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Planning and Designing of Sports Med Lab

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Abstract

Health as we define is the cumulative result of mental, physical, social, economic and spiritual well being: not merely the absence of disease or infirmity. But as we move ahead in the chronology of diseases, the infections fade off, the spate of non-communicable diseases is on rise. Similar change is seen in the fabric of management of the ailments- shift from biomedical approach to biopsychosocial approach.

This piece of research searches for ways to redefine the way we aim to solve the pain management jigsaw. Sports medicine lab will be a revolutionary step in management of injuries. From traditional method of immobilization of the injured part to selective mobilization of group of muscles, the specialist technicians now aim to improve the status of the patient before time. This intervention not only helps the patient and relatives see a healthier and better transformation but also improved stress levels and better cognitive functions. The planning and designing of Sports medicine Lab will prove to be a guiding path to many in the fraternity.

Introduction

As the types of injuries progress, the management has continuously evolved. The evolution of injuries has brought to fore the genre of sports medicine specialists. The sensitivity to potential risk factors for injury, importance of proper training and conditioning as well as effective specialists along with empowered clientele forms an important part of the whole gamut for preventing injuries [1].

The biomedical approach to injuries is gradually shifting to the biopsychosocial approach based on cognitive behavioral interventions for not only solving a problem but regain the lost aptitude and caliber [2].

Biomedical Approach	*Biopsychosocial Approach*
Pain- Cause Effect Relation	Behavioral approach
Pharmacology	Social mix
	Psychological issues
	Lifestyle
	Patient Empowerment
	Self-Management

Table 1: Approaches to an Injury.

The biopsychosocial approach also called Solution Finding Approach not only treats the local injury but deals with the psychosis of the impairment, fear factor related to normal range of movements and the impending risk of further complicating the severity of injury.

Patient education forms an extremely important part of health promotion. Primary prevention of injuries entails the process of frequent discovery of deficiencies and deficits in strength, flexibility and stability. The detection of minor injuries that require further treatment for further prevention in two major injuries may be called secondary prevention. At times significant injuries are uncovered that require additional treatment and rehabilitation to prevent chronic and / or debilitating injuries is called as tertiary prevention. Sports medicine professionals additionally have training and expertise in issues pertaining to nutrition strength and conditioning which when combined to the knowledge of musculoskeletal medicine makes these professionals effective counselors and educators for prevention of injuries [1]. Sports medicine is that area which creates an environment so that an athlete converts all his genetic potentialities into phenotypic realities [3].

This approach recognises that it is not just physiological treatment that happens in the treatment room. A sports medicine professional, such as a physiotherapist, for example might take the sociological cause of an injury (e.g. an overuse injury caused by a 'no pain no gain' culture), the physical consequences of that injury (e.g. restricted movement) and the psychological impact of the injury (e.g. anxiety and frustration) into account when developing a treatment programme.

Figure 1: Aspects to an Injury.

While sports medicine remains a well understood subject in US & UK, it is not so in India. The absence of teaching hosp and requisite manpower the field lacked for quite some time. Sports medicine, also known as sport and exercise medicine, is a branch of medicine that deals with physical fitness and the treatment and prevention of injuries related to sports and exercise. Essentially, sports medicine contains an array of specialities that include orthopaedics, physiotherapy, trainers, nutrition, biomechanics, training methods, rehabilitation and even psychologists. During 2008, considering to the long felt need of the nation, the Ministry of Health and Family Welfare, Government of India decided to upgrade and upscale these facilities and establish a modern Sports Injury Centre under the aegis of the Safdarjung Hospital considering that Sports are becoming more and more intense and competitive and thus, the nature of Sports Injuries and Joint Disorders becoming more complex requiring management of such injuries with special skill and latest technology/expertise. Sports Injury Centre (SIC) at Safdarjung Hospital has been established with an objective of providing comprehensive surgical, rehabilitative and diagnostic services under one roof for specialized treatment of Sports and Joint Disorders [5].

