PRIA

INTERNATIONAL ACADEMY

Initiative in Education & Lifelong Learning

Certificate Programme

Occupational Health and Safety: Legal and Operational Guide

Unit 5

Health Screening Measures

Units of Certificate in Occupational Health and Safety

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- Objectives and Principles of OHS
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Introduction

It is necessary to diagnose the link between a person's occupation and medical health related symptoms if an employee is suffering from an occupational related disease. In this Unit we will discuss and develop an understanding of why a correct diagnosis is important for workers, not only for treatment or prevention of diseases, but also for regular monitoring of their health at the workplace to reduce the further prevalence of diseases. Another aspect is to understand how to rule out the possibility of an incorrect diagnosis.

Employers are obligated to provide their employees with a safe and healthy workplace that is reasonably free of occupational hazards. However, it is unrealistic to expect that accidents will not occur. Therefore, employers are required to provide medical and first aid personnel and supplies commensurate with the hazards of the workplace. The critical factors which shape first aid facilities in a workplace are work-specific risk and depend on the availability of definitive medical care. The intent of the latter half of the Unit is to provide basic information that may be of assistance in providing first aid facilities at the workplace.

Learning Objectives

After completing this unit, you should be familiar with the following concepts and issues:

- Stages of medical examination in occupational health
- Significance of occupational history
- Pulmonary Function Tests (PFT) and their methodology
- Audiometry and prevention of Noise Induced Hearing Loss (NIHL)
- Basic first aid techniques

5.1 Stages of Medical Examination

A medical examination is important for the early detection of asymptomatic illness. Hence, the medical examination of workers necessarily includes making an assessment of their physical and mental fitness to perform the job. Medical examinations are carried out in three stages. The first stage is pre-employment, then periodic medical examinations are done during the course of employment and finally medical examinations are done after a break in employment, if any, which might be due to illness or accident recovery.

5.1.1 Pre-employment Examination

A thorough medical and physical examination of the candidate should be carried out to ascertain the following points.

1. Whether the worker is suffering from any disease which could be a danger to fellow workers. For example, do they suffer from any communicable disease or from any medical or physical condition or if have they met with an accident while working on a machine in a factory?

2. Whether the job for which the worker is being considered is safe for her/his health.

3. To identify if there is any job to which the worker should not be assigned or to identify a job for which the worker is best suited.

The ideal methodology includes checking the worker's physical, sensorial, physiological and psycho-effective characteristics. Finally major systems should be checked. For the genito-urinary system, a urine analysis is done. This test indicates not only the presence of sugar and albumin, but it also helps in identifying the increased absorption of toxic substances. The cardiovascular system is checked by

examining blood pressure and heart rate. The respiratory system should also be checked while in action as well as at rest.

5.1.2 Periodic Examination

Pre-employment examination reports are preserved as the reference value of the worker to be used while conducting periodical examinations during employment. The frequency of periodical examinations depends on the nature of the job. Usually this is done annually. In most countries, conducting annual check-ups is mandatory under law. This exercise provides valuable insights in monitoring the impact of occupational over-exposure on the worker's health.

5.1.3 Examination after a Break

Break from work could be due to prolonged illness or recovery after an accident. A medical examination after the break is important, as it provides an opportunity to reassign a safe and suitable job for the worker. In many countries, this examination is misused to identify disability in a worker so as to remove her/him from the job. Unfortunately, no legal support is available for this action worldwide.

5.2 Occupational History

Recording occupational history provides necessary data for the researcher/doctor to identify the causal relationship between symptoms. Today's fast-changing economic scenario is also reflected in frequent changes in occupation. Prescription slips of many general practitioners carry a column to record the patient's employment. However, due to lack of sensitivity towards this important data, instead of mentioning the nature of the job, patients tend to write "student", "service", "business", etc. By filling this information incorrectly, we miss out on an important tool to find out if the disease we have has any link with our occupation. Therefore, it is important to know and record the occupations in which the patient has been involved.

It must be remembered, however, that only recording the symptoms might sometimes lead to an incorrect diagnosis as many a time symptoms can be common for a number of diseases. For example, symptoms of tuberculosis are similar to that of pneumoconiosis. Admittedly, symptoms play an important role in diagnosis, as they are the first visible expressions of the occurrence of any disease, but further clinical investigation should be undertaken as per the need.

THINK TANK

- What is a medical examination? Name the various stages?
- Why is it important to know and record the previous occupation of a person?
- Were you asked for medical information prior to joining your job? Do you think it is important for the employer to ask and receive such information? What could be the possible consequences if such information is not available with any employer when giving someone a job?
- Do you think medical examinations need to be different for different jobs? What about differences in gender? If a man and a woman have the same job, should the medical examination be different?

5.3 Abnormal Lung Function

Abnormalities in lung function can occur as a result of exposure to hazardous substances in the workplace. Workers employed in cement, pharmaceutical, iron and steel, coal mines, oil and gas, textiles, fertiliser, agro-based industries, etc, are often exposed to various forms of hazardous substances for a prolonged period that can cause respiratory problems leading eventually to abnormalities in lung function, which could result in severe health problems.

