University Hospitals Birmingham NHS
NHS Foundation Trust

ACORN
Assessment of Chronic Opioid Risk using Neurobiology

UNIVERSITY OF BIRMINGHAM

ACORN Study Patient Information Sheet

Title: Brain biomarkers and patient phenotype to identify vulnerability in acute and chronic post-surgical pain and persistent opioid use.

INVITATION

You are being invited to take part in a clinical research study carried out at University Hospitals Birmingham. Before you decide whether or not you wish to take part, you should read the information provided below carefully. You may also wish to discuss it with your family, friends, or GP. Feel free to ask us any questions - there is no pressure to decide straight away It is important that you fully understand the risks and benefits of participating in this study so that you can make a decision that is right for you. This study is entirely voluntary. If you choose not to take part, or later change your mind, it will not affect the care you receive. You should feel confident you fully understand the purpose of the study, what participation involves, and which parts of the study are optional before giving consent.

WHAT IS THE PURPOSE OF STUDY?

We are trying to determine if it is possible to examine a patient's brain activity, mental state, and metabolism before surgery and predict who is more likely to experience greater pain and discomfort and more prone to opioid usage. From these results, we hope to develop a simple test that can warn us about patients who are at high risk of pain and discomfort after a medical procedure.

WHY HAVE I BEEN CHOSEN?

You have been invited because you are scheduled to undergo surgery at one of the participating hospitals. We are inviting patients undergoing different types of operations, both elective and emergency. You must be aged 18 or older and able to give informed consent.

DO I HAVE TO TAKE PART? / WHAT WILL HAPPEN IF I DON'T WANT TO CARRY ON IN THE STUDY?

It is up to you to decide whether or not to take part. If you decide to take part, you will be given this information sheet to keep and offered as ample time for consideration before you provide written consent. This ensures you have time to consider your decision, ask questions, and discuss it with others if you wish. Even after giving consent, you can change your mind and stop taking part at any time without giving a reason.

Withdrawing will not affect the medical care you receive now or in the future. If you choose to withdraw from the study, we will continue to use the data and any samples collected up to that point. This is in line with UK research governance and ethics guidelines and is part of standard practice for ensuring study integrity. This will be clearly explained in the consent form.

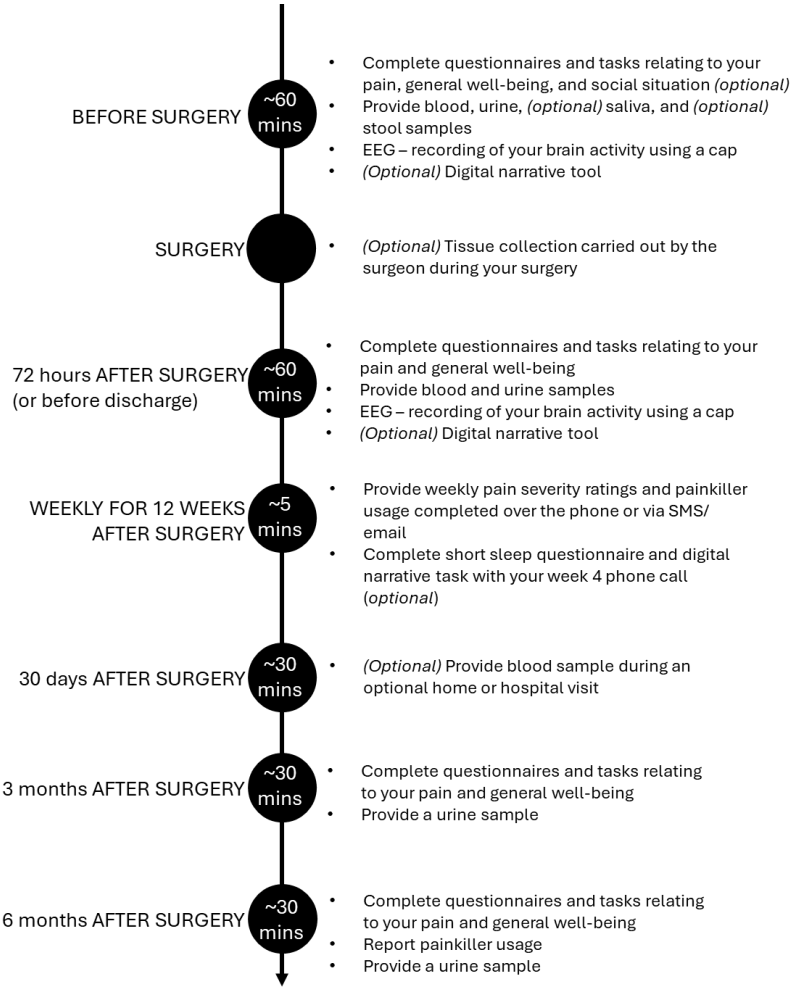
You may change your mind at any time (before the start of the study or even after you have commenced the study) for whatever reason without having to justify your decision and without any negative impact on the care you will receive from the medical staff.