Benefits of Sports Medicine can be summarized as-

a) Benefits on the metabolism.
b) Increase the consumption of fats.
c) Increases oxygen utilization capacity.
d) Reduces cardiac work.
e) Improves glucose tolerance.
f) It generates a loss of weight.
g) Strengthens the structure of bones.
h) It favors the treatment of diabetes.
i) Collaborate in the maintenance of a full sexual life.
j) Benefits on the heart.
k) Increases circulation in the muscles.
l) It reduces the formation of clots within the arteries.
m) Reduces blood pressure.
n) Benefits on the person from a psychological point of view.
o) Increase self-esteem.
p) It reduces stress.
q) Decreases anxiety, anguish and depression.

Historical Perspective

Sports and medicine considered along with moderation in “the six things non natural” were considered important in healing [6].

The focus turned to individual perspective in medieval Renaissance literature which later took shape in the physical education. Physicians taking anthropometric measurements and teaching exercises slowly gave in to the occupational therapists to improve the performance of patients. Exercise physiology moved out of the academic shelves to sports arena. Lack of exercise and lifestyle has turned into a major brunt which further prompted other high profile specialties of Cardiology, Neurology and Rehabilitative medicine to romp back home the exercise philosophy for health promotion of patients and clients.

Rehabilitation

The World Health Organisation defined rehabilitation as a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environments [7].

Anybody may need rehabilitation at some point in their lives, following an injury, surgery, disease or illness, or because their functioning has declined with age.

Figure 2: Medical theory of Galen.

Some examples of rehabilitation include:

- Exercises to improve a person's speech, language and communication after a brain injury.
- Modifying an older person's home environment to improve their safety and independence at home and to reduce their risk of falls.
- Exercise training and education on healthy living for a person with a heart disease.
- Making, fitting and educating an individual to use a prosthesis after a leg amputation.
- Positioning and splinting techniques to assist with skin healing, reduce swelling, and to regain movement after burn surgery.
- Prescribing medicine to reduce muscle stiffness for a child with cerebral palsy.
- Psychological support for a person with depression.
- Training in the use of a white cane, for a person with vision loss.

Benfits of Rehabilitation

Multipronged benefits would result from concerted efforts for rehabilitation of patients irrespective of their psychological and physiological status.

Rehabilitation 2030 initiative was started by WHO in February 2017 to promote efforts at multiple levels to bring up the health levels of the global population. Development of competencies planned in specific domains -

P - Practice.
PM - Professionalism.
LD - Learning & development.
ML - Management & leadership.
R - Research.

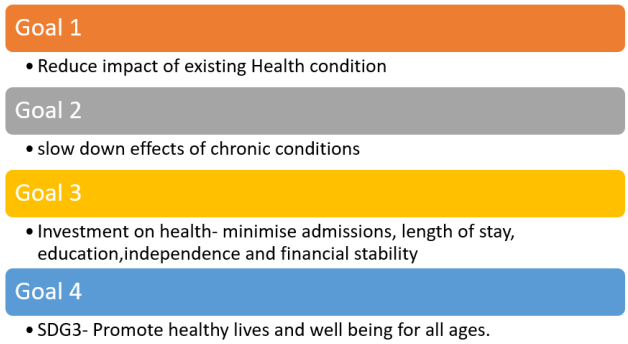

Table 2: Modes of oxygen delivery.

AIM

To plan and design a sports medicine lab.

Objectives

(a) To prepare a planning premises for a sports medicine lab.
(b) To suggest elements of appropriate Healing architecture.
(c) To plan the equipment load based on the facilities in the lab.

Methodology

Descriptive study.

Place of Study - Pune.

Data collected from sports medicine specialists in AFMS, National and International Consultants, Army Sports Institute and Dept of Sports Medicine (AFMC).

Dr Ameya Kegalli (physician to Paralympics team, India).

Mr. Siddharth Hans (GaitOn Ltd).

Designing of Sports Medicine Lab

The design and set up of the Sports medicine lab may follow the following units-

1. Inpatient ward.
2. Recreation rooms- Audiovisual aids, 3D/ 5D simulation halls, conference rooms.
3. Office set up, administrative areas.
4. Clinical side room, patient examination cubicles.
5. Janitor closet and rest rooms.
6. Physiotherapy centre. ADL training set, Running gait analysis, Posture analysis, Plantar pressure analysis, FMS Screening tools, Y Balance testing / Star Excursion testing, VO2 Max Testings and Alter-G treadmill with Reaction timing testing.
7. Gymnasium, Swimming pool, Jaccuzi, Spa and other facilities.
8. Miscellaneous - pet shop, gift shop, shopping centre, florist, social worker, legal help counter, psychological counsellor and allied.