What is a Pulmonary Function Test?

A Pulmonary Function Test (PFT) is a method of assessing the function of a person's lungs. It is a means of detecting and quantifying abnormal lung function in a non-invasive manner. In simpler terms, PFT measures the lungs' ability to exchange oxygen and carbon dioxide appropriately. It is a generic term used to indicate a battery of studies including spirometry, which measures the amount of air that the lungs can hold, lung volume tests, to measure the amount of air remaining in the lungs after exhaling, lung diffusion tests and pulse oximetry, which measures the amount of oxygen passed from the lungs to the blood.

What is the function of a Spirometer?

A spirometer is an instrument used to measure the volume of air entering and leaving the lungs. To do the test, an individual blows into the spirometer that makes tracings of the rate at which air leaves the lungs. That is, the spirometer measures the amount of air expelled and the speed at which the lungs can be emptied. These measurements are useful in measuring respiratory disease. These measurements are called FVC and FEV_1 (See Annexure 1).

Spirometry therefore is a common type of Pulmonary Function Test (PFT) that measures how well a person can move air in and out of their lungs. Over the last several decades much research has been undertaken to determine the normal

values for lung volumes and lung capacities. This has made spirometry very useful since the patient's PFT results can be compared with the tabulated normal values. Thus it becomes easier to compare the severity of the disease process or the patient's rate of recovery. Variables such as age, gender and body size also have an impact on an individual's lung function.

Abnormal PFT

Pulmonary function abnormalities can be grouped into two main categories: obstructive and restrictive defects. This grouping of defects is based on the fact that the routine spirogram measures two basic components – air flow and volume of air out of the lungs. If the flow is impeded, the defect is obstructive and if the volume is reduced, a restrictive defect may be the reason for the pulmonary disorder.

Obstructed Airflow: The patency (dilatation or openness) is estimated by measuring the flow of air as the patient exhales as hard and as fast as possible. The flow of air through the tubular passageways of the lung can be reduced for a number of reasons, such as:

- Narrowing of the airways due to bronchial smooth muscle contraction as is the case in asthma;
- Narrowing of the airways due to inflammation and swelling of bronchial mucosa and the hypertrophy and hyperplasia of bronchial glands as is the case in bronchitis;
- Material inside the bronchial passageways physically obstructing the flow of air as is the case in excessive mucus plugging, inhalation of foreign objects or the presence of pushing and invasive tumours;

- Destruction of lung tissue with the loss of elasticity and hence the loss of the external support of the airways as is the case in emphysema; and
- External compression of the airways by tumours and trauma.

***Restricted Airflow*:** "Restriction" in lung disorders always means a decrease in lung volumes. This term can be applied to patients whose total lung capacity has been measured and found to be significantly reduced. Total lung capacity is the volume of air in the lungs when the patient has taken a full inspiration.

NOTE BANK

Varying normal values

Age: As a person ages, the natural elasticity of the lungs decreases. This translates into decreasing lung volumes and capacities as we age. When determining whether or not a patient has normal PFT findings, it would be important to compare the patient's results with the PFT results of a normal person of the same age and gender.

Gender: Usually the lung volumes and capacities of males are larger than the lung volumes and capacities of females. Even when males and females are matched for height and weight, males have larger lungs than females. Because of this difference in gender-dependent lung size, different tables must be used for males and females.

Body Height & Size: Body size has a tremendous effect on PFT values. A small man's PFT result will be lower than that of a man of the same age who is much larger. Normal tables account for this variable by giving predicted PFT data for males or females of a certain age and height. Sometimes as people age, their body mass increases, because of an increase in their body fat to lean body mass ratio. If they become too obese, the abdominal mass prevents the diaphragm from descending as far as it could and the PFT results will demonstrate a smaller measured PFT outcome than expected, i.e., the observed (measured) values are actually smaller than the predicted values (predicted values from the normal tables).

Ethnicity: Ethnicity can also affect PFT values. Blacks, Hispanics and Native Americans have different PFT values compared to Caucasians. Therefore, a clinician must use an appropriate table to compare the patient's measured pulmonary function against the results of the normal table written for that patient's ethnic group.

Other factors such as environmental factors and altitude may have an effect on PFT results, but the degree of effect on PFT is not clearly understood.

THINK TANK

- Should a PFT be conducted for workers employed in a cement factory? In your opinion why is it important or not important?

- Name eight such sectors or industries in your country or state where you think it would be necessary to conduct a PFT.

5.4 Noise Induced Hearing Loss (NIHL)

When hearing loss is associated with recreational or non-occupational activities, it is referred to as socioacusis. When the hearing loss is due to noise in the workplace, it is referred to as occupational Noise-Induced Hearing Loss (NIHL). The latter is considered to be a more serious problem for the following reasons.

- The threat of loss of employment may convince people to remain in environments with noise levels higher than they would otherwise accept, and
- In the workplace, high levels of noise may be sustained on a regular basis for many hours each day over many years.