ACORN STUDY SUMMARY

The ACORN study aims to better understand how people recover from surgery by exploring the relationship between physical pain, general well-being, biological and neurological markers over time. By collecting biological samples (such as blood, urine, and saliva), brain activity measurements (EEG), and regular questionnaires, the ACORN study hopes to identify patterns that may help predict which patients are more likely to experience ongoing pain, slower recovery, and persistent use of opioids. Our overall goal is to improve future care and outcomes for individuals undergoing surgery.

SUMMARY OF STUDY TIMELINE AND PROCEDURES

If you consent to take part in the study, you will be asked to complete the following:



WHAT BLOOD SAMPLES WILL BE COLLECTED AND WHY

We will collect small blood samples (up to 70ml) at certain points during the study. Where possible, we will collect blood at the same time as your routine hospital tests to avoid extra needle pricks. The samples will be carefully prepared using BD vacutainers and frozen for analysis. These may include whole blood, plasma, serum, and certain immune cells.

We will take blood samples:

- Before your surgery
- Again, before you leave the hospital
- **Optional**: You will be invited to give an extra blood sample around 30 days after surgery. If you agree, you will be invited to attend a hospital visit with travel expenses reimbursed. In certain cases, a home visit can be arranged if necessary. Visits will be conducted by a trained member of the research team.

Please note: To ensure accurate analysis, your blood sample needs to reach the University of Birmingham laboratories within two hours of collection. Because of this, the optional 30-day home visit will need to be carefully planned by the study team. We will assess whether it's practical to collect this sample based on your location and availability arrangements.

What is electroencephalography?

Electroencephalography (EEG) is a safe and non-invasive way to record the electrical signals produced by your brain. By placing a cap covered in small electrodes on your head it will be possible to detect tiny electric changes that occur in your brain as it is working away. For this test, you will simply be asked to sit comfortably, relax, and close your eyes for a few minutes. The process takes about 10 minutes and involves no discomfort.

Please note: If any incidental findings are found in your EEG recordings that may have clinical significance a qualified neurologist will review the results. If appropriate, this will be discussed with you and your GP, in line with your preferences and standard NHS safeguarding procedures.

With your permission, we will obtain information about how you are recovering from the surgery from the following sources:

- Your medical records specifically pertaining to the surgery held by your hospital
- Your medical records specifically pertaining to the surgery stored in NHS data centres

What are the questionnaires?

The questionnaire we will ask you to fill out are the following:

1. *The Brief Pain Inventory:* A quick survey to help us understand the severity of any pain you might be experiencing and how it may be affecting your daily life. You'll be asked to complete a short pain score questionnaire each week for 12 weeks, starting from the day of your surgery

2. *The Neuropathic pain Scale*: A quick survey to help us understand the 'type' of pain you might be experiencing.

3. *Hospital Anxiety and Depression scale (HADS)*: A quick survey for us to assess your mental health depression and anxiety in the hospital setting

4. *EQ-5D-5L*: A quick survey for us to assess how you are generally feeling and your wellbeing in daily life.

5. *The Online Ambiguous Scenarios Task:* This is an online tool that measures how people interpret unclear situations. It presents a series of scenarios that can be understood in different way.

6. *PCS questionnaire:* This is a short questionnaire that asks about the kinds of thoughts and feelings you might have when you experience pain. It helps us understand how people think about and cope with pain.

