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Enhanced Recovery After Surgery (ERAS) in transplantation

Carrie Scuffell

**SME for ERAS in Transplantation,
NHS Blood and Transplant**

- **Multimodal, pathway to help improve recovery**
 - Reduce surgical stress
 - Patient centred - encourages patient engagement and autonomy
 - Reduces the risk of complications
 - Better use of resources
 - Reduced Length of Stay (LOS)
- **‘Business as usual’ in other realms of surgery**





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Clinical TRANSPLANTATION

The Journal of Clinical and Translational Research

ORIGINAL ARTICLE

Enhanced recovery after surgery programs improve short-term outcomes after liver transplantation—A systematic review and meta-analysis

Pascale Tinguely, Nolitha Morare, Alejandro Ramirez-Del Val, Marina Berenguer, Claus U. Niemann, Joerg M. Pollok, Dimitri A. Raptis✉, Michael Spiro✉

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A national transplant in the UK
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Articles & Issues Editor's Picks Collections Social Media For Authors Journal Info

ORIGINAL CLINICAL SCIENCE—LIVER

Guidelines for Perioperative Care for Liver Transplantation: Enhanced Recovery After Surgery (ERAS) Recommendations

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Metrics

Enhanced recovery for liver transplantation: recommendations from the 2022 International Liver Transplantation Society consensus conference

Joerg M Pollok*, Pascale Tinguely*, Marina Berenguer, Claus U Niemann, Dimitri A Raptis†, Michael Spiro†, on behalf of the ERAS4OLT.org collaborative†

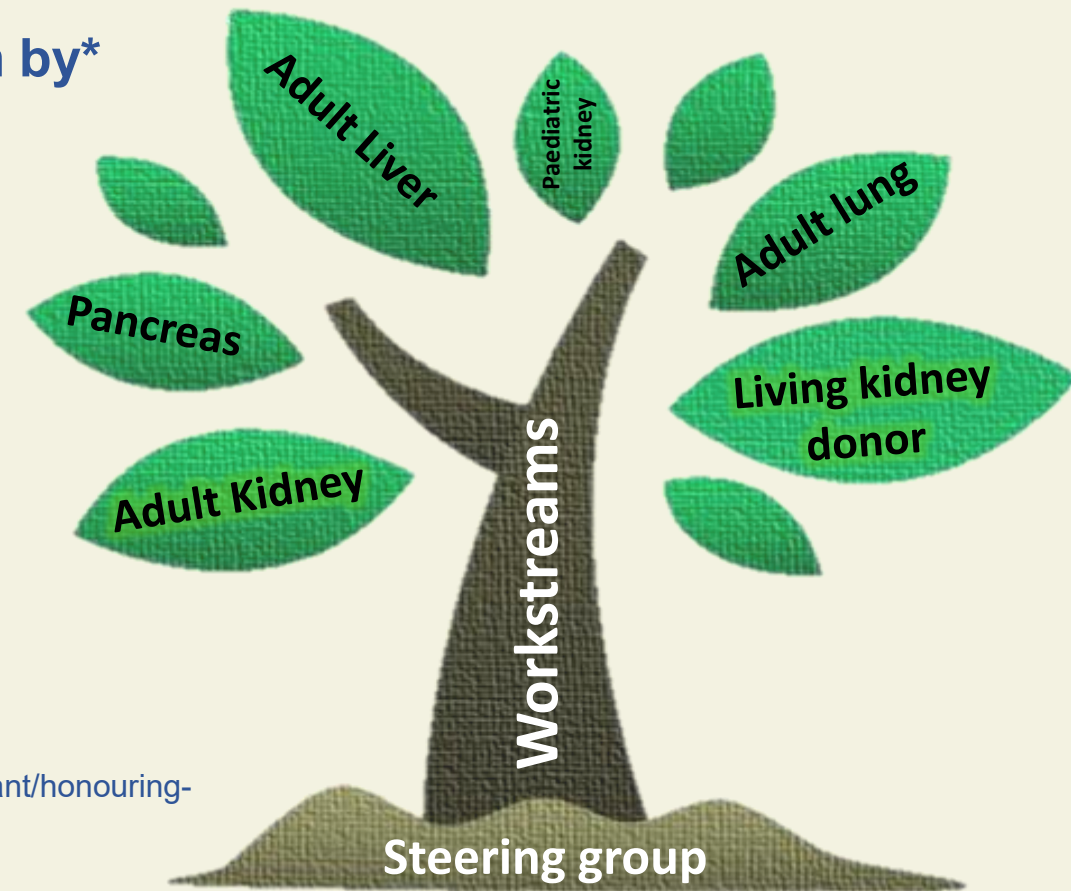
There is much controversy regarding enhanced recovery for recipients of liver transplants from deceased and living donors. The objectives of this Review were to summarise current knowledge on individual enhanced recovery elements on short-term outcomes, identify key components for comprehensive pathways, and create internationally accepted guidelines on enhanced recovery for liver-transplant recipients. The ERAS4OLT.org collaborative partnered by the International Liver Transplantation Society performed systematic literature reviews on the effect of 32 relevant enhanced perioperative recovery elements on short-term outcomes, and global specialists prepared expert statements on deceased and living donor liver transplantation. The Grading Recommendations, Assessment, Development and Evaluations approach was used for rating of quality of evidence and grading of recommendations. A virtual international consensus conference was held in January, 2022, in which results were presented, voted on by the audience, and discussed by an independent international jury of eight members, applying the Danish model of consensus. 273 liver transplantation specialists from 30 countries prepared expert statements on elements of enhanced recovery for liver transplantation based on the systematic literature reviews. The consensus conference yielded 80 final recommendations, covering aspects of enhanced recovery for preoperative assessment and optimisation, intraoperative surgical and anaesthetic conduct, and postoperative management for the recipients of liver transplants from both deceased and living donors, and for the living donor. The recommendations represent a comprehensive overview of the relevant elements and areas of enhanced recovery for liver transplantation. These internationally established guidelines could direct the development of enhanced recovery programmes worldwide, allowing adjustments according to local resources and practices.

