards.

C. Policy Review and Approval

Policies and procedures must be regularly reviewed and approved to ensure their relevance and effectiveness. This includes:

• Periodic review of policies and procedures: Evaluating and updating policies regularly to ensure continuous improvement.

• Approval of policies by the programs department: Ensuring that all policies and procedures are officially approved by the relevant management.

Additionally, global companies specializing in manufacturing materials, components, and operational supplies have implemented these policies, facilitating the work of technical teams by standardizing required materials and streamlining previous evaluation and approval processes.

It is well-known and globally registered, with a list of the top 20 international companies, including: **Fillauer llc. Companies - össur (iceland) - blatchford limited- ottobock se & co. Kgaa - indolite inc.- st&g usa corporation - willowwood global llc - ortotek ltd.- steeper inc. - uniprox - orthotic europe - alps inc.**

6.3. Service Site Standards (Prosthetics and Rehabilitation Center)

Prosthetic and orthotic services are provided in well-designed, air-conditioned, and well-ventilated facilities tailored to the needs of individuals requiring these services.

Typically, the service unit consists of four main areas:

Beneficiaries areas		Workers' Areas	
Reception Area	Clinical Area	Workshop Area	Workers' Area
• Waiting Room • Reception • Toilets	• Assessment Room • Molding and Measurement Room • Walking Training Room • Physiotherapy Room • Shower Room	• Assembly Room • Laboratory • Cast Adjustment Room • Plastic Room • Equipment Room • Storage	• Administration • Employee Offices • Meeting Room • Changing Room • Shower Room • Toilets

The design and size of the unit should be appropriate for the intended operations and types of services provided. Users should have direct and easy access to the reception and waiting area, as well as the relevant clinical sections.
Access to all user areas, including restrooms, should be convenient and accessible, with a comfortable design. Waiting rooms and clinical areas should be separated from workshops to minimize risks of injury, noise exposure, dust, and harmful fumes from chemicals used in prosthetic manufacturing.
User areas should be designed to be comfortable and visually appealing. Depending on local context and cultural considerations, there should be separate service areas for men and women during treatment and rehabilitation.

6.3.1. Service Unit

A. Geographic Location

Proximity to Beneficiaries

Easy Access: The center should be located in an easily accessible area, whether by public transportation or main roads, to facilitate patient and beneficiary visits.
Residential Areas: Preferably, the center should be close to residential neighborhoods where most beneficiaries live to reduce the need for long and costly commutes.

Environmental Considerations

Healthy Environment: The center should be situated in a clean, pollution-free area to ensure a safe and healthy environment for both patients and staff.
Quiet Surroundings: It is preferable for the center to be in a quiet area to provide a comfortable atmosphere for beneficiaries during treatment and rehabilitation sessions.

B. Infrastructure

Space and Design

Adequate Space: The center should have sufficient space, including treatment rooms, administrative offices, and shared facilities, to provide services comfortably.
Accessible Design: The center should be designed for easy navigation and use by individuals with disabilities, including wide hallways, elevators, and accessible restrooms.

Essential Facilities

Well-Equipped Treatment Rooms: Fully equipped treatment rooms with necessary tools and devices for physical and occupational therapy sessions.
Ventilation and Lighting: Proper ventilation and lighting should be ensured for the comfort of both patients and staff.
Safety and Security: Full implementation of safety standards, including emergency exits, fire alarms, and fire suppression systems.

C. Human Resources

Specialized Staff

Qualified Specialists: The center should have a team of specialists in physical therapy, occupational therapy, psychological support, and prosthetic fabrication and fitting.
Continuous Training: Ongoing training programs for staff to keep up with the latest advancements and technologies in the field.
Administrative Support: A qualified management team capable of organizing and coordinating services effectively.
Technical and Administrative Support: Provision of technical and administrative support to ensure smooth and efficient operations.

D. Integrated Services

Comprehensive Assessment

Initial Examination: Conducting a thorough initial examination for each beneficiary to determine their specific needs and develop a personalized treatment plan.
Continuous Follow-Up: Regular monitoring of beneficiaries' progress and adjusting treatment plans as needed.

Comprehensive Rehabilitation Programs

Physical and Occupational Therapy: Providing therapy sessions to improve mobility and functional abilities.
Psychological Support: Offering psychological support sessions to help beneficiaries adapt to prosthetic limbs and overcome psychological challenges.
Prosthetic Training: Conducting training programs to teach beneficiaries how to use their prosthetic limbs efficiently and safely.

6.3.2. Equipment

Equipment and tools are essential for completing tasks effectively and ensuring the high-quality production of prosthetics and orthotic devices. Selecting the right equipment has a significant and direct impact on service cost-effectiveness, ensuring high quality, adequate capacity, and minimizing frequent maintenance.

The equipment used in the service unit typically includes general industrial and craft tools, as well as more specialized tools for prosthetic manufacturing. These tools are designed with the highest safety and security standards. The number and type of equipment depend on the size of the unit and the range of services provided.

All equipment must be regularly maintained according to supplier and manufacturer recommendations.

Department	**Equipment**
Packaging Room	Record-keeping tools, user assessment tools, and equipment
Molding and Measurement Room	Equipment for shape determination, measuring tools
Plaster Modification Room	Tools and equipment for mold adjustment
Plastic Room	Thermal forming and/or vacuum forming equipment (e.g., a vacuum forming machine)
Assembly Room	Manual tools, life-size machines, and related equipment
Machines Room	Prosthetic limb trimming machine, high precision cutting tools and related equipment
Walking and Training Area	Rehabilitation equipment, balance training aids, parallel bars and related tools

6.3.3. Occupational Safety and Health

Adhering to occupational safety and health standards is essential to protect workers in prosthetic and orthotic manufacturing workshops from potential accidents that could cause serious injuries, fatalities, or material damage.

