# HUR Medical Concepts

HUR
For Lifelong Strength

# HUR Medical Concepts

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# HUR Medical Concepts

For preventive exercise, disease management and rehabilitation

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## *General overview*

The HUR Medical Concepts, combined with HUR solutions and products, help professionals to provide the best practice of exercise as medicine based on the latest international treatment guidelines with the help of HUR solutions and products. The concepts presented here are based on research findings from all over the world. In addition, our 30-year experience and knowledge gained through feedback and cooperation with research institutes, professionals, and different organizations within relevant fields have contributed towards the HUR Medical Concepts.

HUR Medical Concepts process


**HUR MEDICAL CONCEPTS**

### FALLS PREVENTION

Provides information on falls and a method for preventing falls.

### HYPERTENSION

Is designed to be used in strength training as a therapeutic modality in treatment of elevated blood pressure (BP).

### TYPE 2 DIABETES

The HUR type 2 diabetes (T2D) concept is designed to be used in strength training as a therapeutic modality in treatment of type 2 diabetes.

### CARDIAC REHABILITATION

Helps the rehabilitation professionals to provide the best practice of exercise as medicine based on the latest international treatment guidelines.

### HIP & KNEE REHABILITATION

The effectiveness of exercise in hip and knee disorders improve muscle function, preventing abnormal movement and restore normal biomechanics of hip and knee.


# Introduction

Falls are a common and often shocking problem among older persons, causing a considerable amount of morbidity, mortality, and use of health care services including premature nursing home admissions. In addition, falls are frightening experiences and can cause individuals to lose confidence in their ability to function safely, which, in turn, can lead to loss of independence.

**The HUR falls prevention concept integrates science-based research findings with the experience and knwoledge gained through 30 years of working with the aged.**

The HUR falls prevention concept helps the health care and rehabilitation professionals to provide the best practice of exercise as medicine based on the latest international preventive and treatment guidelines.

The primary objective of the HUR Falls prevention concept is to help people to reach and maintain a level of physical functioning at which falls can be prevented altogether, or, should a person slip, trip or otherwise begin to fall, balance can be regained.

# Contents

## *Falls prevention concept: Background and Overview*

In persones over 65 years of age, approximately 30% of community-dwelling adults fall each year. Falls in care facilities and hospitals are common events that cause considerable morbidity and mortality for older adults. In addition, falls constitute a significant social and economic burden to individuals, their families, community health services, and the economy.

As the proportion of older adults continues to increase globally, the financial costs associated with falls will increase worldwide. Therefore, prevention of falls is an urgent public health challenge. National health service providers and international guidelines are promoting the implementation of appropriately designed intervention programs that are known to prevent falls in older adults.

Accidents and environment-related reasons are the most commonly recognized causes leading to falls. Most of such falls are associated with one or more identifiable risk factors, e.g muscular weakness, gait or balance disorders, confusion, postural hypotension, visual disorders, and certain medications. A Large body of research has shown that attention to these risk factors can significantly reduce rates of falling.

There is strong scientific evidence that appropriately designed exercise training can prevent falls in older people. Exercise interventions has been shown to reduce the rate of falls (number of falls per person) and the risk of falling (proportion of people having one or more falls) in community-dwelling older people.

Furthermore, exercise as a single intervention has a falls prevention effect comparable to that of multi-factorial programs which suggests that implementation of exercise as a stand-alone intervention may be the optimal and potentially the most cost-effective-approach to falls prevention at a population level.

Promising results using exercise as a single intervention have been observed in subjects with Parkinson's disease and cognitive impairment, but using exercise as a single intervention in other clinical groups and aged care facility residents may require further studies.

The HUR falls prevention concept helps the health care and rehabilitation professionals to provide the best practice of exercise as medicine based on the latest international preventive and treatment guidelines, to help people to engage in regular weekly physical activitiy and to follow an exercise training regimen.

## *The role of balance and strength training in falls prevention*

A range of exercise modalities have been studied with the objective of preventing falls, including balance exercises, strength training, flexibility, tai chi, and endurance training. These can be used as individual or group exercises in isolation or in combination.

A large body of evidence supports the recommendation that balance, strength, gait, and coordination training is effective in reducing falls, and therefore it should be included as part of a multi-component intervention to prevent falls in older persons and may be considered as a single intervention. In most scientific trials, the exercise program has been longer than 12 weeks (1–3 times per week) with variable intensity.

According to the latest meta-analysis, overall exercise reduces fall rates in community-dwelling older people by 21%. Greater fall prevention effects (rate reductions of 39%) are seen from exercise programs that challenge balance and involve 3 or more hours of weekly exercise.

In addition to increased muscle strength in older adults, strength training offers numerous other advantages as well. It has clearly shown improvements in balance, functional mobility, stability limits, quality of life, and fall prevention. Strength training can attenuate age-related changes in muscle function and improve activities of daily living, such as walking endurance, gait speed, and stair climbing.

Muscle mass decreases by approximately 2% every year after the age of 50. In an analogous manner, there is a decrease of approximately 15% decrease in muscle strength every 10 years after the age of 50. However, strength training can mitigate the loss of muscle mass and muscle strength. To attenuate the effects of sarcopenia, it has been recommended that older adults perform strength training 2 to 3 times per week.

## *Outcome measures*

To gather information on the baseline status and effectiveness of exercise training, each patient is evaluated individually. A multi-factorial fall risk assessment is carried out for all older adults who have recently had a fall or who have gait and balance problems. A multi-factorial falls risk assessment should also be undertaken with individuals who simply report difficulties with gait or balance.

The recommendations for more detailed assessment include examination of the feet and footwear, functional assessment (assessment of activity of daily living skills, including use of adaptive equipment and mobility aids, as appropriate), assessment of the individual's perceived functional ability and fear related to falling, and environmental assessment including home safety.

HUR Balance testing solutions are recommended as outcome measures for balance and stability.

The balance systems are easily controlled via the touch-screen computer featuring the HUR SmartBalance software. The test results are compared to normative values and the fall risk is presented in an easy-to-understand manner using traffic light colors.

The maximal isometric strength of big muscle groups can be evaluated by the HUR Performance Recorder for the assessment of side-to-side differences and to document changes in strength after the intervention.

The Performance Recorder can be directly connected to all HUR exercise machines, which are equipped with the isometric testing sensor attachment.


## *Recommended HUR equipment for Falls prevention*

The optimal setup for a HUR falls prevention gym compromises 10 HUR SmartTouch controlled HUR machines covering the muscle groups that are the most important regarding falls prevention, a balance platform for balance assessment and training, one or more pulleys for functional movements, and a performance recorder to assess maximal isometric strength.

In addition, a gallery of exercises features a selection of key exercises designed to improve the individual's ability and preparedness to act in the event of loss of baalnce in order to prevent falls. The HUR FreeTrainer contains a gallery of functional exercises to address balance and falling. The exercises are stored in the same database of the HUR SmartTouch system. Users can also create their own exercises and store them in the HUR database.

With this package, about 12 persons can exercise at the same time. This brings advantages, as exercising with others can greatly improve an individual's exercise adherence. By utilizing the automatic setup of the SmartTouch machines one physiotherapist can manage and supervise the whole group.

Although this is the optimal setting, you can also start with a smaller set of machines if there is are budget or a space constraint.