Characteristics of Occupational Noise-Induced Hearing Loss

Occupational NIHL develops slowly after many years of exposure. Susceptibility varies quite widely, but generally 10 years or more of exposure is required for significant hearing loss to occur. The principal characteristics of occupational NIHL are:

- It is always sensorineural, affecting hair cells in the inner ear.
- Since most noise exposures are symmetric, the hearing loss is typically bilateral.
- Typically, the first sign of hearing loss due to noise exposure is a “notching” of the audiogram at 3000, 4000, or 6000 Hertz (Hz), with recovery at 8000 Hz. The exact location of the notch depends upon multiple factors including the frequency of the damaging noise and the length of the ear canal.

- Noise exposure alone usually does not produce a loss greater than 75 decibels (dB) in high frequencies, and 40 dB in lower frequencies. However, individuals with superimposed age-related losses may have hearing threshold levels in excess of these values.

- The rate of hearing loss due to chronic noise exposure is greatest during the first 10-15 years of exposure, and decreases as the hearing threshold increases. This is in contrast to age-related loss, which accelerates over time.

NOTE BANK

Do you feel face of the problems given below in your work/workplace?

- The noise at work is so high that it is difficult to have any conversation in a normal way.
- At the time of going to work you can hear the sound of car horns, but while going back from work you have difficulty in hearing car horns or other sounds.
- At the end of the work shift there is ringing in the inside of your ears.
- You find it difficult to sense sounds such as ‘s’ ‘th’ ‘ch’.
- When talking to others you sometimes feel as if others speak too loudly.
- You find it difficult to fully understand a conversation on the telephone.
- Sometimes, at the end of the working day, you suffer from headaches for no known reason.
- You become irritable some times. You find it difficult to sleep peacefully.
- If you are working in high noise levels and if you have any of the symptoms listed above or if you suffer from obvious diminished hearing, then your problem is most probably due to the noise at the workplace.

Most scientific evidence indicates that ears previously exposed to noise are not more sensitive to future noise exposure and that hearing loss due to noise does not progress (in excess of what would be expected from the addition of age-related threshold shifts) once the exposure to noise is discontinued.

In obtaining a history of noise exposure, the clinician should keep in mind that the risk of NIHL is considered to increase significantly with chronic exposures above 85 dB for an eight hour time-weighted average (TWA). In general, continuous noise

exposure over years is more damaging than interrupted exposure to noise, which permits the ear to rest for some time. However, short exposures to very high levels of noise in occupations such as construction or fire-fighting may produce significant loss, and measures to estimate the health effects of such intermittent noise are lacking. When the history of noise exposure indicates the use of hearing protective devices, the clinician should also keep in mind that the real world attenuation provided by hearing protectors may vary widely between individuals.

Scientists are focusing their research on the mechanisms causing NIHL because not only does noise cause people to lose their hearing, it can also cost employers money through absenteeism, reduced productivity, medical costs and increasing compensation claims. In fact, noise ranks only second to physical injury as an occupational health hazard.

There may be various causes that could result in ONIHL. It has been observed that exposure to ototoxic drugs and chemicals may potentially interact with noise. Also, if in the past, exposure to drugs had caused hearing loss then it could contribute towards a loss of hearing. The Table below analyses chemicals in the workplace that could affect hearing.

CHEMICALS IN WORKPLACE AFFECTING HEARING	
Substances	*Workplaces where these might be encountered*
Organic Solvents	
Toluene Styrene Xylene	Manufacture of chemicals, paint and lacquers, pharmaceuticals, rubber products, fibre glass products, food containers, carpets; oil refining, aircraft operations, boat building
Dimethylformamide	Manufacture of clothing and textiles
Dinitrobenzene	Dry cleaning Paint manufacture Manufacture of rubber items
Gases	
Carbon Monoxide	Combustion; fuel gas mixtures; chemical manufacturing, mining and metal processing
Heavy Metals	
Cadmium Lead Mercury	Manufacture of alkaline batteries; manufacture of pigments, coatings, plating and plastics Construction, mining, manufacturing (batteries, ammunition), formerly paint, ceramics, pipes Fluorescent light bulbs, dental amalgam, solder, thermometers, detonators.
(The New Zealand Society of Otolaryngology, Head and Neck Surgery, 2011) (Sliwinska, 2007) (CDC, 1978)	

In India, studies have shown that the occupational permissible exposure limit for eight hour TWA is 90 dB (Suter, 1998). There are also quite a few industries that produce noise levels that could be hazardous for the well-being of all employed in these industries. These are textile, printing, saw mills, mining, pharmaceutical firms, fertiliser plants, oil and natural gas, etc.

5.4.1 Audiometry

Audiometry (alternate names: audiology, hearing test, audiography) is a screening technique that is used to detect the damage caused by exposure to noise. The test is performed with the use of electronic equipment called an audiometer, and is administered by a trained technician called an audiologist (a specialist in detecting hearing loss). Testing with audiometry equipment is simple and painless. No special precautions are required.

Process of Audiometry

A trained audiologist uses an audiometer to conduct audiometry testing. This equipment emits sounds or tones, like musical notes, at various frequencies, or pitches, and at differing volumes. Testing is usually done in a soundproof testing room.

