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Mini Review

Advanced Rehabilitation Engineering Devices

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Abstract

Advances in technology are going on day by day. New devices are also being developed for applications in rehabilitation for better health care. The developments in technologies and materials are described here for rehabilitation engineering uses. Future developments of these devices are given here with specific materials.

Keywords: *Rehabilitation Engineering; Health Care*

Introduction

The rehabilitation engineering is defined as the systematic application of different engineering sciences for the design and development of engineering solutions for solving disabilities, particularly in rehabilitation. Apart from this, other options of adaptation, testing and evaluation of devices and materials for the techniques and measurements are given.

The major problems can be spinal cord injury, brain trauma, or any other debilitating injury or disease such as multiple sclerosis, Parkinson's disease etc.

The areas for functional systems of rehabilitation engineering are communication, mobility, cognition, hearing, vision and workings of employment, independent living, education, and living in the society [1].

Rehabilitation engineering and assistive technology

Role of rehabilitation for rehabilitation engineering and assistive technology, clearly defines separately for a rehabilitation engineer as well as for a rehabilitation technician, assistive technologist, and rehabilitation technologist on their website [2,3].

Mostly, the examples of rehabilitation technology as referred to assistive technology, are wheel movement, seating, communication, environmental control, computer use, home and worksite positions. The device development is used mechanical to mechatronics and software.

New technologies

The new technologies for rehabilitation are summarised in figure 1 as follows.

Figure 1: *Trends in rehabilitation technology.*

The range of the rehabilitation technologies range from augmented and virtual reality to telerehabilitation and advanced wearables for remote therapies. Also, rehabilitation robotics, personalized pre-rehab therapy, photo- and electro-therapies are used for faster therapy [1].

Assistive devices: Community-based rehabilitation

In community based rehabilitation, there are assistive devices, which are mainly walking sticks, crutches, walking frames, standing frames and basic seating systems [4].

Innovative rehabilitation technologies

The cutting edge rehabilitation technologies are useful in improving the function after injury or illness, like spinal cord injury [5,6].

Brain injury rehabilitation is shown in figure 2.

Smart portable rehabilitation devices

A smart portable device is an orthotic device to support or supplement weakened or abnormal joints or limbs [7].

Supportive devices

In the mechanical rehabilitation process, devices such as walking aids like wheelchair, are used for people with disabilities for going to society functions, commerce, and recreation, etc. for good posture and independent mobility. Electrically powered wheelchairs and active user (lightweight) manual wheelchairs are also used for the purpose.

A neutrally controlled wheelchair has been invented for patients suffering from locked-in-Syndrome, by using neural signals to command the wheelchair [8,9].

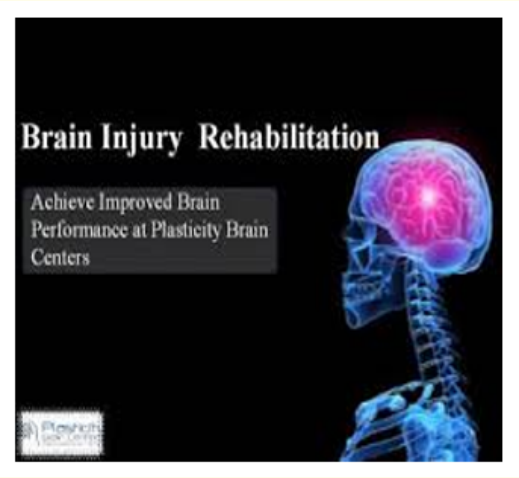


Figure 2: *Brain injury rehabilitation.*

Ongoing research

At different centres Rehabilitation Engineering Research Centers, research is going on in the rehabilitation engineering, with general area or aspect of disability [9], say for the blind and visually impaired [10].

Development of rehabilitation devices for children is very important, for testing healthy and disabled children [11].

The robotic system for rehabilitation of sprained ankles, gives a new device working on a parallel mechanism with a central strut.

A hand robotic rehabilitation is also being developed with laboratory experiments.

A new rehabilitation device for hand rehabilitation has been developed where the mechanical power generator is not on the hand to reduce the weight of the device [11].

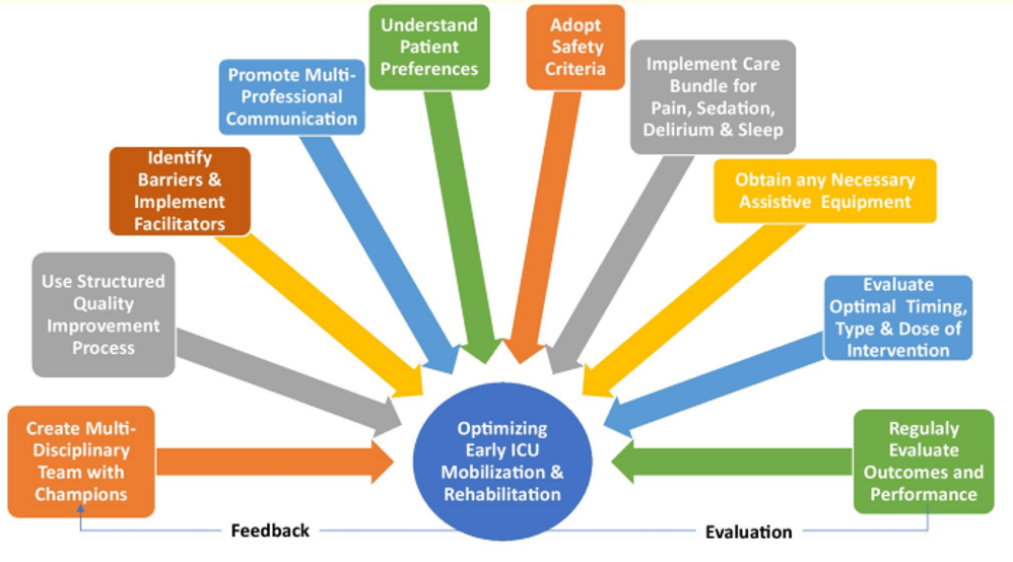
Also, a new multi-layered compliant system is used to incorporate the compliant mechanism into a robotic hand rehabilitation device.

Research has been done on devices for stroke rehabilitation. effectively, for better healthcare, by using robotics systems [12].

Conclusion

The impact of devices for use in rehabilitation engineering has been given, with future possibilities in the field. The techniques and measurements used have been highlighted. Details of advanced technologies for rehabilitation of disabilities of patients are given. New technology devices for stroke rehabilitation have been explained. A hand exoskeleton device for rehabilitation, sprained ankle physiotherapy by robotic system and smart portable rehabilitation devices have been described.

The rehabilitation engineering devices, with new technology, would assist in better health care in future.



Figure

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