## *Optimal Falls Prevention gym package: Full Set*

FULL SET

5120
PUSH UP/
PULL DOWN REHAB

3125
DIP/SHRUG

5140
CHEST PRESS
REHAB

5175
OPTIMAL RHOMB
REHAB

5340
TWIST REHAB

5310
ABDOMEN/
BACK REHAB

5510
BODY EXTENSION
REHAB

5520
ADDUCTION/
ABDUCTION REHAB

5530
LEG EXTENSION/
CURL REHAB

5540
LEG PRESS
REHAB

PULLEY

HUR
SmartBalance

HUR
FreeTrainer
Exercise Panel

# *Optimal Falls Prevention gym package: Medium Set*

MEDIUM SET

3125
DIP/SHRUG

5140
CHEST PRESS
REHAB

5310
ABDOMEN/
BACK REHAB

5520
ADDUCTION/
ABDUCTION REHAB

5530
LEG EXTENSION/
CURL REHAB

5540
LEG PRESS
REHAB

PULLEY

HUR
FreeTrainer
Exercise Panel



# *Optimal Falls Prevention gym package: Basic Set*

BASIC SET

5520
ADDUCTION/
ABDUCTION REHAB

5530
LEG EXTENSION/
CURL REHAB

PULLEY

HUR
SmartBalance

HUR
FreeTrainer
Exercise Panel

## *Balance and strength training prescription for HUR falls prevention concept*

The amount of exercise training should be at least 2 hours per week on an ongoing basis. Greater fall prevention effects are seen from exercise programs that challenge balance and involve 3 or more hours of weekly exercise. Strength training frequency should be at least 2 days a week. Endurance training (e.g., walking) training may be included and other health-related risk factors and baseline fitness status should also be addressed when planning an individually tailored exercise training program.

The exercise training duration should be longer than 12 weeks. It is very important to bear in mind that the benefits of exercise are rapidly lost when exercise is discontinued. Therefore, ongoing exercise would be necessary for a lasting falls prevention effect.

Exercise program prescription should aim at providing a high challenge to balance. Choose exercises that can be performed safely:

- reduce the base of support, such as standing with two legs close together or standing with one foot directly in front of the other, or standing on one leg.
- move the center of gravity and controlling body position while standing, for example reaching, transferring body weight from one leg to another and stepping up onto a higher surface
- stand without using the arms for support, or if this is not possible then aim to reduce reliance on the upper limb, such as hold onto a surface with one hand rather than two or one finger instead of the whole hand.

**For improvements in strength and muscle hypertrophy:**

- use of both multiple- and single-joint exercises with slow-to-moderate velocity, for 1–3 sets per exercise with 60–80% of 1 RM (repetition maximum) for 8–12 repetitions with 1–3 min of rest in between sets for 2–3 is recommended.

**For targeting increased power in healthy older adults, include:**

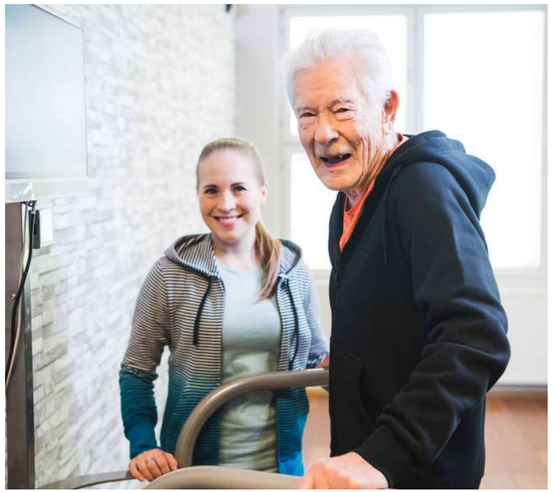
- perform training to improve muscular strength.
- perform both single-joint and multi-joint exercises for 1–3 sets per exercise using light to moderate loading (30–60% of 1 RM) for 6–10 repetitions with high repetition velocity.

**For enhancing muscular endurance:**

- perform low to moderate loads for moderate to high repetitions (10–15 or more).
- use short rest periods for muscular endurance training, e.g., 1–2 min for high-repetition sets (15–20 repetitions or more), less than 1 minute for moderate (10–15 repetitions) sets.
- for circuit strength training, it is recommended that rest periods correspond to the time needed to get from one exercise station to another.

## *Strength and muscle hypertrophy training prescription for HUR devices*

Regular exercise training - including strength, power and balance training - is considered as a cornerstone of the falls prevention. Outlines for six-month workout programs (both beginners and advanced)  using HUR intelligent strength training devices are presented below.



Strength training program for falls prevention  (beginner and advanced ) for six months.

| Falls prevention, Strength Training program for 24 weeks: **Beginner** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 2 | 1 | 15 | 50 | 13 | 90 - 120 | Familiarization |
| 3 - 4 | 2 | 1 | 15 | 50 | 13 | 90 - 120 | Familiarization |
| 5 - 6 | 2 | 2 | 12 | 60 | 14 | 90 - 120 | Training |
| 7 - 8 | 2 | 2 | 12 | 60 | 14 | 90 | Training |
| 9 - 10 | 2 | 2 | 12 | 60 | 14 | 90 | Training |
| 11 - 12 | 2 | 2 | 12 | 60 | 14 | 60 - 90 | Training |
| 13 - 14 | 2 | 2 | 10 | 70 | 15 | 60 - 90 | Training |
| 15 - 16 | 2 | 2 | 10 | 70 | 15 | 60 - 90 | Training |
| 17 - 18 | 3 | 3 | 10 | 70 | 15 | 60 - 90 | Training |
| 19 - 20 | 3 | 3 | 10 - 15 | 70 | 15 | 60 - 90 | Maintenance |
| 21 - 22 | 3 | 3 | 10 - 15 | 80 | 16 | 60 - 90 | Maintenance |
| 23 - 24 | 3 | 3 | 10 - 15 | 80 | 16 | 60 - 90 | Maintenance |

*__Weekly volume:__ exercise sessions weekly
__Series:__ series for each muscle or muscle group
__Reps:__ repetitions in each series
__% 1-RM:__ % of one repetition maximum
__RPE:__ ratings of perceived exertion (Borg's scale 6-20)
__Rest intervals:__ in seconds
__Stage:__ target level of exercise training.

| Falls prevention, Strength Training program for 24 weeks: **Advanced** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 2 | 1 | 12 | 60 | 14 | 90 - 120 | Training |
| 3 - 4 | 2 | 1 | 12 | 60 | 14 | 90 - 120 | Training |
| 5 - 6 | 2 | 2 | 12 | 60 | 14 | 90 - 120 | Training |
| 7 - 8 | 2 | 2 | 12 | 60 | 14 | 90 | Training |
| 9 - 10 | 2 - 3 | 2 - 3 | 12 | 60 | 14 | 90 | Training |
| 11 - 12 | 2 - 3 | 2 - 3 | 12 | 60 | 14 | 60 - 90 | Training |
| 13 - 14 | 2 - 3 | 2 - 3 | 10 | 70 | 15 | 60 - 90 | Training |
| 15 - 16 | 2 - 3 | 2 - 3 | 10 | 70 | 15 | 60 - 90 | Training |
| 17 - 18 | 3 | 3 | 10 | 70 | 15 | 60 - 90 | Training |
| 19 - 20 | 3 | 3 | 10 - 15 | 70 | 15 | 60 - 90 | Maintenance |
| 21 - 22 | 3 | 3 | 10 - 15 | 80 | 16 | 60 - 90 | Maintenance |
| 23 - 24 | 3 | 3 | 10 - 15 | 80 | 16 | 60 - 90 | Maintenance |

*__Weekly volume:__ exercise sessions weekly
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__Reps:__ repetitions in each series
__% 1-RM:__ % of one repetition maximum
__RPE:__ ratings of perceived exertion (Borg's scale 6-20)
__Rest intervals:__ in seconds
__Stage:__ target level of exercise training.