7. *(Optional) Pittsburgh Sleep Quality Index (PSQI)*: This is a short questionnaire that asks about your sleep over the past month—things like how long it takes you to fall asleep, how well you sleep, and how tired you feel during the day. It helps us get a better picture of your overall sleep quality.

8. *(Optional)* Social Determinants of Health Questionnaire: This is a short questionnaire that asks about housing stability, income, education, and access to healthcare.

Please note: We may send you text messages using a secure service called FireText to remind you about study activities, like questionnaires or sample collections. You will only be contacted if you agree, and your information will be kept private. If you don't use a mobile phone, or would otherwise prefer to, we will contact you by phone call or email instead.

OPTIONAL TISSUE SAMPLE DURING SURGERY

A small tissue may be taken during surgery but ***only if you agree to this in the consent form***. This will include a small piece of skin, fat, and muscle from the surgical incision site. The sample will be no wider than 0.5 cm and will be taken by your surgeon during the operation, ensuring it does not interfere with your care or wound healing. Because the site is already being accessed during surgery, this poses minimal additional risk. The tissue will be used to study biological factors that may influence recovery, such as inflammation and healing. All samples will be handled in accordance with the Human Tissue Act and may be stored for future ethically approved research. Participation in this part of the study is entirely optional.

What is an interactive digital data collection tool
You will be able to speak to an interactive digital data collection tool as part of this study at different time points (before surgery, 72 hours after surgery). The interactive digital data collection tool is a computer program designed to process and respond to what you say. When you talk, your speech will be recorded and converted into text so the chat box can understand and respond appropriately. This will help us learn more about how you're feeling before and after your surgery.

WHAT ARE THE RISKS OR HARMS OF PARTICIPATING IN THIS STUDY?
Taking part in this study is not expected to cause you harm. Your medical treatment will continue as usual, and there is no experimental intervention involved. However, as with any study involving sample collection, there may be minor risks. These include temporary discomfort, bruising, or swelling at the site of a blood draw or tissue sample. In rare cases, there may be a small risk of infection or bleeding. However, the site and method of sample collection will be carefully reviewed by your surgical team. They will not approve any procedure that poses any undue risk, and nothing will go ahead without your full agreement, as tissue sample collection is entirely optional. You will have the chance to discuss the procedure and ask questions before deciding whether you wish to take part. All procedures will be carried out by trained professionals and all necessary precautions will be taken to ensure your comfort and safety.

DIGITAL TOOLS AND DATA PROTECTION
As part of the study, you may be invited to use a secure online tool that asks open-ended questions about your thoughts and feelings before surgery. This tool is for research only — it won't offer medical advice or monitor you in real time. Your answers will not include your name or any identifying details. No personal data or IP addresses are collected. All information is encrypted and stored securely on UK-based systems that meet strict data protection standards. After collection, your responses will be transferred to the University of Birmingham for research use only. Some responses may be analysed using computer-based tools (AI), but this will be done anonymously. No data will be used to train commercial AI, and any temporary copies stored on external systems will be deleted after transfer.

WHAT ARE THE POSSIBLE BENEFITS OF TAKING PART?
Whilst there are no immediate benefits to you, you may find it interesting to learn about the study results. The information gained from this study will help us to better understand pain and recovery after surgery, which may improve care for future patients.

WILL THERE BE ANY FINANCIAL REIMBURSEMENTS FOR TAKING PART IN THIS STUDY?
No financial payments or reimbursements will be received for taking part in this study.

WHAT IF THERE IS A PROBLEM?
If you have any concerns or questions about the study you can speak to a member of the research team in the first instance.

If you're not satisfied with the response and wish to make a complaint, you can contact:

Patient Advice and Liaison Service (PALS)
Queen Elizabeth Hospital Birmingham
Mindelsohn Way, Edgbaston, Birmingham, B15 2GW
Tel: 0121 371 3280
Email: **PALS@uhb.nhs.uk**

If you have a concern about how your personal information is being handled, you can contact:
University of Birmingham Data Protection Officer
Email: **dataprotection@contacts.bham.ac.uk**

WILL MY TAKING PART IN THIS STUDY BE KEPT CONFIDENTIAL?

We will need to use information from your medical records for this research project.