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The corrected version first appeared at thelancet.com/gastro on Jan 5, 2023
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§members are listed in appendix p 93
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To facilitate a UK-wide roll out of ERAS in Transplantation by*

- Drawing from evidence and existing best practice
- Providing a repository of evidence-based resources to support adoption of ERAS in centres
- Started with adult kidney transplant recipients
- Scope to include other organs and living donors

Key deliverable for the Implementation and Steering
Organ Utilisation (ISOU) Group¹



¹<https://www.gov.uk/government/publications/honouring-the-gift-of-donation-utilising-organs-for-transplant/honouring-the-gift-of-donation-utilising-organs-for-transplant-summary-report-of-the-organ-utilisation-group>

*ERAS Steering Group ToR, May 2023

NHSBT

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Multidisciplinary Steering group

Expert by experience panels

PUBLISHED
Adult kidney
transplant

COMING SOON
Adult liver
transplant

Living kidney
donor

Pancreas
transplant

Lung
transplant

? Paediatric
kidney

Evaluation and measurements

- Interested and participated centres
- Geographically diverse
- Variety of disciplines
- Lay and recipient/donor representation

Transplant recipients and living donors

- Stage 1
 - core and desirable ERAS components with supporting evidence
- Stage 2
 - Downloadable resources for centres
 - Evaluation and measurement criteria
- Stage 3
 - Circulation and communication
 - Patient facing content

PUBLISHED

ODT CLINICAL

Home / Transplantation / Enhanced Recovery After Surgery

Enhanced Recovery After Surgery in transplantation

What is the Enhanced Recovery After Surgery (ERAS) programme?

ERAS is a multimodal perioperative rehabilitation programme with published evidence supporting the benefit it provides for patients and clinicians.

Aim of the programme

By considering ERAS principles in transplantation surgery we aim to improve outcomes for patients and clinical staff in the following ways:

- Empower patients to play a key role in their clinical care
- Reduce the risk of potential post-operative complications, including exposure to hospital acquired infections
- Reduce opioid analgesic requirements and associated complications
- Improve efficiency of bed occupancy and resource utilisation
- Increased autonomy and efficiency for the clinical team

You can find out more about the ERAS programme by reading our [terms of reference](#) (PDF 164KB) 

You can find how-to guidance for organ specific ERAS pathways below.

Transplant specific ERAS pathways

14:11
05/03/2025

This is a test area, if you are looking for the NHSBT website, please go to www.nhsbt.nhs.uk

NHS
Blood and Transplant

Search 

[Home](#) / [Test Area](#) / Adult liver transplant recipient pathway

Adult liver transplant recipient pathway

On this page

Navigate the page using the buttons below

[Pre-operative](#) [Peri-operative](#) [Post-operative](#) [Additional documents and evaluation](#)

Overview

The information below outlines the core and desirable perioperative components to consider when establishing an ERAS service in adult liver recipient transplantation.