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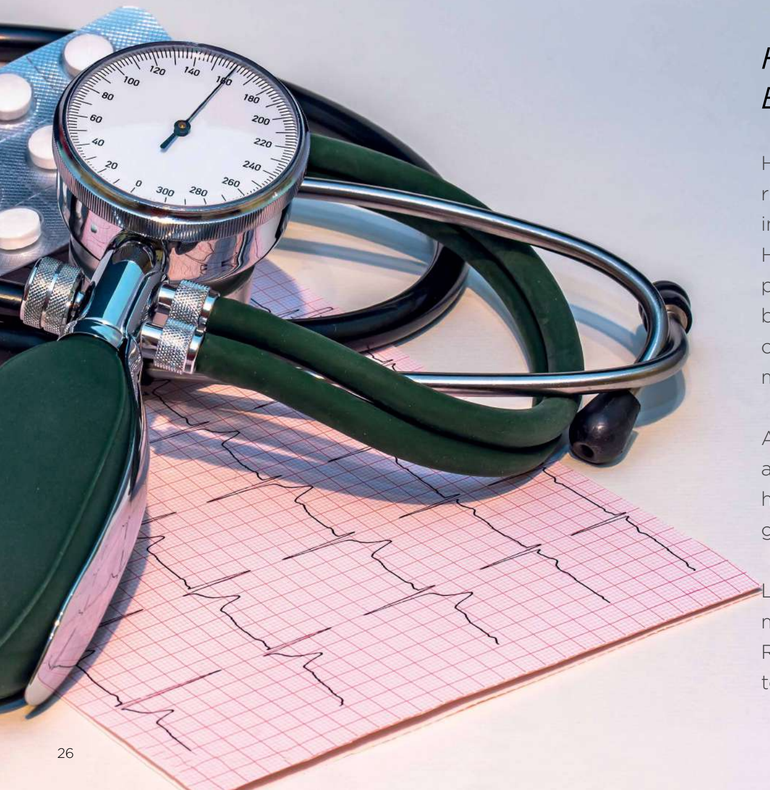
# Introduction

**The HUR hypertension concept is designed to be used in strength training as a therapeutic modality in treatment of elevated blood pressure (BP) by using the HUR's Natural Transmission method.**

The Natural Transmission Method is a resistance strength training method based on pneumatic technology. The method allows for resistance to be adapted in response to the muscle's own force production, regardless of the speed of movement. An intelligent technology system for automated reporting, close to zero starting load, 100 g/1 kg increments in resistance, range limiters and additional support with connected outcome measures to document the effectiveness, enables the user to start strength training safely when considering the individual treatment prescriptions, e.g., appropriate medication.

The HUR hypertension concept helps the rehabilitation professionals to provide the best practice of exercise-as-medicine, based on the latest international treatment guidelines, to help individuals with elevated blood pressure levels engage in regular weekly physical activity and to follow an exercise training regimen.



# Contents

## *Hypertension concept: Background and overview*

Hypertension is a major independent risk factor for cardiovascular diseases including all age, race and gender groups. Hypertension is defined as a systolic blood pressure (SBP) of ≥140 mm Hg or a diastolic blood pressure (DBP) of ≥90 mm Hg and/or the current use of antihypertensive medication.

Approximately 65 million adult American adults have hypertension, and its prevalence has been found to be about 30-45% of the general population in Western Europe.

Lifestyle factors are recognized as major modifiable determinants of hypertension. Recent guidelines emphasize, in addition to medical treatment, the assessment of lifestyle, particularly as it relates to diet and exercise, and the management of obesity and dyslipidemia as key factors in the treatment of hypertension.

Large body of evidence shows that exercise training elicits BP reduction in both normotensive and hypertensive individuals. The mean training-induced reductions in SBP and DBP have varied from –3 to –11 mmHg and from –2 to –6 mmHg, respectively. The BP lowering effect of exercise training is assumed to be multifactorial, but appears to be independent of weight loss. The mechanisms include neuro-hormonal, vascular, and structural adaptations. Decreases in catecholamine levels and total peripheral resistance, improved insulin sensitivity, and alterations in vasodilators and vasoconstrictors are some of the postulated explanations for the antihypertensive effects of exercise.

The HUR hypertension concept helps the health care professional to provide the best practice of exercise-as-medicine, based on the latest international treatment guidelines, to help individuals with elevated blood pressure levels to engage in regular weekly physical activity and to follow an exercise training regimen.


## *The role of strength training in treatment of hypertension*

Both regular endurance and strength training are important determinants of the treatment of hypertension. Endurance training is recommended as first-line antihypertensive lifestyle therapy based on convincing evidence showing that it lowers BP at average level of –5 to –7 mmHg among adults with hypertension. Because of weaker evidence showing that dynamic strength training reduces BP –2 to –3 mm Hg among adults with hypertension, it is recommended as adjuvant lifestyle therapy to endurance training.

However, latest meta-analysis shows that for nonwhite adult samples with hypertension, dynamic strength training elicits BP reductions that are comparable to or greater than those reportedly achieved with endurance training.

Therefore, strength training should be further investigated as a viable stand-alone therapeutic exercise option for adult populations with high BP.



## *Outcome measures*

To gather information on the baseline status and effectiveness of exercise training, each patient is evaluated individually. The main objective is to achieve and maintain an optimal BP level. Since both cardiorespiratory and muscle fitness have prognostic value in hypertensive patients, they can be recommended as main outcome measures of exercise training interventions.

Assessment of blood pressure, lipid profile, body weight is highly recommended to be used as outcome measures. Furthermore, when existing co-morbidities or other needs are registered, other appropriate outcome measures may be performed. These may include assessment of balance, and questionnaires related to an individual's experience of pain, symptoms of depression,  and health-related quality of life.

The maximal isometric strength of big muscle groups can be evaluated by the HUR Performance Recorder for the assessment of side-to-side differences and to document changes in strength after the intervention.

The Performance Recorder can be directly connected to all HUR exercise machines, which are equipped with the isometric testing sensor attachment.

# *Recommended HUR equipment for treatment of hypertension*

HUR BP GYM

1 5540
LEG PRESS
REHAB

2 5310
3 ABDOMEN/
BACK REHAB

4 5140
CHEST PRESS
REHAB

5 5120
6 PUSH UP/
PULL DOWN REHAB

7 5520
8 ADDUCTION/
ABDUCTION REHAB

9 5175
OPTIMAL RHOMB
REHAB

10 5340
11 TWIST REHAB

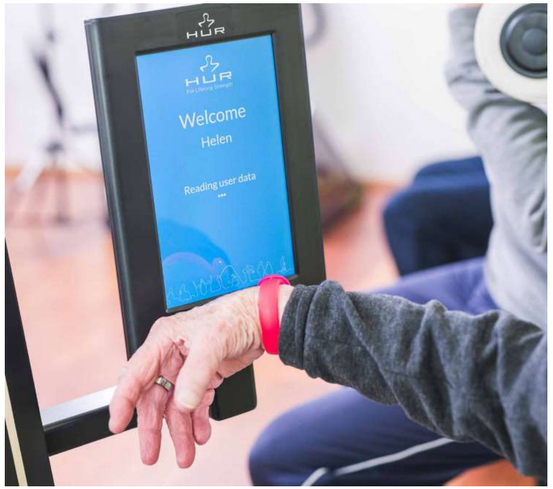
12 5530
13 LEG EXTENSION/
CURL REHAB

for 5-10 min
warm-up and
cool-down
*for example:*

Performance
Recorder PR1

# *Strength training prescription for HUR devices for hypertension*

Regular exercise training - including both endurance and strength training - is considered as a cornerstone of the primary and secondary prevention of hypertension. Outlines for six-month workout programs (both beginner and advanced) and a recommended set-up for HUR intelligent strength training devices are presented below.