This information will include your [initials/ NHS number/ name/ contact details.
Only authorised members of the research team will be able to access and use this information to do the research or to check your records to make sure that the research is being done properly. Your data will be **pseudonymised**, meaning it will be stored using a unique study ID instead of your name, and is assigned upon consent and will function as your primary identifier for the research team. Your data will have our study's reference number instead.

All study data will be securely stored on a password-protected research database called REDCap, hosted by the University of Birmingham. Collaborators from the University of Birmingham (e.g., doctors, research nurses, physiotherapists, statisticians) will also have access to this data, and members of the Research Ethics Committee (REC) and Health Research Authority (HRA) may need access to ensure the study is conducted in accordance with their approval.

Questionnaire data will either be entered directly or securely transcribed. EEG data will be pseudo-anonymised and stored on secure University of Birmingham servers. These will then be coded and stored only using encrypted computers, complying with data governance laws. Furthermore, as part of the study, some participants may be invited to contribute a short audio narrative describing their mental state before surgery. These recordings, collected using a digital narrative tool (AI chat bot), will be transcribed and securely stored in line with University of Birmingham protocols. All research members involved with participant data will be bound by the same duty of care and trained appropriately.

The raw data from this study will be retained for up to 10 years after completion on the Birmingham Environment for Academic Research (BEAR) secure server, in line with hospital protocol. Your pseudonymized data may also be shared with students, collaborators of the investigators, and the UK Data Archive.

We will keep all information about you safe and secure. Some of your information will be sent to other international collaborators. They must follow our rules about keeping your information safe.

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no one can work out that you took part in the study.

WHAT WILL HAPPEN WITH THE RESULTS OF THE STUDY?

The data may be published in peer reviewed journals and presented at meetings. You will be informed about the publication of results by either letter/email with a free link to the study. No individual will be identified in any publication.

Once we have finished the study, we will keep some of the data so we can check the results. This data may also be shared with other approved researchers for future studies, but only in a way that ensures you cannot be identified.

WHAT ARE YOUR CHOICES ABOUT HOW YOUR INFORMATION IS USED?

You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have. If you choose to stop taking part in the study, we would like to continue collecting information about your health from your hospital. If you do not want this to happen, tell us and we will stop. If you lose capacity to give consent, we will keep information about you that we already have but will not collect further data.

We need to manage your records in specific ways for the research to be reliable. This means that we will not be able to let you see or change the data we hold about you. If data is used for future research this will be only if you agree to take part in this study, you will have the option to take part in future research using your data saved from this study.
We will share your anonymized data with other researchers or institutions outside the UK to help us better understand pain and opioid usage. This could include combining your data with findings from other studies to explore possible new markers for pain or enhance existing research. These researchers will follow strict guidelines to protect your data. Your information will remain anonymous, and you will not be identifiable in any published results or future analysis,

- **Specialized Expertise**: Access to researchers with unique expertise, techniques, or analytical approaches not available in-house
- **Advanced Equipment**: Use of high-end or specialized equipment or software that may not be available or affordable locally.
- **Collaborative Insights**: Enabling multidisciplinary collaboration that enriches the analysis with diverse perspectives and methodologies.
- **Data Validation**: Cross-checking results with independent research teams to enhance reliability and objectivity.
- **Resource Efficiency**: Reducing costs and time associated with in-house analysis when outsourcing is more efficient.
- **Broader Comparative Analysis**: Allowing data to be integrated into larger, multi-national studies that require a diverse data pool for broader scientific insights.

If your data is shared outside the UK, it will be with Academic institutions part of the Wellcome Leap Untangling Addiction Program. We follow strict rules about who can access your information, how it is stored, and how it may be used in future research. Anyone who accesses your data outside the UK must do what we tell them so that your data has a similar level of protection as it does under UK law. We will make sure your data is safe outside the UK by doing the following:

- (some of) the countries your data will be shared with have an adequacy decision in place. This means that we know their laws offer a similar level of protection to data protection laws in the UK
- we use specific contracts approved for use in the UK which give personal data the same level of protection it has in the UK. For further details visit the Information Commissioner's Office (ICO) website
- we do not allow those who access your data outside the UK to use it for anything other than what our written contract with them says
- we need other organisations to have appropriate security measures to protect your data which are consistent with the data security and confidentiality obligations we have. This includes having appropriate measures to protect your data against accidental loss and unauthorised access, use, changes or sharing
- we have procedures in place to deal with any suspected personal data breach. We will tell you and applicable regulators when there has been a breach of your personal data when we legally have to. For further details about UK breach reporting rules visit the Information Commissioner's Office (ICO) website

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study. We will keep your study data for up to 10 years in line with NHS and University of Birmingham research governance policies. This allows enough time to analyse the results, publish findings, and respond to any regulatory or audit requirements. After this period, the data will either be fully anonymised and securely archived or permanently deleted, depending on the guidance at that time.