The person being tested wears a set of headphones that blocks out other distracting sounds and delivers a test tone to one ear at a time. At the sound of a tone, the patient holds up a hand or finger to indicate that the sound is detected. The audiologist lowers the volume and repeats the sound until the patient can no longer detect it. This process is repeated over a wide range of tones or frequencies from very deep, low sounds, like the lowest note played on a tuba, to very high sounds, like the pinging of a triangle. Each ear is tested separately. It is not unusual to find that levels of sensitivity to sound differ from one ear to the other.

A second type of audiometry testing uses a headband rather than headphones. The headband is worn with small plastic rectangles that fit behind the ears to conduct sound through the bones of the skull. The patient being tested senses the tones that are transmitted as vibrations through the bones to the inner ear. As with the headphones, the tones are repeated at various frequencies and volumes.

The results of the audiometry test may be recorded on a grid or graph called an audiogram. This graph is generally set up with low frequencies or tones at one end and high ones at the other end, much like a piano keyboard. The low notes are graphed on the left and high notes on the right. The graph also charts the volume of the tones used; from soft, quiet sounds at the top of the chart to loud sounds at the bottom. Hearing is measured in units called decibels (dB). Most of the sounds associated with normal speech patterns are generally spoken in the range of 20-50 dB. An adult with normal hearing can detect tones between 0-20 dB.

Speech audiometry is another type of testing that uses a series of simple recorded words spoken at various volumes into headphones worn by the patient being tested. The patient repeats each word back to the audiologist as it is heard. An adult with normal hearing will be able to recognise and repeat 90-100 per cent of the words.

NOTE BANK

What constitutes normal hearing and hearing loss?

The ability to hear a whisper, normal speech, a ticking watch and a tuning fork through air and bone is normal. In detailed audiometry, hearing is normal if tones from 250 Hz through 8000 Hz can be heard at 25 dB or lower.

There are many different kinds and degrees of hearing loss. Some include only the loss of the ability to hear high or low tones, or the loss of only air or bone conduction. The inability to hear pure tones below 25 dB indicates some extent of hearing loss.

The extent and kind of hearing loss may give clues to the cause and the prognosis (probable outcome).

Normal Results

A person with normal hearing will be able to recognise and respond to all of the tone frequencies administered at various volumes in both ears by the audiometry test. An adult with normal hearing can detect a range of low and high pitched sounds that are played as softly as between nearly 0-20 decibels. Normal speech is generally spoken in the range of 20-50 decibels.

Abnormal Results

Audiometry results are considered abnormal if there is a significant or unexplained difference between the levels of sound heard between the two ears, or if the person is unable to hear normal frequencies and volume. The pattern of responses on the audiogram can identify hearing loss if it is present and if the patient might benefit from hearing aids or corrective surgery.

5.4.2 Prevention of NIHL

No well-recognised and scientifically validated treatments are specifically available for NIHL. Some doctors have alleged that smoking, cardiovascular disease, diabetes mellitus, hyperlipidaemia, and exposure to ototoxic drugs following treatable conditions can exacerbate NIHL, and the appropriate management of these considerations might influence the development or progression of NIHL.

Deterrence is the only accepted management method for NIHL. If noise levels cannot be brought down, hearing protection must be provided and its use must be enforced. Noise levels must be monitored either with area monitoring or personal dosimetry. Personal dosimetry is required if workers are exposed to variable noise levels. In addition, the noise levels must be displayed in work areas.

The following features are essential for an adequate **hearing conservation programme**.

- Hearing conservation programmes must include a baseline audiometry performed within six months of the onset of exposure for all employees.
- The audiogram must be obtained when the employee has not been exposed to hazardous noise for at least 14 hours.

- Annual audiometric testing should be performed for workers whose TWAs equal or exceed 85 dB.
- Workers should be given training annually on the effects of noise on hearing.
- If exposure to loud environmental noises cannot be avoided, hearing protection should be used. Unfortunately, enforcement has been sporadic. Hearing Protective Devices (HPDs) vary considerably in their effectiveness, comfort, and cost.
- Only devices that are designed for hearing protection and tested for efficacy should be used. Items such as cotton, tissue paper, and expended cartridge casings provide no meaningful noise attenuation.
- Earplugs are available with attenuation levels from as low as 10 dB to as high as 32 dB. They can be purchased over the counter or custom made. Earplugs can be as effective as earmuffs. However, earplugs are effective only when properly inserted. When earplugs are improperly inserted, noise attenuation may not be eliminated but may be greatly reduced. Earplugs are especially useful when noise exposure is continuously sustained.
- Earmuffs can provide as much attenuation as earplugs. An advantage of earmuffs is that they are easy to place correctly. Earmuffs are especially useful when exposure to noise is relatively intermittent. For example, runway workers may need to put on and take off earmuffs dozens of times during a shift. These workers are not likely to insert and remove their earplugs that frequently; if they did, many times the earplugs would not be placed correctly.
- Earmuffs that permit normal hearing in the absence of a loud noise are now available. The muffs are able to detect the presence of a loud noise and attenuate it before it reaches the human ear.