Strength training program for hypertension patients (beginner and advanced) for six months.

| Hypertension, Strength Training program for 24 weeks: **Beginner** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 1-2 | 1 | 15 | 30 - 40 | 10 | 60 - 90 | Familiarization |
| 3 - 4 | 1-2 | 1 | 15 | 30 - 40 | 10 | 60 - 90 | Familiarization |
| 5 - 6 | 2 | 1 | 12 - 15 | 40 | 10 | 60 - 90 | Familiarization |
| 7 - 8 | 2 | 1-2 | 12 - 15 | 40 | 10 - 12 | 60 - 90 | Training |
| 9 - 10 | 2 | 1-2 | 12 - 15 | 40 | 10 - 12 | 60 - 90 | Training |
| 11 - 12 | 2 | 1-2 | 12 - 15 | 40 | 12 | 60 - 90 | Training |
| 13 - 14 | 2 | 2 | 10 - 12 | 40 - 50 | 12 | 60 - 90 | Training |
| 15 - 16 | 2 | 2 | 10 - 12 | 40 - 50 | 12 | 60 - 90 | Training |
| 17 - 18 | 2 - 3 | 2 - 3 | 10 - 12 | 50 - 60 | 13 | 60 - 90 | Training |
| 19 - 20 | 2 - 3 | 2 - 3 | 10 - 12 | 50 - 60 | 13 | 60 - 90 | Training |
| 21 - 22 | 2 - 3 | 2 - 3 | 8 - 12 | 60 - 70 | 13 - 14 | 60 - 90 | Training |
| 23 - 24 | 2 - 3 | 2 - 3 | 8 - 12 | 60 - 70 | 13 - 14 | 60 - 90 | Training |

*__Weekly volume:__ exercise sessions weekly
__Series:__ series for each muscle or muscle group
__Reps:__ repetitions in each series
__% 1-RM:__ % of one repetition maximum
__RPE:__ ratings of perceived exertion (Borg's scale 6-20)
__Rest intervals:__ in seconds
__Stage:__ target level of exercise training.



| Hypertension, Strength Training program for 24 weeks: **Advanced** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 2 - 3 | 2 | 12 | 60 | 12 | 60 | Training |
| 3 - 4 | 2 - 3 | 2 | 12 | 60 | 12 | 60 | Training |
| 5 - 6 | 2 - 3 | 2 | 12 | 60 | 12 | 60 | Training |
| 7 - 8 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 | Training |
| 9 - 10 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 | Training |
| 11 - 12 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 | Training |
| 13 - 14 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 80 | 12 - 14 | 60 | Training |
| 15 - 16 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 80 | 12 - 14 | 60 | Training |
| 17 - 18 | 2 - 3 | 3 | 8 - 12 | 60 - 80 | 14 - 16 | 60 | Maintenance |
| 19 - 20 | 2 - 3 | 3 | 8 - 12 | 60 - 80 | 14 - 16 | 60 | Maintenance |
| 21 - 22 | 2 - 3 | 3 | 8 - 12 | 60 - 80 | 14 - 16 | 60 | Maintenance |
| 23 - 24 | 2 - 3 | 3 | 8 - 12 | 60 - 80 | 14 - 16 | 60 | Maintenance |

*__Weekly volume:__ exercise sessions weekly
__Series:__ series for each muscle or muscle group
__Reps:__ repetitions in each series
__% 1-RM:__ % of one repetition maximum
__RPE:__ ratings of perceived exertion (Borg's scale 6-20)
__Rest intervals:__ in seconds
__Stage:__ target level of exercise training.

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NOTE: The treatment of diseases should always follow the quidelines given by the treating party.




# Introduction

The HUR type 2 diabetes (T2D) concept is designed to be used in strength training as a therapeutic modality in treatment of T2D by using the HUR's Natural Transmission method.

The Natural Transmission Method is a resistance strength training method based on pneumatic technology. The method allows for resistance to be adapted in response to the muscle's own force production, regardless of the speed of movement. An intelligent technology system for automated reporting, close to zero starting load, 100 g/1 kg increments in resistance, range limiters and additional support with connected outcome measures to document the effectiveness, enables the T2D patient to start strength training safely when on appropriate medication.

The HUR T2D concept helps the rehabilitation professional to provide best practice exercise-as-medicine, based on the latest international treatment guidelines, to help the T2D patient to engage in regular weekly physical activity and to follow an exercise training regimen.

# Contents

## *Type 2 diabetes concept: Background and overview*

T2D is characterized by chronic hyperglycemia due to decreased insulin secretion, insulin action or both. It is a progressive condition in which the body becomes resistant to the normal effects of insulin.

The diagnosis of T2D is based on the level of glucose at which retinopathy occurs, but macrovascular complications, such as coronary, cerebrovascular and peripheral artery disease, appear earlier and are often present when T2D is diagnosed. It has been reported that >60% of people with T2D develop a cardiovascular disease. The global prevalence of diabetes has increased markedly from 1980 to 2014 (108 vs. 422 million).

All the international guidelines aim at achieving and maintain optimal blood glucose, lipid and blood pressure levels to prevent or delay development of diabetic complications. Along with a proper diet, smoking cessation and medical treatment, exercise training and physical activity more generally has been shown to be an important cornerstone in the treatment of T2D.

Exercise increases energy demand and glucose and fatty acid uptake into active muscles and a greater part of energy is produced from glucose when exercise intensity  is increased. In addition to glucose metabolism, regular exercise training and increased daily habitual physical activity have direct effects on several risk factors in subjects with T2D including increased muscle mass and cardiorespiratory fitness, decreased LDL cholesterol, decreased blood pressure, improved weight management, reduction of symptoms of depression, and improved health-related quality of life.

The HUR T2D concept helps the health care professional to provide best practice exercise-asmedicine, based on the latest international treatment guidelines, to help people with T2D to engage in regular weekly physical activity and to follow an exercise training regimen.


## *The role of strength training in treatment of T2D*

Both regular endurance and strength training are important determinants in the treatment of T2D. Since skeletal muscle is the primary tissue for glucose and triglyceride metabolism and a crucial determinant of resting metabolic rate, the role of strength training is essential. It is necessary to train skeletal muscle groups separately to maximize whole body skeletal muscle fiber recruitment.

Therefore, regular strength training should be an integral part of daily life of persons with T2D.

Strength training in persons with T2D is feasible, well tolerated, and beneficial. It is also worth mentioning that, in addition physiological health benefits, strength training is associated with improvements in quality of life.

## *Outcome measures*

In order to gather information on the baseline status and effectiveness of exercise training, each patient is evaluated individually. The main target is to achieve and maintain optimal blood glucose. Since both cardiorespiratory and muscle fitness have prognostic value in T2D patients, they can be recommended as main outcome measures of exercise training interventions.