WHO HAS SPONSORED, INSURED AND FUNDED THIS STUDY?

This study is sponsored by the University of Birmingham and is funded by the Wellcome Leap.The University of Birmingham has in place Clinical Trials indemnity coverage for this trial which provides cover to the University for harm which comes about through the University's, or its staff's, negligence in relation to the design or management of the trial and may alternatively, and at the University's discretion provide cover for non-negligent harm to participants. With respect to the conduct of the trial at Site and other clinical care of the patient, responsibility remains with the NHS organisation responsible for the clinical site and is therefore indemnified through NHS Resolution. The University of Birmingham is independent of any pharmaceutical company, and as such it is not covered by the Association of the British Pharmaceutical Industry (ABPI) guidelines for participant compensation. The NHS have a duty of care to participants whether or not the participant is taking part in a clinical trial and the normal NHS complaints mechanisms will still be available to you.

WHERE CAN YOU FIND OUT MORE ABOUT HOW YOUR INFORMATION IS USED?

You can find out more about how we use your information

- at www.hra.nhs.uk/information-about-patients/
- by asking one of the research team by emailing thoracicresearch@uhb.nhs.uk
- by sending an email dataprotection@contacts.bham.ac.uk

WHO HAS REVIEWED THIS STUDY?

This study has been reviewed and given a favourable opinion by the Research Ethics Committee (REC) and Health Research Authority (HRA).

CONTACT FOR FURTHER INFORMATION

For additional information now or any future time please contact:

Acorn Central Research Team
Email - thoracicresearch@uhb.nhs.uk
Telephone - 01213714228
Mo 07826533088

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STUDY SUMMARY:

Here is a summary of what we'll ask you to do if you decide to take part. Please note: Some parts of the study are essential (mandatory) for taking part, while others are optional. You can still participate in the study even if you decide not to take part in the optional parts. These are clearly marked below

TIME POINT	WHAT YOU WILL BE ASKED TO DO	ESTIMATED TIME TO COMPLETE
Before surgery	MANDATORY: (1.) Complete a set of questionnaires about your pain, mood, and general health (2.) Give a blood and urine sample (3.) EEG recording (4.) Complete a short cognitive task	~ 60 minutes
	OPTIONAL: • Complete an interactive digital data collection tool (optional) • Sleep (*optional*) • Social factors (*optional*) • Saliva (*optional*) • Stool (*optional*)	~ 30 minutes
During Surgery	OPTIONAL: • Tissue sample (a small piece of skin, fat, and muscle) during surgery (*optional*)	N/A
Within 6 days post-surgery	MANDATORY: (1.) Repeat the same set of questionnaires as before (2.) Give further blood and urine samples (3.) Repeat EEG recording (4.) Complete a short cognitive task	~ 60 minutes
	OPTIONAL: • Complete an interactive digital data collection tool (optional)	~ 10 minutes
Week 1 to week 12 after surgery	MANDATORY: (1.) Report of weekly pain severity ratings and painkiller usage completed over the phone or via email or SMS each week.	~ 5 minutes
	OPTIONAL: • Short sleep questionnaire (Pittsburgh Sleep Quality Index) completed with your week 4 phone call (*optional*)	~ 10 minutes
30-days after surgery (optional)	OPTIONAL: (1.) Complete an interactive digital data collection tool (optional) Give blood samples (*optional*)	~ 10 minutes
3-months after surgery	MANDATORY: (1.) Complete a short cognitive task (2.) Provide a urine sample	~ 15 minutes
6-months after surgery	MANDATORY: (1.) Complete a short cognitive task (2.) Provide a urine sample (3.) Report your pain severity rating (4.) Report your painkiller usage	~ 25 minutes