Existing protocols from centres with successful ERAS programmes form the basis of these components.

Guidance is grouped by the stages of the patient journey, pre-operative, peri-operative and post-operative care.

Pathway contributors



Overview

The information below outlines the transplant pathway.

Existing protocols from centres

Guidance is grouped by the

Pathway contributors

Pre-operative

Education and

Prehabilitation

Pre-operative

Education and counselling

Core elements include:

- Introduction to principles of ERAS
- Patient education around components of the pre, peri and post-operative period
- Identification of individual circumstances which may pose barriers to recovery and discharge from hospital

Desirable elements include:

- Dedicated ERAS nurse specialist to lead pre-operative education/counselling sessions
- Accessible learning resources - additional languages, adjustments for hearing, visual impairment and neurodivergence
- Provision of a standardised ERAS information/patient shared care plan

www. Link to supporting evidence....

Additional documents

You can use the below downloadable resources to support your adult liver transplant recipient ERAS programme.

- Patient shared care plan (TBC)
- TBC

Centre evaluation document

This framework will support you in evaluating the implementation of your ERAS programme.

» Download evaluation (Word 34KB)

Publications

View the publications relevant for the ERAS programme.

» View publications

[Pre-operative](#) | [Peri-operative](#) | [Post-operative](#) | [Additional documents and evaluation](#)

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[Pathway contributors](#)

Pre-operative

[Education and counselling](#)

[Prehabilitation and patient optimisation](#)

Peri-operative

[Nutrition](#)

[Lines and monitoring](#)

[Anaesthetic conduct](#)

[Fluid administration](#)

[Coagulation strategy](#)

[Surgical conduct](#)

Post-operative

[Early extubation](#)

[Mobilisation](#)

[Nutrition](#)

[Catheter, drain and line removal](#)

[Pain management](#)

[Discharge planning](#)

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eñas^{Tx} Enhanced Recovery After Surgery in Transplantation

ERAS and liver transplant
Getting ready to leave hospital

NHS
Blood and Transplant



Preparing to look after yourself and your new liver

It is important to think about how you will manage being at home and if you will need extra support. Discuss this with your friends, family and nursing staff at an early stage (before the transplant if you can).

Understanding your medication is important to take medications. The team will support you with this. As you prepare to leave hospital, you will be given information about your new liver. It is important to know how to look after it. The team will guide you on the best way to do this.

When you do leave hospital, you will have appointments and your team will be with you day or night. Leaving the hospital can be a bit of a shock. Having a transplant can affect your mood. There are support groups including from local areas that can help you. If you are worried about this, talk to your team.

eñas^{Tx}

Enhanced recovery after surgery



The programme helps you to improve your overall health and recovery. You will be given information about your new liver. It is important to know how to look after it. The team will guide you on the best way to do this.



An enhanced recovery programme can help you to get back to normal faster. If you wish, a friend, relative or carer can also be involved and help you to look after your new liver.



Aiming for certain targets can reduce the likelihood of complications, for example, staying in bed, staying in hospital, staying in the ward, staying in the room, staying in the house, staying in the community, staying in the country, staying in the world.



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eñas^{Tx} Enhanced Recovery After Surgery in Transplantation



Tubes and lines are necessary to help you to move around, and can increase the risk of infection. It is important to know how to look after them. The team will guide you on the best way to do this.

- Drains – tube coming from the back of your abdomen

Where possible, the surgeons will avoid using drains. If you need drains, the team will explain this to you. They may be able to offer you a catheter bag to make it easier for you to move around (ask your team about this).

- Urinary catheter – tube into your bladder

The team will try to remove your urinary catheter as soon as possible. They may be able to offer you a catheter bag to make it easier for you to move around (ask your team about this).

- Nasogastric tube – tube going through the nose down to the stomach

This is put in to empty the stomach. The team may remove it at the end of surgery if possible.

- Other lines – tubes in the neck, wrist and groin

It is necessary to insert lines into your neck or groin to give some types of medicine and to monitor your blood pressure and take blood samples. They will explain the need for any lines to you and aim to remove them as soon as it is safe.

eñas^{Tx} Enhanced Recovery After Surgery in Transplantation

ERAS and liver transplant

What are the main components?