Assessment of lipid profile, blood pressure, and body weight are highly recommended to be used as outcome measures. Furthermore, when existing comorbidities or other needs are registered, other appropriate outcome measures may be performed. These may include assessment of balance, questionnaires related to an individual's experience of pain, symptoms of depression, and health-related quality of life.

The maximal isometric strength of big muscle groups can be evaluated by the HUR Performance Recorder for the assessment of side-to-side differences and to document changes in strength after the intervention. The Performance Recorder can be directly connected to all HUR exercise machines, which are equipped with the isometric testing sensor attachment.

## *Recommended HUR equipment for treatment of T2D*

HUR T2D GYM

1 5540
LEG PRESS
REHAB

2 5310
3 ABDOMEN/
BACK REHAB

4 5140
CHEST PRESS
REHAB

5 5530
6 LEG EXTENSION/
CURL REHAB

7 5120
8 PUSH UP/
PULL DOWN REHAB

9 5340
10 TWIST REHAB

11 5175
OPTIMAL RHOMB
REHAB

12 3110
BICEPS/ TRICEPS

for 5-10 min
warm-up and
cool-down
*for example:*

Performance
Recorder PR1

## *Strength training prescription for HUR devices for T2D*

The primary objective is to transfer appropriate strength training programs into clinical practice and, first and foremost, to help persons with T2D to integrate the training programs into their daily life.

To facilitate a lifelong commitment to regular exercise, outlines for six-month workout programs (both beginner and advanced) are presented below.

Strength training program for T2D patients (beginner and advanced ) for six months.

| Type 2 Diabetes, Strength Training program for 24 weeks: **Beginner** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 2 | 1 | 15 | 30 - 40 | 10 | 90 - 120 | Familiarization |
| 3 - 4 | 2 | 1 | 15 | 30 - 40 | 10 | 90 - 120 | Familiarization |
| 5 - 6 | 2 - 3 | 2 | 10 - 15 | 40 | 10 | 90 - 120 | Training |
| 7 - 8 | 2 - 3 | 2 | 10 - 15 | 40 | 10 - 12 | 90 | Training |
| 9 - 10 | 2 - 3 | 2 | 10 - 15 | 40 - 50 | 10 - 12 | 90 | Training |
| 11 - 12 | 2 - 3 | 2 | 10 - 15 | 40 - 50 | 12 | 60 - 90 | Training |
| 13 - 14 | 2 - 3 | 2 - 3 | 10 - 12 | 50 - 60 | 12 | 60 - 90 | Training |
| 15 - 16 | 2 - 3 | 2 - 3 | 10 - 12 | 50 - 60 | 12 | 60 - 90 | Training |
| 17 - 18 | 3 | 3 | 10 | 60 | 13 - 14 | 60 - 90 | Training |
| 19 - 20 | 3 | 3 | 10 | 60 | 13 - 14 | 60 - 90 | Training |
| 21 - 22 | 3 | 3 - 4 | 8 - 10 | 70 - 80 | 14 - 15 | 60 - 90 | Training |
| 23 - 24 | 3 | 3 - 4 | 8 - 10 | 70 - 80 | 14 - 15 | 60 - 90 | Training |

*__Weekly volume:__ exercise sessions weekly
__Series:__ series for each muscle or muscle group
__Reps:__ repetitions in each series
__% 1-RM:__ % of one repetition maximum
__RPE:__ ratings of perceived exertion (Borg's scale 6-20)
__Rest intervals:__ in seconds
__Stage:__ target level of exercise training.



| Type 2 Diabetes, Strength Training program for 24 weeks: **Advanced** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 2 - 3 | 2 - 3 | 10 - 15 | 50 | 12 | 90 | Training |
| 3 - 4 | 2 - 3 | 2 - 3 | 10 - 15 | 50 | 12 | 90 | Training |
| 5 - 6 | 2 - 3 | 2 - 3 | 10 - 15 | 50 | 12 | 90 | Training |
| 7 - 8 | 2 - 3 | 2 - 3 | 10 - 15 | 50 | 12 | 90 | Training |
| 9 - 10 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 - 90 | Training |
| 11 - 12 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 - 90 | Training |
| 13 - 14 | 2 - 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 - 90 | Training |
| 15 - 16 | 3 | 2 - 3 | 10 - 12 | 60 - 70 | 12 - 14 | 60 - 90 | Training |
| 17 - 18 | 3 | 3 - 4 | 8 - 10 | 70 - 80 | 14 - 16 | 60 - 90 | Maintenance |
| 19 - 20 | 3 | 3 - 4 | 8 - 10 | 70 - 80 | 14 - 16 | 60 - 90 | Maintenance |
| 21 - 22 | 3 | 3 - 4 | 8 - 10 | 70 - 80 | 14 - 16 | 60 - 90 | Maintenance |
| 23 - 24 | 3 | 3 - 4 | 8 - 10 | 70 - 80 | 14 - 16 | 60 - 90 | Maintenance |

*__Weekly volume:__ exercise sessions weekly
__Series:__ series for each muscle or muscle group
__Reps:__ repetitions in each series
__% 1-RM:__ % of one repetition maximum
__RPE:__ ratings of perceived exertion (Borg's scale 6-20)
__Rest intervals:__ in seconds
__Stage:__ target level of exercise training.

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NOTE: The treatment of diseases should always follow the guidelines given by the treating party.




# Introduction

**The HUR cardiac rehabilitation concept is designed to be used as a therapeutic modality in exercise-based cardiac rehabilitation using the HUR's Natural Transmission method.**

The Natural Transmission Method is a resistance strength training method based on pneumatic technology. The method allows for resistance to be adapted in response to the muscle's own force production, regardless of the speed of movement. An intelligent technology system for automated reporting, close to zero starting load, 100 g/1 kg increments in resistance, range limiters and additional support with connected outcome measures to document the effectiveness, enables the patient to start rehabilitation early and safely when coronary artery disease (CAD) is stable and the patient is on appropriate medication.

The HUR cardiac rehabilitation concept helps the rehabilitation professional to provide best practice of exercise-as-medicine, based on the latest international treatment guidelines, to help people with CAD to engage in regular weekly physical activity and to follow an exercise training regimen.

# Contents

## *Cardiac rehabilitation concept: Background and overview*

CAD is a disease caused by plaque building up along the inner walls of the coronary arteries. Arteries become narrow and blood flow to the heart is reduced, causing ischemia.

The decreased blood flow may be manifested as chest pain (angina pectoris), shortness of breath, or other CAD symptoms. A complete blockage can cause a myocardial infarction, which may lead to sudden cardiac death. CAD is the killer number one in the world, causing 7.4 (13.2%) million deaths in 2012.

CAD is strongly connected to lifestyle, especially the use of tobacco, unhealthy diet habits, physical inactivity, and psychosocial stress. CAD patients, after an acute event or with chronic heart disease, need special attention to be able to restore their quality of life and to maintain or to improve their functional capacity.

The components of cardiac rehabilitation include patient assessment, physical activity counseling, exercise training, nutritional counseling, weight control management, lipid management, blood pressure monitoring, smoking cessation, and psychosocial management.

Most importantly, it has been stated that many of the above-mentioned risk factor improvements occurring in cardiac rehabilitation can be mediated through increasing daily habitual physical activity and exercise training.

The current guidelines for exercise training and physical activity in CAD shows that evidence for exercise training in CAD patients is at the highest level both in terms of recommendations and scientific justification stratification.