Siting of the Lab

1. Colocation to Hospital / Stand alone.
2. Co-located Specialist OPDs or referral mechanism for the specific branches to facilitate patients - Surgery, Neurosurgery, Orthopaedics, Gynaecology and Paediatrics, Medical-Cardiology, Respiratory, Neurology, ENT and Ophthalmology.
3. Parking - Earmarked 7m x 5m for every parking keeping in mind specially abled clientele Access from parking to registration area and futher.
4. Stairs and lifts- As per specifications dictated by disabled friendly guidelines.
5. Design Specifications - Designing of healthcare facilities should be based on the principle of Form following Function. Traditionally, visual satisfaction has predominated the type of finishings. Recent research has brought about a concept of multi sensory perception of mind to environment involving sound, proprioception (touch), kinesthesis, vestibular perception, smell and at times taste to bring about an improved cognitive feedback which helps in early improvement in symptoms and disease [8].

Inpatient ward
Mixed pattern of Nightingale and Ritz
Physiotherapy Centre

Following list of items can be a part of the physiotherapy centre -

- Furnishings.
- Mirrors and Privacy Screens.
- Basic Supplies.
- Exercise Machines.
- Continuous Passive Motion Machines.
- Decompression and Traction Tables.
- Skeletal and Anatomical Models.
- Spilt Pans and Sheets.
- Biofeedback Machines.
- Cold Therapy Units.
- Electrotherapy Devices.
- Ultrasound Imaging and Therapy Machines.
- Diathermy Machine.
- Hydrotherapy: Whirlpool and Hydrolift.
- Hydrocollator and Thermalator.
- Ice machine and chilling unit for cold packs.
- Laser Therapy: Dynatron Solaris.

Furniture

Additional options like parallel bars, stand-in tables, and bariatric-specific equipment will vary depending on practitioners' area of expertise along with the specific needs of their current or future patients.

- Exam Tables.
- Parallel Bars.
- Mat platforms.
- Rolling Stools.
- Massage Tables.
- Storage carts and cabinets.

- Stand-in Tables.
- Reception Furniture.

Specialized Carts and Cabinets

Along with essential furniture, specialized carts and cabinets allow for the proper use and storage of supplies and expensive medical equipment. Spending thousands on state-of-the-art devices only to neglect proper maintenance and storage turns a smart investment into a poor one.

The needs and dimensions of each office will vary and largely determine the most efficient and effective use of space and resources.

Mirrors and Privacy Screens

While every practice may wish they had unlimited space and resources, most of the time that is unfortunately not the case. Many smaller treatment centers rely on mirrors and privacy screens to segment single rooms into different, private areas allowing multiple specialists to work more efficiently in a smaller area.

Mirrors are also vital for exercise therapy in providing recovering patients with visual feedback and should be a part of any therapy gym setup.

Basic Supplies: Scale, Goniometer, Tape Measure, Braces

Outfitting your office with basic supplies is more of a requirement than an option. Scales, goniometers, and tape measures provide an accurate ability to measure initial patient weight as well as track progress over time in the case of long-term treatment. Braces, wraps, and other support devices make up the foundation of any therapy center.

Additional necessities like computers are obvious, but picking the correct software for your practice can either make or break you.

Decompression and Traction Tables

Spinal decompression is an FDA-approved option that can provide an effective alternative to surgery for patients suffering with debilitating back pain. For this reason many clinics find it easy to market the benefits of the machine—generating a return on initial investment quickly.

Non-surgical decompression works by stretching the spine within a safe range of motion. This can help to alter and relieve painful and uncomfortable compression most often associated with herniated and bulging disks. As pressure is relieved these bulging disks can begin to retract, taking pressure off of surrounding areas and delivering an increased flow of nutrient-dense fluids and oxygen-rich blood to hurt discs.

While it may have been popularized for its use with herniated discs, physicians have found success using them for a range of conditions and symptoms.

- Back Pain.
- Neck Pain.
- Sciatica.
- Bulging and herniated disks.
- Spinal nerve issues.
- Spinal overuse injuries (worn joints: posterior facet syndrome).