NHS
Blood and Transplant

Eating the right foods to give your body what it needs.

Helping to get ready for surgery and to heal afterwards.

Fewer tubes and lines, and removing them sooner

Keeping well on the waiting list
Early and regular mobility
Building strength and fitness after discharge



Good pain control with fewer side effects

Being better informed about what to expect and how you can help own your recovery

Helping you to prepare for discharge and how to manage at home



- After your transplant operation, the team will aim to get you up and moving as soon as possible. This can often be within the first 24 hours. As you progress, you will be given some information about walking and sitting out in your chair. If you are worried, this will be tailored to meet your needs. All patients are different, and some days may be harder than others as you recover. Don't worry if you don't meet all your targets. Every little helps and each step is important. Just do what you can and keep a record of your progress in your enhanced recovery shared care plan.

- As you continue to recover, the team can give you some simple and safe ways to keep moving and build strength. It is important for you and the health of your liver that you try to begin to rebuild your strength and movement.

eñas^{Tx} Enhanced Recovery After Surgery in Transplantation

ERAS and liver transplant

Keeping you comfortable and moving

NHS
Blood and Transplant



The way we manage pain to keep you comfortable and to minimise side effects from drugs.

- After a liver transplant operation, it is expected that you will have some discomfort, particularly around your wound as you recover. There are lots of ways the team can support you to make sure this is as manageable as possible.
- You can use these three questions to guide you;
 - Can you cough?

This suggests that your pain is not well managed. It may slow your recovery. Let the transplant team know how you feel, especially around your wound. You can keep comfortable, including hot and cold packs.

For pain relief, but over time they can build up. They may cause constipation and drowsiness. We have a PCA (patient-controlled analgesia) pump that can offer you other pain relief, with fewer side effects.

ERAS and liver transplant

Fewer tubes and lines and removing them sooner

NHS
Blood and Transplant

Drains can be uncomfortable, make it more difficult for you to move, and increase the chance of infections. You can play a role in your recovery by encouraging the team to be as soon as it is safe to do so.

Drains near your scar that drains fluid from the operation. The team will aim to avoid drains altogether. If drains are needed, they will try to limit how many drains, the team will monitor them closely and aim to remove them as soon as possible.

Drains to your bladder, to pass urine into your bladder. The team will try to remove your urinary catheter as soon as possible after the transplant operation. If your catheter is not working, they will explain this to you. They may be able to offer you a different type of drainage bag to make it easier for you to move around (ask your team about this).

Drains through the nose down to the stomach. The team may remove it at the end of surgery if possible.

Drains in the neck, wrist and groin

It is necessary to insert lines into your neck or groin to give some types of medicine and into your wrist to monitor your blood pressure and take blood samples. They will explain the need for any lines to you and aim to remove these as soon as it is safe.



Enhanced Recovery After Surgery in Transplantation



Blood and Transplant



Enhanced recovery after surgery for liver transplant recipients

Patient shared care plan

Page | 1

When you wake up after your transplant (the first 24hrs or so), the team will help you with these activities

Positioning
Try to sit up

Breathing exercises

Stand and step

Every day in ICU

Positioning
Try to sit up in bed

Sitting out in your chair
The team will help you to sit out in a chair if you are able

Walking
The team will help you to stand and step on the spot or walk short distances if you can

Recording your progress

Breakfast	Snacks / nutritional drinks
.....	
Lunch	
.....	
Evening meal	
.....	

How many walks did you manage today? Walks Metres

How much time did you spend sitting in your chair? Minutes

What was your pain control like today? (Please circle)

Pain score - 0 no pain 1-3 mild pain 4-6 moderate pain 7-10 severe

Did you make any progress today? Is there anything making this difficult? Talk to the team.

On the transplant ward

You will usually be encouraged to drink to keep well hydrated. If you are struggling, let the nurses know. Sometimes you need to aim for a particular amount each day. If so, we will explain why this is needed.

Nutrition is an important part of your recovery. Your body needs more food than usual to heal. Snacks between meals can help. You may need nutritional drinks or tube feeding if you are not able to eat enough. Try to record what you are eating on the daily progress pages.

Try to increase your mobility each day if you can. Some days may be easier than others. The nurses and physiotherapy team will support you to meet your individual targets. Use this shared care plan to record your progress on the daily progress pages.

It is still important to be able to take deep breaths, cough and move around. If pain is making this difficult, talk to the team. We have many methods of pain relief we can try, including hot and cold packs. Try to record your progress on the daily progress pages.