Exercise training sessions are organized with brief periods of warm-up and cool-down. Endurance training is usually performed on days that alternate with strength training, but both modes can be combined into a single session for patients who are sufficiently vigorous and healthy to tolerate the effort. Flexibility training is often integrated into the warm-up or cool-down periods.

The HUR cardiac rehabilitation concept helps the rehabilitation professional to provide best practice of exercise-as-medicine, based on the latest international treatment guidelines, enabling the earliest return to daily life and activity.


## *The role of strength training in cardiac rehabilitation*

Skeletal muscle is the primary tissue for glucose and triglyceride metabolism and a determinant of resting metabolic rate. Therefore, increase in muscle mass reduces multiple CAD risk factors. Cross-sectional studies have shown that muscular strength is inversely associated with all-cause mortality and the prevalence of metabolic syndrome independently of aerobic fitness levels.

Furthermore, increased muscle mass can improve the individual's ability to become more physically active, raise the basal metabolic rate, and in older people, improve the ability to perform activities of daily living, decrease fall risk, and increase the quality of life.

Both research findings and clinical experience indicate that strength exercise is safe for stable CAD patients. For patients at moderate to elevated risk of adverse cardiac events, strength training can be safely undertaken with proper preparation, guidance, and surveillance.

## *Outcome measures*

In order to gather information on the baseline status and effectiveness of the rehabilitation process, each patient is evaluated individually. Patients with CAD can initiate exercise training within a week after an acute coronary syndrome, after clinical screening, provided the patient is clinically stable.

It is recommended that CAD patients undergo symptom-limited exercise testing before initiating an exercise program in cardiac rehabilitation to establish a baseline fitness level, determine maximal heart rate, and ascertain the safety of exercise by assessing symptoms that would contraindicate exercise training or require a different therapeutic approach.

However, a clinical exercise test is not an absolute requirement and many programs do not require such testing in clinically stable patients. If facilities are lacking, it is recommended to use the 6 minute walking test to assess the patient's baseline fitness level.

When existing co-morbidities or other needs are registered, appropriate outcome measures should be performed. These may include maximal strength, stability, and questionnaires related to an individual's experience of pain and health-related quality of life.

The maximal isometric strength of big muscle groups can be evaluated by the HUR Performance Recorder for the assessment of side-to-side differences and to document changes in strength after the intervention.

The Performance Recorder can be directly connected to all HUR exercise machines, which are equipped with the isometric testing sensor attachment.

# *Recommended HUR equipment for Cardiac Rehabilitation*

HUR CAD GYM

1 5540
LEG PRESS
REHAB

2 5140
CHEST PRESS
REHAB

3 5310
4 ABDOMEN/
BACK REHAB

5 5120
6 PUSH UP/
PULL DOWN REHAB

7 5340
8 TWIST REHAB

9 5175
OPTIMAL RHOMB
REHAB

10 5520
11 ADDUCTION/
ABDUCTION REHAB

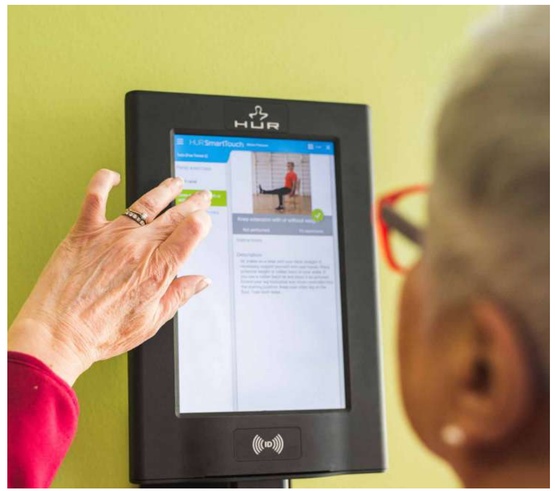
12 5530
13 LEG EXTENSION/
CURL REHAB

for 5-10 min
warm-up and
cool-down
*for example:*

Performance
Recorder PR1

# *Strength training prescription for HUR devices for CAD*

The primary objective is to transfer appropriate strength training programs into clinical practice and, first and foremost, to help persons with CAD to integrate the training programs into their daily life. To facilitate a lifelong commitment to regular exercise, outlines for six-month workout programs (both beginner and advanced) are presented below.




Strength training program for CAD patients (beginner and advanced) for six months.

| Coronary Artery Disease, Strength Training program for 24 weeks: **Beginner** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 1 - 2 | 1 | 15 - 20 | 20 - 30 | 10 | 90 - 120 | Familiarization |
| 3 - 4 | 1 - 2 | 1 | 15 - 20 | 20 - 30 | 10 | 90 - 120 | Familiarization |
| 5 - 6 | 2 | 1 | 15 - 20 | 20 - 30 | 10 | 90 - 120 | Familiarization |
| 7 - 8 | 2 | 1 - 2 | 15 | 30 - 40 | 10 - 12 | 90 | Training |
| 9 - 10 | 2 | 1 - 2 | 15 | 30 - 40 | 10 - 12 | 90 | Training |
| 11 - 12 | 2 | 1 - 2 | 15 | 40 | 12 | 60 - 90 | Training |
| 13 - 14 | 2 | 2 | 15 | 40 | 12 | 60 - 90 | Training |
| 15 - 16 | 2 | 2 | 15 | 40 | 12 | 60 - 90 | Training |
| 17 - 18 | 2 - 3 | 2 - 3 | 12 - 15 | 40 - 50 | 13 | 60 - 90 | Training |
| 19 - 20 | 2 - 3 | 2 - 3 | 12 - 15 | 40 - 50 | 13 | 60 - 90 | Maintenance |
| 21 - 22 | 2 - 3 | 2 - 3 | 10 - 15 | 50 | 13 - 14 | 60 - 90 | Maintenance |
| 23 - 24 | 2 - 3 | 2 - 3 | 10 - 15 | 50 | 13 - 14 | 60 - 90 | Maintenance |



| Coronary Artery Disease, Strength Training program for 24 weeks: **Advanced** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Weekly volume | Series | Reps | % 1-RM | RPE | Rest intervals | Stage |
| 1 - 2 | 2 | 2 | 15 | 40 | 12 | 90 - 120 | Training |
| 3 - 4 | 2 | 2 | 15 | 40 | 12 | 90 - 120 | Training |
| 5 - 6 | 2 | 2 | 15 | 40 | 12 | 90 - 120 | Training |
| 7 - 8 | 2 | 2 - 3 | 12 - 15 | 40 - 50 | 12 - 14 | 90 | Training |
| 9 - 10 | 2 - 3 | 2 - 3 | 12 - 15 | 40 - 50 | 12 - 14 | 90 | Training |
| 11 - 12 | 2 - 3 | 2 - 3 | 12 - 15 | 40 - 50 | 12 - 14 | 60 - 90 | Training |
| 13 - 14 | 2 - 3 | 2 - 3 | 12 - 15 | 50 | 12 - 14 | 60 - 90 | Training |
| 15 - 16 | 3 | 2 - 3 | 12 - 15 | 50 | 12 - 14 | 60 - 90 | Training |
| 17 - 18 | 3 | 3 | 10 - 15 | 50 - 60 | 14 - 16 | 60 - 90 | Maintenance |
| 19 - 20 | 3 | 3 | 10 - 15 | 50 - 60 | 14 - 16 | 60 - 90 | Maintenance |
| 21 - 22 | 3 | 3 | 10 - 15 | 50 - 60 | 14 - 16 | 60 - 90 | Maintenance |
| 23 - 24 | 3 | 3 | 10 - 15 | 50 - 60 | 14 - 16 | 60 - 90 | Maintenance |

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# (Cardiac Rehab Concept)


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NOTE: The treatment of diseases should always follow the guidelines given by the treating party.


