STUDY PROTOCOL

Full Title:

The role of an implantable Doppler vascular monitoring device in kidney transplant patients: a feasibility randomised controlled trial with an embedded qualitative study.

Short Title:

Continuous Implantable Doppler probe monitoring in renal transplant (CONDOR Study)

CONDOR STUDY

Version: 1 (final) Date: 07/12/2021

IRAS Project ID: 302833
ISRCTN Number: 40726
Sponsor: UHPNT
Sponsor's Number: 21/SUR/626
FUNDER: Renal Department UHPNT

This protocol has regard for the HRA guidance and order of content

This describes the study and provides information about procedures for entering participants. Every care was taken in its drafting, but corrections or amendments may be necessary. These will be circulated to investigators in the study. Problems relating to this study should be referred, in the first instance, to the Chief Investigator.

This study will adhere to the principles outlined in the NHS UK Policy Framework for Health and Social Care Research (2017). It will be conducted in compliance with the protocol, the Data Protection Act (2018) and other regulatory requirements as appropriate

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1. SIGNATURE PAGE

The undersigned confirm that the following protocol has been agreed and accepted and that the Chief Investigator agrees to conduct the study in compliance with the approved protocol and will adhere to the principles outlined in the Declaration of Helsinki, the Sponsor's SOPs, and other regulatory requirement.

I agree to ensure that the confidential information contained in this document will not be used for any other purpose other than the evaluation or conduct of the investigation without the prior written consent of the Sponsor.

I also confirm that I will make the findings of the study publicly available through publication or other dissemination tools without any unnecessary delay and that an honest accurate and transparent account of the study will be given; and that any discrepancies from the study as planned in this protocol will be explained.

For and on behalf of the Study Sponsor:

Signature: ..... Date: .....

Name (please print): .....

Position: .....

Chief Investigator:

Signature: *Shahzar Malik* Date: 04/12/2021

Name: Dr M Shahzar Malik

2. KEY CONTACTS

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Mr. Aroori has an interest in research and relevant knowledge of the clinical area.

Sponsor

University Hospitals of Plymouth NHS Trust

Funder

Southwest transplant centre, Derriford Hospital, UHPNT

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3. LIST OF ABBREVIATIONS

AE: Adverse event	AE
Body Mass Index	BMI
British Transplant Society	BTS
Cardiovascular	CVS
Chronic kidney disease	CKD
Diabetes Mellitus	DM
Early graft loss	EGL
End-stage renal disease	ESRD
Health Research Authority	HRA
Hypertension	HTN
Implantable Doppler flow probe	IDP
Kidney Disease Outcomes Quality Initiative	KDOQI
National Health Service	NHS
National Health Service	NHS
National Health Service Blood & Transplant	NHSBT
National Kidney Foundation UK	NKF
NHS Trust R&D Department	R&D
Principal Investigator	PI
Renal replacement therapy	RRT
Research Development & Innovation	RD&I
Research Ethics Committee	REC
Serious Adverse Event	SAE
Serious Adverse Reaction	SAR
Standard Operating Procedure	SOP
UK Renal Registry	UKRR
University Hospitals Plymouth NHS Trust	UHPNT