General Safety Measures

1. Use personal protective equipment (PPE) while working.
2. Clearly display usage guidelines next to all machines in operation.
3. Provide safety presses in case of any machine malfunction and train staff on proper usage.
4. Ensure proper lighting and ventilation in workshop areas, particularly in patient service sections.
5. Maintain a first aid kit at workstations for quick response to minor injuries.
6. Store chemicals and flammable materials away from worker gathering areas to minimize risks.
7. Enhance worker preparedness by conducting evacuation drills and training on handling emergencies.
8. Maintain coordination between the technical workshop and health authorities responsible for occupational safety and relevant regulatory bodies.

General Objectives of Occupational Safety and Health

Protect workers from occupational hazards by preventing exposure to accidents, injuries, and work-related illnesses.	Preserve material assets, including facilities, equipment, and machinery, from damage and loss due to accidents.

Following workplace safety guidelines, especially in storage areas, is crucial. Warehouses often contain expensive and diverse materials, making it essential to protect them from fire, theft, and vandalism. Fire prevention measures must be implemented to prevent ignition and ensure readiness in case of an emergency, as fires can cause significant damage to stored materials. Even non-flammable materials can be affected by exposure to smoke, high temperatures, or water used in fire suppression efforts.

6.4. Training and Professional Development

Technical Training Programs

Continuous training programs for technicians are an essential part of professional development strategies to ensure high-quality prosthetics and rehabilitation services while keeping up with scientific and technological advancements. These programs include:

- **A. Foundational Training:**
Training new technicians on prosthetics and rehabilitation basics, including material knowledge, manufacturing techniques, and safety procedures.

- **B. Specialized Training:**
Advanced training in specialized areas such as upper and lower limb prosthetics, orthoses, scoliosis braces, and advanced physical therapy.

- **C. Field Training:**
Hands-on training under expert supervision in rehabilitation centers, providing practical experience in real-world work environments.

- **D. Training on Modern Technologies:**
Education on the latest devices and equipment used in prosthetic fabrication and fitting to ensure up-to-date knowledge and skills.

Courses and Workshops

Workshops and training courses serve as effective tools for enhancing knowledge and exchanging experiences among technicians. These include:

- **A. Short-Term Training Courses:**
Intensive courses on specific topics such as new prosthetic manufacturing techniques or innovative rehabilitation methods.

- **B. Practical Workshops:**
Hands-on workshops where technicians can experiment with new devices and tools, improving their practical skills and addressing daily challenges.

- **C. Seminars and Conferences:**
Encouraging technicians to attend local and international conferences to learn from global experts and discuss the latest research and innovations.

- **D. Experience Exchange Sessions:**
Organizing internal meetings where technicians can share knowledge, discuss complex cases, and explore potential solutions.

Skills and Capability Development

Developing technicians' professional skills and capabilities is crucial for delivering comprehensive and integrated services. This includes:

- **A. Continuous Learning:**
Encouraging technicians to stay updated by reviewing scientific literature, participating in online courses, and keeping up with the latest research.

- **B. Regular Performance Evaluation:**
Implementing periodic performance assessments to identify strengths and weaknesses, providing feedback for improvement.

- **C. Individual Development Plans:**
Creating tailored professional development plans based on each technician's needs and career goals, including relevant training courses and growth opportunities.

- **D. Encouraging Innovation:**
Promoting a work environment that supports new ideas and innovations to improve processes and services.

Chapter Seventh
Conclusion

Based on the mission of the International Wars and disasters Victims Protection Association -Al-Ameen, which asserts that well-being is a right for all individuals, the Association adopts a comprehensive set of policies and standards to establish an integrated service system. In this system, every individual has the right to access all rights and resources without discrimination.
IRVD/Al-Ameen strives to ensure the quality of all services provided within its projects by implementing the best internationally recognized policies and standards. This is achieved through the formulation of guidelines that align with the humanitarian and regional context of its humanitarian programs. Given the importance of the prosthetics and rehabilitation program, which aims to serve one of the vulnerable groups by focusing on individuals with disabilities and facilitating their lives and reintegration into their communities, it became essential to create this general guideline.
This guideline aims to ensure the application of internationally recognized policies and standards in all prosthetics and rehabilitation centers operated by IRVD/Al-Ameen and funded by KS relief. This is intended to guarantee the quality of specialized health services provided and reflects our belief in the importance of operating such specialized health centers, particularly during humanitarian crises, due to their significant role in alleviating the burden on local communities and health entities. These specialized services work to address activity limitations and provide scientific solutions according to international approaches, protocols, and the WHO's classification of disability and health-related functioning.
This guideline has clarified the general concepts associated with disabilities, especially mobility impairments, and outlined the comprehensive operational mechanisms of prosthetics and rehabilitation center services, detailing all stages involved. It also encompasses the recruitment of staff and the acquisition of high-quality academic expertise in accordance with clear policies. Furthermore, the guideline emphasizes the integration of roles through the critical contributions of the interdisciplinary rehabilitation team, including prosthetists, physiotherapists, occupational therapists, psychologists, as well as doctors and nurses, in delivering comprehensive and effective care.
The technical team, under the supervision of the program management at IRVD/Al-Ameen, has made every effort to ensure the accuracy and validity of the information and procedures recognized globally. The implementation of these standards remains the professional responsibility of the rehabilitation team to ensure the achievement of the desired outcomes from rehabilitation services for individuals with mobility impairments.

Management of the International Wars and Disasters Victims Protection Association / Al-Ameen

Chapter Eight

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General guideline for prosthetics
And rehabilitation services