THINK TANK

- Define the meaning of occupational noise induced hearing loss? In your opinion should the management within workplaces play a role in the prevention of noise induced hearing loss?
- In your countries do the major industries have a policy for ensuring prevention of noise induced hearing loss?

5.5 First Aid Techniques

First aid is the immediate treatment or care given to someone suffering from an acute injury or illness. The initial treatment a person receives directly after an injury, accident or when a person becomes ill at work is extremely important in achieving the aims of first aid.

The aims of first aid are to:

- Preserve life;
- Prevent illness or injury from becoming worse;
- Relieve pain, if possible;
- Promote recovery; and
- Protect the unconscious.

Technically, first aid refers to medical attention that is usually administered immediately after the injury occurs and at the location where it occurred. It often consists of a one-time, short-term treatment and requires little technology or training to administer. First aid can include cleaning minor cuts, scrapes, or scratches; treating a minor burn; applying bandages and dressings; the use of non-prescription medicines; draining blisters; removing debris from the eyes; massage; and drinking fluids to relieve heat stress.

First aid may be administered by the first person “on the spot”. It is generally recognised, however, that a person providing first aid has had some level of formal training. First aid givers may have skills that range from basic expired air

resuscitation (EAR) or cardio-pulmonary resuscitation (CPR) to being able to provide more complex treatment. The selection and training of first aid personnel is most important.

First aiders should be familiar with the specific conditions and hazards at the workplace and the types of injuries likely to require treatment. The number of first aiders at a workplace and the level of training that is needed should be determined according to the hazards identified at the workplace and the assessed risks.

5.5.1 SAFE Steps of Risk Management

To determine what first aid facilities and services are appropriate for an organisation/workplace, one should apply the SAFE Steps of Risk Management:

- **S - Spot the hazard** — identify the possible causes of injuries and work related illnesses in your workplace
- **A - Assess the risk** — of workplace injuries or illnesses occurring
- **F - Fix the problem** — by working out the appropriate first aid facilities and training required for your workplace
- **E - Evaluate results**

STEP 1 — SPOT THE HAZARD

A hazard is anything that has the potential to cause injury, illness or damage to one's health. While assessing the first aid needs of one's workplace, the following factors should be taken into consideration.

- Nature of hazards and level of risk;

- Size and layout of the workplace;
- Location of the workplace;
- Workers in the workplace; and
- Known occurrences of injury and illness.

Walk around your workplace and use the first aid assessment questionnaire (given below) to assess the kinds and nature of hazards in your workplace.

- What type of workplace is it?
- What type of work is done here?
- What is the level of risk in the industry?
- What is the area of the workplace?
- Is the workplace located on more than one level?
- What is the access into and out from the workplace?
- What is the access into and out from different levels of the workplace?
- How many workers work here?
- How many shifts operate here?
- How many workers are there on each shift?
- Do workers do overtime here? How frequently? How much?
- Are there workers with disabilities or other special needs to consider?
- Are there isolated areas in the workplace where employees are required to work alone?
- What communication and supervision is there with workers in isolated areas?
- Does the public have access to the workplace? If yes, where?
- Are there any controls in place to monitor third party access to the workplace?
- Do any of the six major types of hazards occur in your workplace?
- Have you checked material safety data sheets and product labels?
- How long does it take for emergency services to reach the workplace?

- How long does it take to reach the nearest medical service or hospital?
- What is the current number of accidents and injuries that have occurred in your workplace?
- Has this number increased or decreased from previous years?
- What are the most frequent injuries your workers suffer?
- Are there jobs in your workplace that are more prone to injuries or to particular injuries?
- What is the maximum distance to the first aid facilities within your workplace?
- Are first aid facilities identified in a manner that workers understand?
- Do workers have ready access to first aid facilities and first aid staff?
- Are there written procedures for medical emergencies?
- Have you told relevant personnel about these emergency procedures?
- Are extra modules required for the first aid kit to cover circumstances specific to your workplace?

It is recommended that one maintains written records of this information for reviewing the first aid facilities and training needs, and if any legal issues arise about first aid in the workplace.

Nature of hazards and level of risk

Certain workplaces have greater risks of injury and illness due to the nature of the work that they undertake. For example, a library may require less first aid facilities than a factory. *There is no single first aid option that fits all workplaces.* Additional first aid facilities and services may need to be provided in the place where a workplace stores or uses toxic or corrosive chemicals, to treat specific injuries, particularly if this is specified in the relevant material safety data sheet. First aiders should also be trained in the management of industry-specific injuries and informed about the size and layout of the workplace; consider the kind of work being performed at different work areas; work out how far an injured or ill person would have to be transported for medical care and how easily this could be done.

First aid facilities and services should be located at points convenient to workers. A workplace with a large physical area may need first aid facilities and services in more than one location, especially if:

- The workplace is at a distance from the accident and emergency facilities.
- A small number of workers are spread over a wide area.
- Access to treatment is difficult.
- The workplace is on more than one building level.

The time taken for medical aid to reach an injured or ill person is more significant than the distance. Workplaces in remote areas should have additional first aid facilities and services.