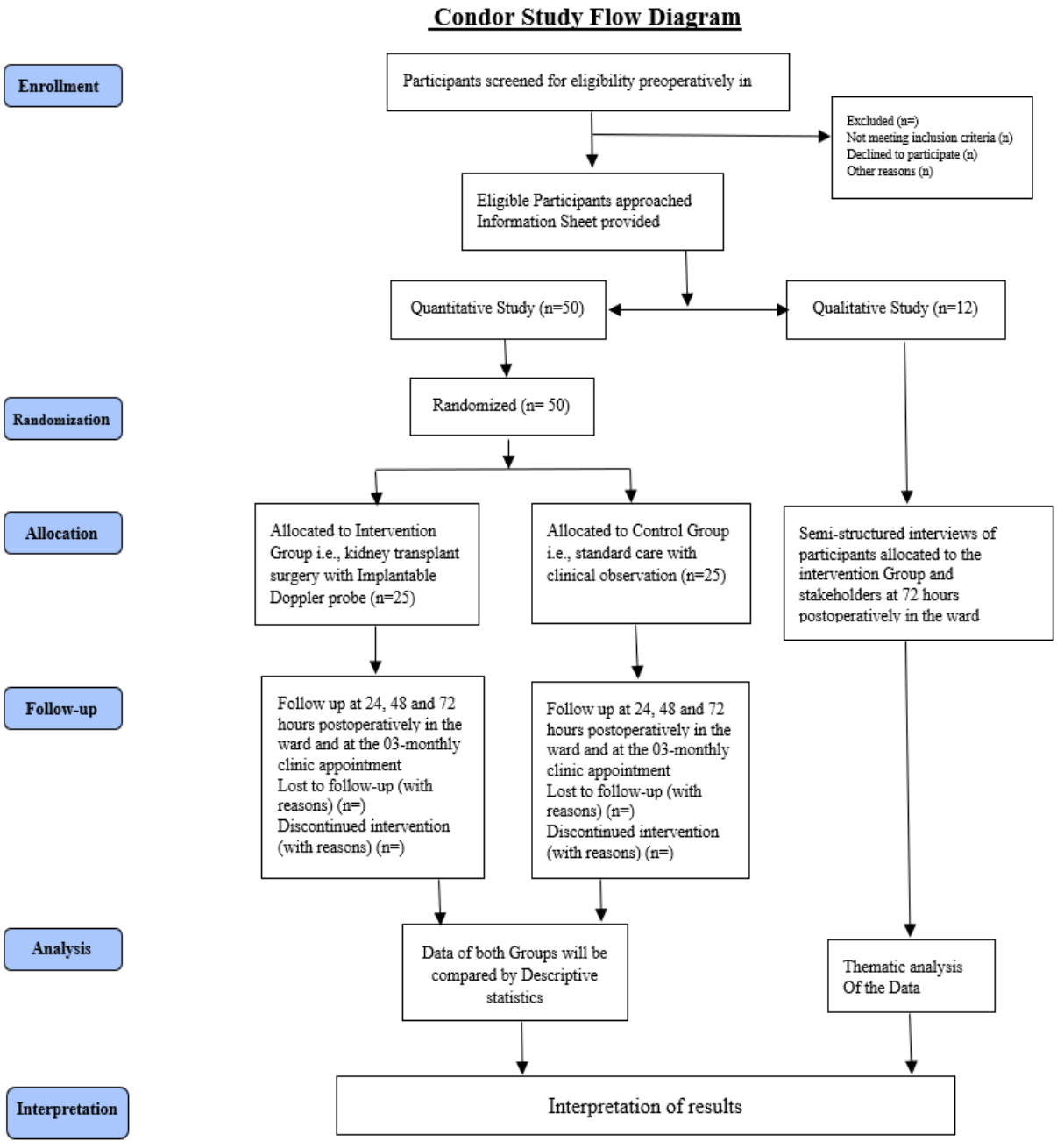
4. STUDY SUMMARY

Study Title	The role of an implantable Doppler vascular monitoring device in kidney transplant patients: a feasibility randomised controlled trial with an embedded qualitative study.
Short title/acronym	Continuous Implantable Doppler probe monitoring in renal transplant (CONDOR Study)
Study Settings	Southwest transplant centre at Derriford Hospital, University Hospitals Plymouth NHS Trust
Study Design	Feasibility randomised controlled trial with an embedded qualitative study
Study Aim	To evaluate the feasibility of an implantable continuous vascular monitoring device in kidney transplant patients and to inform the protocol development of a definitive RCT**.**
Study Objectives	<u>Objectives "1-3" will be met within the feasibility randomised controlled trial:</u> 1. To assess the capability of vascular monitoring device in the early postoperative period of kidney transplant patients. 2. To assess the research methods used to compare vascular monitoring device with the standard care and to estimate surgical outcome measures essential to inform the sample size calculation for the definitive planned RCT. 3. To assess the availability of research resources, management support, potential barriers and challenges for the definitive planned RCT. <u>Objectives "4" will be met within the embedded qualitative study:</u> 4. To assess the acceptability of vascular monitoring device in clinical practice and to acquire suggestions and innovative ideas of the stakeholders on refining the design of definitive RCT, functioning of the implantable vascular monitoring device, and improving postoperative patient care.
Trial Participants	50 kidney transplant patients (25 in the intervention and 25 in the control group)
Inclusion criteria	• Patients who will have deceased or living kidney donor transplants at the Southwest Transplant Center. • Patients aged 18 years or above. • Patients able and willing to comply with the trial requirements.
Exclusion criteria	• Patients who will have a kidney transplant with more than two arteries (evident at the time of surgery). • Patients below 18 years of age. • Patients lacking capacity or unwilling to give consent.