The machine works by gently pulling against two harnesses: one that attaches at the pelvis and another attached to the torso. Treatment generally last for 30-45 minutes and patients may require a total of twenty to thirty visits which should be spaced out relatively

close within a five to seven week period.

Physical Therapy Clinic Exercise Equipment for Strength and Balance

Regaining strength and balance is a critical part of any therapy program, and while calisthenics are used often in rehabilitation, many times machines are the only option.

Upright and Recumbent Bikes

Stationary bikes effectively strengthen the lower body and core without placing a large amount of stress on lower-body joints, like in running.

Not all bikes are created the same. Recumbent bikes have a reclined, larger seat and peddles that are placed in front of the body. This can allow even patients with back pain to capitalize on the benefits of an exercise bike.

Alternatively, an upright bike has a smaller seat with peddles placed underneath the body allowing for a more natural riding position that mimics a real bicycle. Because of this, more muscles are engaged; the muscles of the abdomen, shoulders, and arms work to stabilize and support the upper body. Finally, an upright bike is smaller and therefore will take up less space in your facility.

Standing Elliptical

The elliptical trainer is a non-impact machine that stimulates the sensation and involved muscles of walking and running. Almost all have handles or poles attached to the feet to provide support and assistance.

The largest appeal is the lack of impact. Many lower-body rehabilitation programs require the reintroduction of lower-body running and the elliptical is often the preferred solution. On top of the lack of impacting forces found in running on a treadmill, it provides complete control of intensity. In early stages of recovery, range of motion may be limited—the exact stride and speed can be tailored for each patient.

Rehab Treadmill

A treadmill is the staple of any clinic gym and is an essential aspect of many lower-body rehabilitation plans. While average fitness treadmills may be okay for general exercise, they are often too narrow or limited in scope to safely and effectively use in the case of recovering patients.

Additionally, options such as the AlterG treadmill open up an entirely new range of possibilities. Pioneered by a NASA biomechanics specialist in the 1990s, it was originally designed to help astronauts train by increasing the pressure to their lower body. While it never became adopted for space-station use, the original design was used to do the opposite—allow users to walk and even run while decreasing their weight by up to 80% without the use of a restricting harness or yoke.

This new application has since become widely-adopted in not only clinics but athletic training centers as well.

Unweighing System

In some cases an AlterG treadmill may be out of budget or inappropriate due to special considerations for the ankles, knees, and hips where manual manipulation and facilitation of lower-body movement is required. If direct contact with these areas is needed, an unweighing system is the only option.

Just like its NASA counterpart, an unweighing system helps to relieve pressure off of the lower body—except with the use of a harness. These special harnesses adjust and adapt to allow for natural pelvic function and gait.

Additional software can also be used to provide concurrent visual and audio feedback to individuals as they perform rehabilitation modalities.

Training Stairs

The strength and mobility to use stairs is an essential part of daily life, but patients recovering from injury may not be able to do so safely yet—that is where your job as a therapist begins.

By including training stairs along with a holistic treatment plan, you can help your patients to regaining necessary function in their lower body. More importantly, you are able to do so in a safe and controlled environment; many options provide additional railings and support.

SciFit Upper-Body Exerciser

While upper-body exercisers are a critical component in the rehabilitation of shoulder injuries, they also provide an effective fitness option tailored towards strengthening the upper body and improving cardiovascular fitness. In individuals recovering from a lower-extremity injury or who cannot perform traditional exercise, it provides a safe fitness opportunity for patients otherwise lacking the ability.

For this reason some clinics may offer a monthly gym membership for these individuals as an accessory treatment offering.

Cable Columns and Pulley System

Cable systems provide endless exercise opportunities. With the right attachments, almost every area of the body can be targeted. For this reason, it receives a high score in the versatility department and should be placed high on your list when making purchasing decisions for your treatment center.

Power Plate

A power plate is an innovative pulsating device that creates an unstable platform, enhancing muscular coordination, balance, and strength. While muscles normally contract only once or twice a second, the power plate's vibrations require them to contract at a much higher rate: thirty to fifty times every second. Many clinics include use of the power plate in prevention packages for sports athletes or offer individual half-hour sessions.