Workers in the workplace

One needs to consider the number and distribution of their workers and arrangements that have been planned for them such as shift work, overtime and flexible hours. If workers work away from the workplace, the following aspects must be taken into consideration.

- Whether workers work alone or in groups?
- Whether they have any access to the telephone or an emergency radio communications?
- What kind of work are they engaged in?

Do you have more than one shift in your workplace*?*

First aid facilities and trained first aiders should be available whenever workers are working, and at an appropriate level for the number of workers on each shift. While the number of people working overtime may be fewer than that on a regular shift, the additional work hours can heighten fatigue, which can increase the risk of accidents and injuries. If your workplace is a school, museum, library or sporting venue where the public may be present, you may need to consider additional first aid services and facilities.

Known occurrences of injury and illness

One should be able to identify problem areas by reviewing the following data.

- Accidents
- Injuries
- Illness
- Near misses

Types of hazards

- Physical hazards
- Chemical hazards
- Ergonomic hazards
- Radiation hazards
- Psychological hazards
- Biological hazards

NOTE BANK

What is required?

The types of first aid facilities required in the workplace are determined by:

- The laws and regulation of the state or territory you live in;
- The type of industry you work in (industries such as mining may have specific industry regulations detailing specialised instructions);
- The type of hazards present in your workplace;
- The number of employees in your workplace;
- The number of different locations that your workplace is spread over;
- The proximity to local services (doctors, hospital, ambulance).

STEP 2 —ASSESS THE RISK

Risk is the likelihood of a hazard actually harming someone in the workplace. The list of the nature and kinds of hazards in response to the questionnaire above may be surprisingly long, with some hazards posing more safety risks than others. For this reason one must work out which of the hazards are more serious than others, and those hazards should therefore be dealt with first.

To assess the risk associated with the hazards that have been identified, ask these questions:

- What is the potential impact of the hazard?
- How severe could an injury or illness be?
- What is the worst possible damage the hazard could cause to someone's health?
- Would it require simple first aid only, or cause permanent ill health or disability or could it be fatal?
- How likely is the hazard to cause someone harm?
- Could it happen at any time or would it be a rare event?
- How frequently are workers exposed to the hazard?

STEP 3 — FIX THE PROBLEMS

After having collected information regarding the nature and kinds of hazards, and assessing the risks, they need to be fixed based on the following:

- The first aid facilities that one needs to select, provide and maintain, including the number, location and contents of first aid kits and any additional modules, and whether a first aid room or health centre is required.
- The first aid services one needs, including the number of first aiders, the training that workers need about the first aid facilities and services in their workplaces and the training that workers need to become first aiders in their workplaces.
- The policies, procedures and processes for using first aid facilities and services.

STEP 4 — EVALUATE RESULTS

Risk management is not a one-off event; it is an ongoing process. The first aid assessment questionnaire should be used as a part of the regular review to make sure that the first aid facilities and services meet the requirements of the workplace.

The following questions should be asked.

- How many people should be involved as first aid officers?
- What are the first aid skills and competencies required?
- Are more first aid kits required?
- Should first aid kits be located in different places?
- Are the first aid kits well maintained and identifiable?
- Are the first aid rooms or health centres well maintained?

5.5.2 First Aid Kits

First aid kits should be clearly marked and placed in a highly visible area. The names of the designated first aid officers should also be listed on or near the kits. The number of first aid kits in the workplace should not depend solely on the number of staff on site. This approach may not always be appropriate if the work facilities are divided and the layout of the workplace suggests this approach may not be reasonable. A first aid kit should be well stocked with dressings and bandages, disinfectants, fasteners, safety pins and other equipment such as resuscitation masks, scissors and splinter forceps. It should be ensured that the first aid kit has clear instruction leaflets or guides placed so that they can be found easily. In the

event of an emergency, it is always reassuring to have clearly written instructions and if there is someone who can read them out, it is even better.

Contents of a Basic Kit

While first aid kits should meet the specific safety needs of the workplace and vary from one workplace to the next, a basic kit might include (hypoallergenic)

- Adhesive tape (hypoallergenic)
- Antiseptic solution (single use only)
- Approved EAR (expired air resuscitation) mask (reusable or single use)
- Burn dressings
- Conforming roller bandages
- Crepe bandages
- Drinking vessel
- Elastic dressing strips
- Important information including basic first aid notes and contact details for emergency services and first aiders
- Gauze swabs
- Hygienically clean plastic bags
- Notebook and pen for recording treatment given
- Protective equipment such as disposable gloves, aprons and, where applicable, eye protection

- Safety pins
- Scissors
- Splinter forceps, tweezers
- Sterile eye pads
- Sterile saline solutions (single use only) for cleaning wounds and as an eye wash
- Triangular bandages

5.5.3 Some Basic First Aid Instructions

Resuscitation

Tilt the head right back and clear the mouth and throat. Check if the injured person is breathing with their head back. Give mouth to mouth with five quick breaths. Remember to use the resuscitation mask if you have a first aid kit nearby. Check for a pulse rate. If there is no pulse rate then begin depression of the breast bone with mouth to mouth resuscitation. Once the injured person is breathing again, turn them onto their side and check for bleeding. Seek medical advice.