# Introduction

The HUR hip and knee concept is designed to be used as a therapeutic modality in several hip and knee based disorders using the HUR's Natural Transmission method.

The Natural Transmission Method is a resistance strength training method based on pneumatic technology. The method allows for resistance to be adapted in response to the muscle's own force production, regardless of the speed of movement. An intelligent technology system for automated reporting, close to zero starting load, 100 g/1 kg increments in resistance, range limiters and additional support with connected outcome measures to document the effectiveness, enables the user to start rehabilitation early and safely, whatever the hip or knee disability.

The HUR hip and knee concept helps the rehabilitation professional to provide best practice of exercise-as-medicine, based on the latest international treatment guidelines, enabling the earliest return to daily life and activity.

# Contents

## *Hip and knee concept: Background and overview*

Osteoarthritis (OA) is the most common chronic condition of the joints, and occurs most often in hips and knees. Degenerative diseases of the joints have become the primary cause of pain and reduced healthrelated quality of life, especially in senior population.

Knee injuries may be caused by e.g. abnormal twisting or bending of the knee or falling on the knee, for example during sports. Professional athletes who sustain knee injuries often require surgical treatment to restore the stability of the knee.

There is a clear consensus that controlled regular daily physical activity and exercise training are major contributing factors in prevention, treatment and rehabilitation.  Initial treatment should aim to restore range of movement with reasonable loading, and within the initial pain tolerance. Patience is essential since physiological changes are slow, and an individually tailored exercise training program is essential to the healing process.The duration of an exercise training intervention could be three months with an ongoing program afterwards.

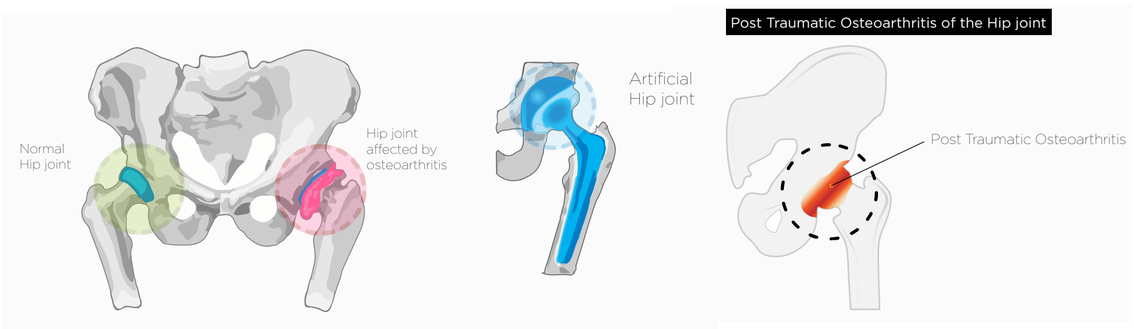
The HUR hip and knee concept helps the rehabilitation professional to provide best practice of exercise-as-medicine, based on the latest international treatment guidelines, enabling the earliest return to daily life and activity.

## *Degenerative joint diseases*

Osteoarthritis (OA), sometimes called Degenerative joint disease or Degenerative arthritis, is the most common chronic condition of the joints, and occurs most often in hips and knees.

Among adults 60 years or older, the prevalence of symptomatic knee OA is approximately 10% in men and 13% in women, and the number of people affected with symptomatic OA is likely to increase due to the aging of the population and the obesity epidemic. OA is also the most common reason for total hip and total knee replacement.

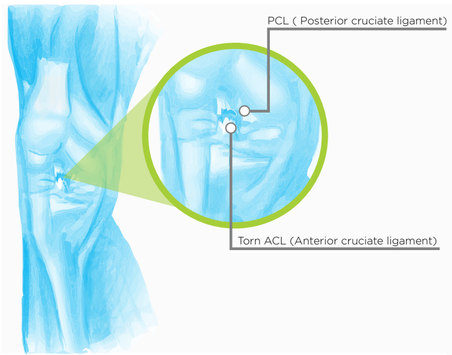
The effectiveness of exercise in hip and knee OA is well recognized to improve muscle function, prevent abnormal movement and restore normal biomechanics of hip and knee. In addition, it has been shown that strength training and weight reduction decrease the pain experience and regular medication use and prolong the time until total joint replacement.



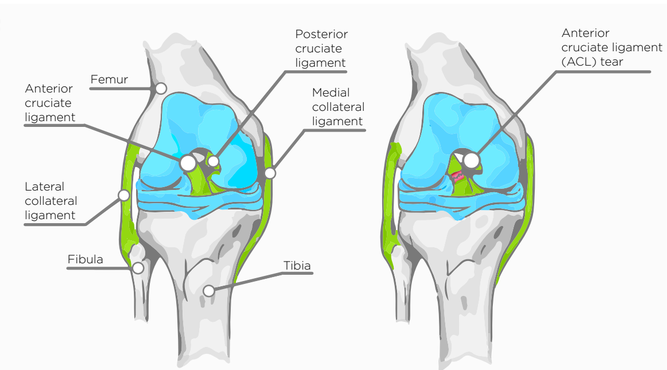

## *Knee injuries*

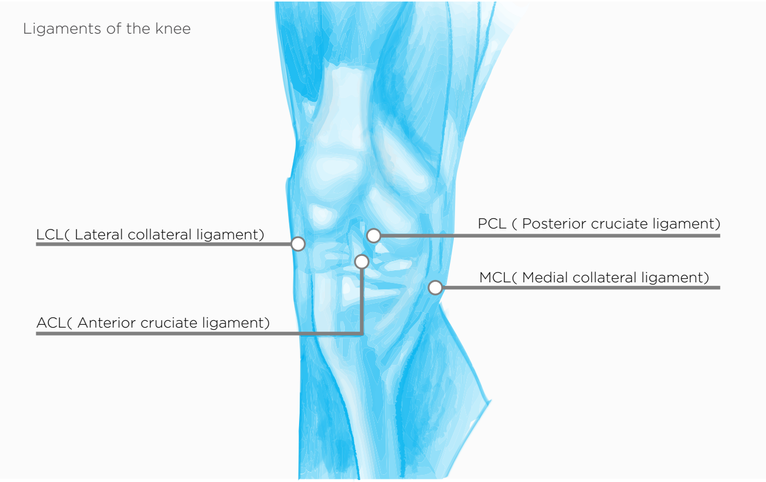
Anterior cruciate ligament (ACL) injuries are among the most common knee injuries, with over 100,000 tears in the US occurring annually. It is one of the four major ligaments providing stability to the knee when moving and playing sports. The other major ligaments providing stability to the knee are posterior collateral ligament (PCL), medial collateral ligament (MCL), and lateral collateral ligament (LCL). The ACL plays the most important role in stabilizing the knee by preventing anterior tibial displacement.

After a knee injury, regardless of whether surgery will take place or not, rehabilitation focuses on regaining range of movement, strength, proprioception and stability, in addition to reducing swelling and pain during the acute phase of an injury.