By now, your catheter will probably have been removed. If you still need a catheter, the team will discuss this with you. If you are not sure of the plan for this, just ask the transplant team on ward round. A leg bag can help to make it easier to move around - ask the nurses.

You may still have a drain in, we will try to remove this as soon as possible. Feel free to ask the team about this. The nurses can help you to look after your drain and can help to make it easier to move around.

On the ward, the team will start educating you about your new medications. This is an important step to help you to prepare for when you are discharged from hospital. They will give you information on how to look after your liver and how to help prevent complications.

On the transplant ward

Breathing exercises

Try to sit in chair

Day of Transfer to ward

Sitting out in chair

Walks

Exercise Programme

Prehab

Nutrition and exercise

Cardiovascular Exercise

Cardiovascular exercise is any activity that increases your heart rate and breathing rate. It can include activities such as walking, jogging, cycling, swimming, dancing, or using a rowing machine.

General guidelines recommend 150 minutes of moderate intensity cardiovascular exercise per week to improve your heart and lung function. Moderate intensity is when you're breathing rate is increased but you are still able to hold a conversation. Please see the rate of perceived exertion (RPE) chart below which provides a guide to activity intensity.

Research which specifically looks at patients waiting for a liver transplant suggests that even short bursts (less than 5 mins) of moderate intensity physical activity can help keep you stronger. Something is always better than nothing, therefore starting small and building up can really help you improve your function and overall well-being.

Always consider safety when choosing what type of exercise to do. If you have trouble with your balance, it may be safer to use a stationary bicycle. If you have pain in your joints, you may find it better to carry out a low impact form of exercise such as swimming or cycling.

Measuring your level of intensity with exercise

Exercises should make you feel breathless. This is good! You may feel slightly warmer, or that your heart rate has increased, this is normal.

A simple guide to the level of intensity to aim for

Rating	Exertion Level
6	
7	Very, very light
8	Very light
9	
10	
11	
12	
13	Fairly hard
14	
15	Hard
16	
17	Very hard
18	
19	
20	Maximal effort

INCREASE LEVEL
You are able to talk freely and easily in full sentences.

AIM HERE
You can still talk but this may be paused once or twice.

SLOW DOWN
You are unable to say more than one word without catching your breath.

Strengthening & Resistance Exercises

If you have cirrhosis, you are at high risk of losing your muscle due to the liver not being able to store energy well and instead starting to use your muscle as an energy source. You will have information about your diet and how to help combat that, but it

notice it may become harder to do the day-to-day tasks you would normally be able to do and can start to affect your quality of life and how easily you can socialise with people or complete your usual hobbies. In this booklet we have provided an exercise programme to help you with this.

Start with Level 1 and as the exercises become easier, you can progress to Level 2.

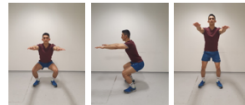
Safety Tip: Only complete the exercises on the floor, if you can safely get yourself on and off the floor Exercise 1: Sit to Stand → Squats

Level 1 - Stand up and sit down slowly from a chair. If able, try not to use your arms.



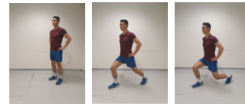
Level 2 - Keeping your back straight. Bend your knees and move your bottom back. Then return to standing slowly.

Reach your hands out and stick your bottom back. Go down as far as you can, just above 90 degrees and return to standing. Ideally, sit back into your heels and then come back up.



Exercise 2: Static Lunges → Dynamic Lunges

Level 1 - Start standing with your feet together, and step forwards letting your back knee drop towards the floor. Ensure that your front knee does not go beyond your toes and keep your back straight. You can hold onto a rail.



Letting your back knee drop
3 your toes and keep your back

right in each hand. Step forwards
neutral with your feet together.



Level 1 - Step both feet onto the step and then step both feet back down. If you need, you can lightly hold a handrail for balance. Try to alternate which foot you step up with first.
Level 2 - As above but holding weights in your hands to make it harder or step onto the 2nd step.



Level 1 - Step both feet onto the step and then step both feet back down. If you need, you can lightly hold a handrail for balance. Try to alternate which foot you step up with first.
Level 2 - As above but holding weights in your hands to make it harder or step onto the 2nd step.