Scratches and minor wounds

Clean and disinfect the wound with a disposable cleaning swab. Apply an appropriate sized dressing. Do not touch the wound or the part of the dressing that will be used on the wound, otherwise it will not be sterile.

Major wounds

You should not attempt to clean penetrative or larger wounds. Cover them with sterilised dressings and seek medical attention. Seek medical advice as to whether tetanus immunisation is needed.

Sprains and Strains

Rest the arm or leg in the most comfortable position and apply an ice pack covered in cloth to the area. The area should be compressed using roller bandages. Seek medical advice.

Burns and Scalds

Minor burns are best treated by cooling the area with cold water as quickly as possible. Blistering burns should be cooled and the injured person should be taken to a doctor or hospital as soon as possible. No attempt should be made to either clean the wound or remove any charred clothing. Chemical burns should have the clothing removed and the areas must be washed with running water for up to 20 minutes. Record the name of the chemical that caused the burn and seek medical assistance urgently.

Eye Injuries

Do not attempt to remove any foreign bodies from the eyes with match sticks or forceps. Try to flush the foreign body out of the eye with running water or a disposable eye wash. If the foreign body has not been removed then simply use a moist handkerchief on the inside of the eyelids or the white of the eye but never the coloured portion of the eye. If the injury is due to chemicals then rinse the eye out thoroughly, place an eye pad over the eye and seek medical assistance.

Summary

In this Unit, we have learnt about medical conditions such as abnormal lung functions and noise induced hearing loss and their connection with one's occupation. We were oriented to health screening techniques such as the PFT and audiography. We also learnt about first aid techniques to be adopted in the workplace. The aim of the Unit was to largely orient oneself to the kind of measures that need to be taken to prevent any workplace accident or illness from developing and the kind of immediate steps that the employer need ensure in case of an accident in the workplace.

Glossary of Terms

- ***Audiometer***: An instrument used to measure a person's hearing ability. It is an electronic device that produces acoustic stimuli of known frequency and intensity for the measurement of hearing.

- ***Cardio-pulmonary resuscitation (CPR)***: CPR is emergency first aid given to an unconscious person whose breathing and pulse cannot be detected. It helps restore blood circulation to prevent death and brain damage, using mouth-to-mouth breathing and heart muscle compression.

- ***Chronic obstructive pulmonary disease (COPD)***: COPD is a group of lung diseases involving limited airflow and varying degrees of air sac enlargement, airway inflammation, and lung tissue destruction. Emphysema and chronic bronchitis are the most common forms of COPD. Shortness of breath (dyspnoea) persisting for months to years, wheezing, decreased exercise tolerance, cough with or without phlegm, etc, are some of the common symptoms.

- ***Diagnosis***: Diagnosis (from the Greek words dia = by and gnosis = knowledge) is the process of identifying a disease by its signs, symptoms and the results of various diagnostic procedures. The conclusion reached through that process is also called a diagnosis. It is the process of taking a history and performing an examination in order to decide what is causing a particular symptom, so that the correct treatment can be chosen.

- ***Diffusion capacity****:* In biology, diffusion capacity is a measurement of the lung's ability to absorb and excrete gases, notably, oxygen and carbon dioxide. It is part of a comprehensive test series of lung function called pulmonary function testing.

- ***Expired Air Resuscitation (EAR)***: It is the method by which a rescuer breathes for a casualty who is in respiratory arrest. The common term is

"mouth-to-mouth resuscitation". It is a most effective method for sustaining life, as a rescuer breathes out sufficient oxygen to supply a casualty with the necessary requirement. There are five main methods for delivering EAR– mouth-to-mouth, mouth-to-nose, mouth-to-nose-and-mouth, mouth-to-stoma and mouth-to-mask. EAR is considered effective if the chest rises and falls with each breath given by the rescuer.

- ***Hearing protection devices***: Workers should wear a hearing protector if the noise or sound level at the workplace exceeds 85 decibels (A-weighted) or dB(A). Effective hearing protectors, if worn properly, reduce the risk of damaging your hearing. Earplugs, earmuffs, etc, are some of the hearing protection devices used. The choice of hearing protectors is a very personal one and depends on a number of factors including level of noise, comfort, and the suitability of the hearing protector for both the worker and his environment. Ear plugs are inserted to block the ear canal. They are sold as disposable products or reusable plugs. Semi-insert ear plugs are also available which consist of two ear plugs held over the ends of the ear canal by a rigid headband. Ear muffs consist of sound-attenuating material and soft ear cushions that fit around the ear and head.

- ***Hyperlipidaem***ia: Hyperlipidaemia means that there are excess levels of fats in the blood. These fats can be triglycerides, or cholesterol. It is often associated with increased risk of heart disease and strokes. There are genetic disorders that predispose to hyperlipidaemia. Hyperlipidaemia can also be caused by some medications including prednisone and others.

- ***Hyperplasia***: An abnormal increase in tissue growth caused by excessive cell division. Too much growth of cells or tissue in a specific area, such as the lining of the breast ducts or the prostate. By itself, hyperplasia is not cancerous, but when there is a lot of growth or the cells are not like normal cells, there is a greater risk of developing cancer.