Anterior Cruciate Ligament (ACL) Tear






Greater attention to involved lower extremity eccentric strength may greatly enhance patient function following knee rehabilitation. Restoring involved lower extremity strength and power within 80% – 90% of the noninvolved lower extremity before sport-specific training is recommended. Muscular strength test has been proposed to be an important tool to determine if an athlete can return to competitive sports after ACL reconstruction.



## *Outcome measures*

In order to gather information on the baseline status and effectiveness of the rehabilitation process, each patient is evaluated in several ways. Objective measures for range of movement, strength and stability, and questionnaires related to an individual's experience of pain and health-related quality of life (if appropriate) are utilized. In addition, soreness and swelling are evaluated.

The maximal isometric strength of knee and hip can be evaluated by the HUR Performance Recorder for the assessment of side-to-side differences and to document changes in strength after the intervention.

The Performance Recorder can be directly connected to all HUR exercise machines equipped with the isometric testing sensor attachment.

## *Recommended HUR equipment for hip and knee rehabilitation*

5540
LEG PRESS REHAB

5530
LEG EXTENSION /
CURL REHAB

5520
ADDUCTION /
ABDUCTION REHAB

5510
BODY EXTENSION REHAB

5310 ABDOMEN /
BACK REHAB

5340
TWIST REHAB

PULLEY

Performance Recorder PR1



## *A gentle and versatile method for hip and knee rehabilitation*

The intelligent HUR equipment for rehabilitation, exercise and testing enables the user to start rehabilitation early and safely, whatever the hip or knee disability.

The core of the HUR equipment is HUR's Natural Transmission with pneumatic technology, and the HUR SmartTouch intelligent software, which together offer the following features:

- safe natural movement with air resistance
- resistance is adapted in accordance with the production of force, regardless of the speed of the movement
- close to zero starting load
- 100 g/1 kg increments in resistance
- range limiters
- additional support
- connected outcome measures to document the effectiveness
- individual programs
- automatic setup of position (lever arms and back support), load and repetitions
- automated reporting
- touch screen

# *Example of HUR concept for total hip replacement rehabilitation*

The main factors defining the rehabilitation process are the surgical approach and the general state of the patient. Whether the patient desires to gain physical fitness or wishes to recover for recreational activity should also be considered when establishing the rehabilitation program. The given order is not fixed and should be interpreted as an example. However, it shows a progressive contribution of the patient in the therapy. It should start as soon as possible according to the patient's tolerance and medical recommendations.

| Action | Post-operative Days | | Post-operative | Post-operative Months | |
|---|---|---|---|---|---|
| | Day 1 | Day 2-7 | week 2-4 | 1-3 | 3-12 |
| **Prevention of dislocation:** | | | | | |
| Hip flexion above 90°, endorotation and adduction across midline | X | X | X | X (6 weeks) | |
| **Acute in hospital and post discharge:** | | | | | |
| Ankle pumps | X | X | X | | |
| Operative hip range on motion (HROM) | X | X | X | | |
| Muscle strengthening: primarily hip | X | X | X | | |
| abductor and extension | X | X | X | | |
| Gait training (with assistive devices and stair climbing technique) | | X | X | | |
| Proprioceptive training | | X | X | | |
| Functional training (daily living) | | X | X | | |
| Endurance training | | X | X | | |
| **Pain control/edema reduction** | X | X | X | X | |



| Action | Post-operative Days | | Post-operative | Post-operative Months | |
|---|---|---|---|---|---|
| | Day 1 | Day 2-7 | week 2-4 | 1-3 | 3-12 |
| **Therapeutic exercise:** | | | | | |
| Passive, active-assisted and active HROM | | | X | X | X |
| Closed kinetic chain activities | | | X | X | X |
| Stationary biking | | | X | X | X |
| Aquatic therapy/activities | | | X | X | X |
| Scar massage/mobility | | | X | X | X |
| **Strengthening with HUR equipment:** | | | | | |
| Knee flexion hamstring curls | | | X | X | X |
| Knee extension quadriceps | | | X | X | X |
| Hip abduction-adduction | | | | X (adduction after 6 wks) | X |
| Leg press | | | (X) | X | X |
| Abdomen/Back/Twist | | | (X) | X | X |
| Pulley (case specific exercises) | | | (X) | X | X |
| **Balance/proprioceptive training with HUR SmartBalance** | | | X | X | X |
| **Endurance training** | | | X | X | X |
| **Gait training** | | | X | X | X |
| **Functional training** | | | X | X | X |

# *Example of HUR concept for ACL reconstruction rehabilitation*

The main factors defining the rehabilitation process are the surgical approach and the general state of the patient. Whether the patient desires to gain physical fitness or wishes to recover for recreational activity should also be considered when establishing the rehabilitation program. The given order is not fixed and should be interpreted as an example. However, it shows a progressive contribution of the patient in the therapy. It should start as soon as possible according to the patient's tolerance and medical recommendations.

| Action | Post-operative Weeks | | | | | Post-operative Months | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1-2 | 3-4 | 5-6 | 7-8 | 9-12 | 4 | 5 | 6 | 7-12 |
| **Brace:** immobilizer for patient comfort | X | (X) | | | | | | | |
| **Range of motion minimum goals:** | | | | | | | | | |
| 0°-110° | X | | | | | | | | |
| 0°-120° | | X | | | | | | | |
| 0°-135° | | | X | | | | | | |
| **Weight bearing:** | | | | | | | | | |
| 1/2 body weight | X | | | | | | | | |
| Full | | X | | | | | | | |
| **Patella mobilization** | X | X | X | | | | | | |
| **Modalities:** | | | | | | | | | |
| Electrical muscle stimulation | X | X | X | | | | | | |
| Pain/edema management (cryotherapy) | X | X | X | X | X | X | X | X | X |

| Action | Post-operative Weeks | | | | | Post-operative Months | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1-2 | 3-4 | 5-6 | 7-8 | 9-12 | 4 | 5 | 6 | 7-12 |
| **Stretching:** | | | | | | | | | |
| Hamstring, gastrocnemius-soleus, iliotibial band, quadriceps | X | X | X | X | X | X | X | X | X |
| **Strengthening:** | | | | | | | | | |
| Quadriceps isometrics, straight leg raises, active knee extension | X | X | X | X | | | | | |
| Closed-chain: gait retraining, toe raises, wall sits, mini-squats | X | X | X | X | | | | | |
| **Strengthening with HUR equipment:** | | | | | | | | | |
| Knee flexion hamstring curls | X | X | X | X | X | X | X | X | X |
| Knee extension quadriceps | X | X | X | X | X | X | X | X | X |
| Hip abduction-adduction | X | X | X | X | X | X | X | X | X |
| Leg press | X | X | X | X | X | X | X | X | X |
| Abdomen / Back / Twist | X | X | X | X | X | X | X | X | X |
| Pulley (case specific exercises) | X | X | X | X | X | X | X | X | X |
| **Balance/proprioceptive training with:** | | | | | | | | | |
| HUR SmartBalance | X | X | X | X | | | | | |
| Balance board, mini-trampoline | | | | X | X | X | X | X | |
| **Conditioning:** | | | | | | | | | |
| Bike (stationary) | | X | X | X | X | X | X | X | X |
| Aquatic program | | X | X | X | X | X | X | X | X |
| Swimming (kicking) | | | | X | X | X | X | X | X |
| Walking | | | | X | X | X | X | X | X |
| Running: straight | | | | | X | X | X | X | X |
| **Full sports or previous activity** | | | | | | | X | X | X |

# References
# (Hip and Knee Concept)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NOTE: The treatment of diseases should always follow the quidelines given by the treating party.


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