Power Rack and Weight Bench

Power racks are arguably the ultimate tool for building strength. Coupled with a weight bench, they provide the ultimate strength training experience so that virtually any exercise can be completed. Along with a cable machine, their versatility is high. A weight bench is a nice addition that opens up the possibility for upper-body strengthening exercises.

Smith Machine

Invented by the "Godfather of Fitness" Jack LaLanne, A smith machine is an adapted form of the power rack that includes a railing system for the barbell to glide on.

It takes away the need to stabilize the bar to allow for an easier lifting experience and the ability to better target specific muscles. Vertical posts along the machine allow for a range of different exercises to be completed.

Accessory Muscle Group Machines

When it comes to outfitting a complete therapy gym, the range of options are endless. And when you add muscle-group-specific machines into the mix the possibilities only expand further.

Larger facilities will often have many machines, but even smaller offices may wish to include select machines to target the legs or upper body.

Rebounders: Round and Square

It can be used as a trampoline, but also as a return surface for exercise balls. This creates a large amount of possibilities.

- Helping patients with ankle injuries restore balance and stability.
- Improving core strength in patients with groin conditions through one-legged rebound exercises that require full-body stabilization.
- Providing overweight or bariatric patients a feasible option to begin exercise.

Plyometric Sleds

Plyometric sleds are a highly-versatile piece of equipment for clinics that is perfect for strength, conditioning, and rehabilitation. By providing varied levels of resistance in a closed chain exercise, they are often used when reintroducing explosive movements for athletes. Gradually increasing aggressiveness over time can help ease and prepare for return to sport.

Recumbent Squat System

While many of the machines discussed so far double as general exercise equipment, the recumbent squat machine is also a closed-chain system that was designed specifically for patients with knee and lumbar spine injuries. Those rehabilitating from ACL, PCL, and patellofemoral injuries find them to be a godsend.

Their beauty comes in their ability to replicate squat mechanics in the supine position. This unique motion decreases the hip flexion and provides constant lumbar support. Ultimately, this reduces knee shear and forces on the patellar tendon.

If your clinic specializes in the treatment of athletes or knee injuries, this machine is a must.

Thera-Band Rehab and Wellness Station

If space is limited, or concerns for budget are high on the list of priorities, the Thera-Band Rehab and Wellness Station becomes is the perfect solution. Providing a total rehabilitation experience in a compact wall-mounted system, the device can be used to strengthen both upper and lower body extremities through varied physical therapy exercises.

While quality is often thrown out in the case of quantity, that isn't the case with Thera-Band. Their complete station setup focuses on an integrated approach without the need for additional expensive devices and machines.

Shuttle Balance

Popularized for their use in ACL and total knee rehabilitation, they have also caught on for use in treatment of a number of additional conditions and injuries.

- Shoulder stabilization during rotator cuff injuries and.
- Core stabilization during phases of lower-body rehabilitation.
- Patients with spinal conditions.

Multi speciality Staff to co-ordinate -

- Physicians: diagnosing the underlying pathology and impairments, medical assessment and treatment, setting-up treatment and rehabilitation plan, prescription of pharmacological and non-pharmacological treatments and assessment of response to these.
- Rehabilitation nurses: addressing and monitoring day-to-day care needs. Expertise in the management of tissue viability and

continence problems. Providing emotional support to patients and their families.

- Physiotherapists: detailed assessment of posture and movement problems, administering physical treatments including exercise to restore movement and alleviate pain, etc.
- Occupational therapists: assessing the impact of physical or cognitive problems on activities of daily living, return to work, education and/or leisure activities, etc. Providing expertise on strategies that can be used by the patient and his/her family and environmental adaptations to facilitate independence.
- Speech and language therapists: assessing and treating communication and swallowing disorders. • Clinical psychologists: detailed assessment of cognitive, perceptual and emotional/behavioural problems. Development of strategies to manage these with the patient, his/her family and with other health professionals.
- Social workers: promoting participation, community reintegration and social support.
- Prosthetists, orthotists and rehabilitation engineers: expertise in the provision of technologies ranging from splints and artificial limbs to environmental controls to address functional limitations, for example, following limb loss, loss of independent mobility, loss of ability to communicate.
- Dieticians: assessing and promoting adequate nutrition.

Example

Sports Medicine centre of Mayo Clinic.

22,000-square-foot center to meet growing demands for its sports-related injury and rehabilitation expertise.

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