Rehab

Nutrition and exercise

Keeping moving and rebuilding strength after your Liver Transplant

This booklet aims to provide advice and education to guide your recovery and rehabilitation following a Liver Transplant, so you can rebuild your strength and fitness to help you get back to doing the things you want to do more quickly and live an ongoing healthy life with your new liver. Here you will find specific exercises, as well as tips on how to improve your general levels of physical activity and eat well to help your body to recover and build strength.

Safety Advice

If you feel unwell with any of the following, take a rest day and do not return to exercise until you feel better:

- a bad cold, flu, a high temperature, feeling very tired or generally unwell
- any injury to a muscle or joint
- acute episode of arthritis in ankles knees or hips.

Stop immediately if while exercising you experience any of these:

- chest pain
- dizziness
- extreme shortness of breath.

If you experience chest pains or extreme shortness of breath that does not go away when you stop exercising, please call an ambulance.

Avoid abdominal exercises or heavy lifting for 6-8 weeks post-surgery. This should include lifting anything heavier than the weight of a full kettle to minimise excessive discomfort and pain.

Getting started

You may have had a long or a short stay in hospital so you may have already been doing a lot of walking and exercises in hospital, or you may still be needing to use a walking stick or need some help with your day-to-day tasks. It is important that whatever level you start from that you are trying to increase your activity levels daily until you can return to your previous level of function.

Weeks 1 to 2

Try to do some daily outdoor walking if you are able, you could start with 5-10 minutes twice a day and build up from there. If you are already able to manage this then you could aim for 20-30 minutes. You can also continue with the strengthening exercises you received in hospital.

Weeks 2-8

Aim to be doing some more brisk walking, including some hills so you start to challenge your breathing. You may want to progress your exercises to the ones below, aim to do these 2-3 times per week.

Weeks 8+

Aim to be thinking about returning to some regular cardiovascular exercise and strengthening exercises. This could be returning to cycling or swimming or going to a local gym.

If you have cirrhosis, you are at high risk of losing your muscle due to the liver not being able to store energy well and instead starting to use your muscle as an energy source. You will have information about your diet and how to help combat that, but it

Reach your hands out and stick your bottom back. Go down as far as you can, just above 90 degrees and return to standing. Ideally, sit back into your heels and then come back up.



Exercise 3: Step Ups



Level 1 - Step both feet onto the step and then step both feet back down. If you need, you can lightly hold a handrail for balance. Try to alternate which foot you step up with first.
Level 2 - As above but holding weights in your hands to make it harder or step onto the 2nd step.

It is important to progress your activity after your Liver Transplant to optimise your recovery. A graded exercise programme will help progress your strength, function and level of fitness, in a safe and measured approach. This will also help to minimise the risk of post-operative complications.

This booklet covers exercise and activity guidance for:

- Weeks 1-6 after your liver transplant
- Weeks 6-12 after your liver transplant
- Weeks 12+ after your liver transplant

Advice and Activity Once You Return Home

Weeks 1-6

It is important to maintain your level of physical activity and function once you return home, in order to optimise health benefits. This may include:

- An increase in bone density
- An increase in muscle strength, mass and function
- An increase in flexibility
- Supporting your mental health

Following a progressive walking programme will contribute to your overall health as your strength and stamina will begin to slowly improve. Start with short 5-10 minute walks twice daily and gradually increase the time spent walking each week. Providing you are medically well, you should be able to walk for around 30-45 minutes daily at week 6. An example of how you might increase your walking is detailed on the next page.

Setting daily activity targets will help minimise any sedentary behaviour. This may include breaking up the time you spend sitting for 1 minute, every hour.

Example: Progressive Two-Week Walking Programme

Example of a weekly movement plan

Week 1	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Walking Time	12 min	12 min	15 min	12 min	12 min	15 min	12 min
Week 2	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Walking Time	15 min	15 min	17 min	15 min	15 min	17 min	15 min

your back knee drop
down and keep your back

each hand. Step forwards
with your feet together.



NHSBT

Derek Manas, Medical Director
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Multidisciplinary Steering group

Expert by experience panels

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transplant

Adult liver
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COMING SOON

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Pancreas
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- Additional resources

? Heart
transplant

? Living donor
liver

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**Ben Stutchfield, Aubrey McCallum,
Catherine McAnenny**
Royal Infirmary of Edinburgh

**Experts by
experience panel**

Erica Fairburn

Jayne Pilkington

Nathen Raffle

Sarah Barker

Katherine Walcot

**Thank
you!**

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