- ***Hypertrophy***: It is the increase of the size of an organ. It should be distinguished from hyperplasia, which occurs due to cell division; hypertrophy occurs due to an increase in cell size rather than division. It is most commonly seen in muscle that has been actively stimulated, the most well-known method being exercise.

- ***Restrictive lung disease***: Restrictive lung disease is defined as a decrease in the total volume of air that the lungs are able to hold. Often this is due to a decrease in the elasticity or compliance of the lungs themselves or a problem in the expansion of the chest wall during inhalation.

- ***Sensorineural***: A type of hearing impairment caused by damage that occurs to the inner ear (cochlea) and or nerve of hearing. Sensorineural damage is usually irreversible.

- ***Socioacusis***: Hearing loss due to contribution from non-occupational sources.

- ***Symptoms***: Any perceptible, subjective change in the body or its functions that indicates disease or phases of disease, as reported by the patient. In simpler terms, physical signs of a disease such as cough and shortness of breath, discharge, blisters, pain, etc.

- ***Total lung capacity***: The average pair of human lungs can hold about six litres of air, but only a small amount is used during normal breathing. Different lung volumes and capacities measure the various features about the lungs. It is the total amount of air in the lungs when a person has breathed in as far as possible. This is one of the measurements obtained in pulmonary function testing. These volumes vary with the age and height of the person.

- **Ventilator:** A machine often called a respirator that is designed to assist or takeover breathing for a patient. The ventilator has many different settings or

capabilities also called modes to assist patients in the way that is most effective for them. Ventilators come equipped with noisy alarms to alert the medical staff about potential problems.

Annexure 1

Terminology and Definitions

Forced Vital Capacity (**FVC**): After the patient has taken in the deepest possible breath, this is the volume of air which can be forcibly and maximally exhaled out of the lungs until no more can be expired. FVC is usually expressed in units called litres. This PFT value is critically important in the diagnosis of obstructive and restrictive diseases.

Forced Expiratory Volume in One Second (**FEV_1**): This is the volume of air which can be forcibly exhaled from the lungs in the first second of a forced expiratory manoeuvre. It is expressed as litres. This PFT value is critically important in the diagnosis of obstructive and restrictive diseases.

FEV_1 Percent (**FEV_1%** or FEV_1/FVC ratio): This number is the ratio of FEV_1 to FVC. It indicates what percentage of the total FVC was expelled from the lungs during the first second of forced exhalation. This PFT value is critically important in the diagnosis of obstructive and restrictive diseases.

Forced Expiratory Volume in Three Seconds (**FEV_3**): This is the volume of air which can be forcibly exhaled in three seconds, measured in litres. This volume is usually fairly close to the FVC since, in the normal individual, most of the air in the lungs can be forcibly exhaled in three seconds.

FEV_3 Percent (**FEV_3%**): This number is the ratio of FEV_3 to FVC. It indicates what percentage of the total FVC was expelled during the first three seconds of forced exhalation.

Forced Expiratory Flow (**FEF**): Is a measure of how much air can be expired from the lungs. It is a flow rate measurement. It is measured as litres/second or litres/minute. The FVC expiratory curve is divided into quartiles and therefore there is a FEF that exists for each quartile. The quartiles are expressed as $FEF_{25\%}$, $FEF_{50\%}$, and $FEF_{75\%}$ of FVC.

$FEF_{25\%}$: This measurement describes the amount of air that was forcibly expelled in the first 25% of the total forced vital capacity test.

$FEF_{50\%}$: This measurement describes the amount of air expelled from the lungs during the first half (50%) of the forced vital capacity test. This test is useful when looking for obstructive disease. The amount of air that will have been expired in an obstructed patient is smaller than that measured in a normal patient.

$FEF_{25\%-75\%}$: This measurement describes the amount of air expelled from the lungs during the middle half of the forced vital capacity test. Many physicians like to look at this value because it is an indicator of obstructive disease.

Maximal Voluntary Ventilation (**MVV**): This value is determined by having the patient breathe in and out as rapidly and fully as possible for 12 to 15 seconds. The total volume of air moved during the test can be expressed as litres/second or litres/minute. This test parameter reflects the status of the respiratory muscles, compliance of the thorax-lung complex, and airway resistance. Surgeons like this test value because it is a quick and easy way to assess the strength of the patient's pulmonary musculature prior to surgery. A poor performance on this test suggests that the patient may have pulmonary problems post-operatively due to muscle weakness. MVV can therefore be viewed as a measure of respiratory muscle strength. One major cautionary note is that this test is effort-dependant and therefore can be a poor predictor of true pulmonary strength and compliance.

Peak Expiratory Flow Rate (**PEFR**): This is maximum flow rate achieved by the patient during the forced vital capacity (FVC) manoeuvre beginning after full

inspiration and starting and ending with maximal expiration. It can either be measured in litres/second or litres/minute. This is a useful measure to see if the treatment is improving obstructive diseases like broncho-constriction secondary to asthma.

Recommended Readings

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