



## Leadership in rehabilitation

# Acquisition of Armeo Power: Robotic system for upper limb activation



### About Loewenstein Hospital

Loewenstein Hospital, part of the Clalit Group, is the largest independent rehabilitation hospital in Israel and one of the most prominent rehabilitation centers in the world, with a tradition of over 50 years in extending life and improving its quality for more than 100,000 patients. The hospital has been recognized by the Scientific Council of the Israel Medical Association for the purposes of specialization in physical medicine and rehabilitation, and it serves as a training platform for students in all nursing and paramedical professions, such as physical therapy, occupational therapy, communication therapy, social work, and psychology. Loewenstein Hospital employs the largest number of physicians specializing in rehabilitation medicine in Israel. Loewenstein experts – physicians, nurses, and medical staff in all health professions – bring to their work a rich experience and unique skills and knowledge in all areas of rehabilitation.

### Exercising the upper limbs - Target population and treatment

Difficulties in using the upper limbs and inability to move them appear in patients with damage to the nervous system. This can happen as a result of a spinal cord injury, stroke, or brain injury. It is also common in patients treated for upper limb fractures as a result of car accidents, work accidents, accidents at home, etc. Performing upper limb functions is vital in activities of daily living, such as dressing and bathing, as well as in the realm of work and leisure, computer work, driving, and so on. The occupational therapy service is the body that deals with these problems, with a general objective of providing the patients with tools and skills that will enable them to cope with life demands, ranging from basic daily activities to work, study, and use of various technologies. The occupational therapy service at Loewenstein Hospital enjoys an excellent reputation in Israel and worldwide for physical rehabilitation, and it is recognized especially for developing tools for the

cognitive assessment of patients with brain damage, and for the assessment of daily activities after spinal cord injuries. The occupational therapy service of the hospital is affiliated with the Tel-Aviv University and serves as a clinical training center for occupational therapy students from all universities in the country. The treatment of upper limbs currently provided by occupational therapists at Loewenstein Hospital includes, among others, manual therapy, where the therapist physically supports the patient's upper limb, and together with the patient practices its motion, according to patient's ability and condition. The treatment is based on multiple repetitions of various movements, and contributes to increasing the range of motion of the limb joints. The addition of the Armeo Power robotic system to the therapeutic resources of the hospital will upgrade the quality of care for patients requiring treatment related to the functioning of upper limbs.

## Leadership in rehabilitation: Acquisition of Armeo Power Robotic system for upper limb activation

### The Armeo Power system and its benefits

The Armeo Power system is an innovative robotic system in the field of upper limb rehabilitation. It consists of two main parts:

- The device to which the robotic arm is connected.
- A computer station with a monitor, attached to the robotic arm, hosting the exercise and game software.

Treatment is performed with the patient sitting in front of a computer monitor, with the arm attached by straps to the robotic arm. The robotic arm communicates with the computer through a wireless connection, so that in the process of movement the patient can perform the tasks built into the software, including various games that appear on the computer screen. Depending on the patient's condition, the therapist chooses the training program that is stored in the computer, the range of motion of the arm joints (shoulder, elbow, hand), the direction of movement appropriate for the patient, the game that is suitable for the patient to play, and the degree to which the robotic arm is to activate the hand in the course of the game. There are three levels of operation:

- **Active operation** – in this mode the patient's hand is merely borne by the robotic arm, but not operated by it. All motion activity is performed by the patient.
- **Partial activation** – the patient's hand is borne by the robotic arm and is also assisted by it in performing the movement, with the degree of assistance defined in the computer by the therapist, depending on the condition and capabilities of the patient.
- **Passive operation** – in this mode, all hand movement is performed by the robot alone, without any assistance on the part of the patient. The motion of the hand attached to the robotic arm is designed to maintain joint range and strengthen the image of movement in the patient's brain.

### This unique system allows:

- **Motor learning** – the connection between the mobility of the hand assisted by robot, the tasks defined in the computer game (such as moving a ball, piercing balloons), and viewing the computer screen contributes to the learning of motor skills. In the course of learning the patient achieves renewed control over the execution of body movements by training and activation of the upper limb.
- **Increase in the number of repetitions of exercises** – upper limb movement therapy is currently provided by the occupational therapist manually. Phenomena such as fatigue and physical burnout from the effort, which might afflict the occupational therapist during treatment, are not relevant to the robotic system. Thanks to the advantages of the system, it is possible to increase the number of repetitions of the exercise, naturally depending on the patient's condition.
- **Increased interest and motivation** – computer games are of interest to patients, increase the motivation to participate in the treatment and to persevere, helping increase the number of repetitions of exercises.
- **Patient control over movement practice** – difficulty moving the upper limbs creates in the patients a hard feeling of lack of control over their body. The transition from passive operation to even partial operation may contribute to a sense of control over the situation and result in a sense of satisfaction.
- **Monitoring patient progress** – entering patient data into the computerized system allows monitoring patient progress in a controlled manner, and changing the treatment based on the patient's condition.
- **Efficient personnel allocation** – with the help of the robotic system, patients can perform the exercises that require multiple repetitions by themselves, without involving the therapist. The therapist is therefore able to devote this time to promote other aspects of the patient's treatment.

## Requested contribution

Loewenstein Hospital would like to make the Armeo Power robotic system available to its patients because of its importance and uniqueness. This acquisition will upgrade the quality of care significantly. It will enable the hospital to offer patients higher quality care, making better use of the most advanced technologies available today in rehabilitation medicine. With the means that the public system puts at the disposal of the hospital, it is currently impossible to purchase the system. Therefore, we need a contribution of **USD 340,000**. For a donation that exceeds half the above cost, a sign with the donor's name will be displayed on the device. We are grateful for contributions covering any portion of this amount, and we appreciate your willingness to assist us in acquiring this advanced system.