Embedded qualitative study	Using the phenomenology approach, semi-structured interviews with open-ended questions will be conducted with the stakeholders (clinicians, nurses, and kidney transplant patients) directly involved with the implantable vascular monitoring device (n=12). The interviews will be aimed at exploring the experiences of participants (receiving/delivering the intervention) and suggestions of the stakeholders on participating in the study.
Study duration	24 months
Follow up for assessment of outcomes	• In the immediate period after the kidney transplant in recovery, • At 24, 48, and 72 hours postoperatively in the ward • At the three-monthly postoperative clinic visit.
Trial Arms	a) Intervention group: kidney transplant patients with the vascular monitoring device): The kidney transplant patients will receive the Implantable continuous vascular monitoring device surveillance for the first 72 hours in addition to the standard care clinical observation as part of their postoperative care. b) Control group (kidney transplant patients with standard care clinical observation): The kidney transplant patients will receive the standard care clinical observation as part of their postoperative care.
The Outcomes that will be measured to achieve objectives (1-4)	
Objective 1: To assess the capability of vascular monitoring device in the early postoperative care of kidney transplant patients.	a. The number of early vascular complications identified (incidence). b. The period between the graft implantation and diagnosis of vascular complication (early or late). c. The number of departmental ultrasound scans requested in the first 24, 48, and 72 hours postoperatively. d. The 03-month kidney graft survival
Objective 2: To assess the research methods used to compare vascular monitoring device with the standard care and to estimate surgical outcome measures essential to inform the sample size calculation for the definitive planned RCT.	a. Suitability of eligibility criteria and recruitment process. b. Refusal rates for participation and randomization c. Retention and follow-up rates during the research process d. Assessment of the study methods, procedures, and follow-up schedules (researcher and participants) e. Assessment of the procedures for monitoring variation and fidelity in the delivery of the intervention. A fidelity checklist will evaluate the adherence to the standardised protocol of intervention delivery (i.e. consent of the participants, delivery of the intervention, and conduct of the serial Doppler signal monitoring). f. Assessment of the feasibility, appropriateness and performance of the potential outcome measures for the definitive multi-centre RCT. g. Calculation of the means and standard deviation of the outcome

	measures arising from the differences between the intervention and control arm essential to inform sample size calculation for the definitive planned RCT.
Objective 3: To assess the availability of research resources, management support, potential barriers and challenges for the definitive planned RCT.	a) Assessment of ease and simplicity of the participant documentation (i.e. participant information sheet, consent form, data collection sheet) through the study b) Availability of equipment and medical staff in the host centre to handle the number of participants and the research procedures c) Technological capacity for communication and adequate software to randomize, record, process, and store research data. d) Availability of management support for the research project and back up plans for any extenuating circumstances. e) Documentation of any technical glitches or postoperative complications related to application of the monitoring device. f) To explore factors that will enable future economic evaluation of the vascular monitoring device in the definitive planned RCT (i.e. testing procedures that can collect information to inform a cost effectiveness analysis).
5. **Objective 4:** To assess the acceptability of vascular monitoring device in clinical practice and get suggestions on the protocol development of the definitive planned RCT	Exploring the views of stake holders (clinicians, nurses, and patients) regarding receiving/delivering the intervention, participating in the study, and acquiring their suggestions and innovative ideas to improve the design of definitive future RCT, functioning of the implantable vascular monitoring device, or any aspect of postoperative patient care.

6. CONDOR STUDY FLOW DIAGRAM



6.0. BACKGROUND AND RATIONALE

6.1. THE BURDEN OF END-STAGE RENAL DISEASE (ESRD) AND INADEQUACY OF TRANSPLANTABLE GRAFTS

End-stage renal disease (ESRD) is fatal and in the absence of a kidney transplant, around 50% of the ESRD patients perish within five years due to associated complications [1]. The UK Renal Registry's (UKRR) latest published report revealed that the prevalence of ESRD patients on renal replacement therapy (RRT) in the UK has increased from 700 per million population in 2007 to 1000 per million population in 2017. The one-year survival rate of these patients on RRT aged 60-65 is 85% however; it further declines steeply in the older age groups [2]. Haemodialysis (HD) can provide at best 10% solute clearance of normal kidneys yet it is the commonest form of RRT in the NHS [3]. The ESRD patients on HD have a 17-fold increase in mortality compared to age-matched controls from the general population which is mainly due to premature cardiovascular death [4].

Keeping in line with the Kidney Disease Outcomes Quality Initiative (KDOQI) clinical guidelines published by the National Kidney Foundation UK recommend that kidney transplantation is the safest and most dependable form of long-term treatment for ESRD patients [5]. The five-year patient survival amongst the transplant recipients is 87% as compared to 30% for the ESRD on HD.

The NHS Blood and Transplant (NHSBT) annual report (2018-2019) revealed that despite a 2% increase in the number of kidney transplants performed that year, there are still 3952 patients on the National waiting list. This is the second highest in the last decade [6]. The unprecedented cessation of transplant activity in the UK due to COVID-19 Pandemic has further increased the shortage of transplant organs [7].

6.2. PROBLEM OF EARLY GRAFT LOSS (EGL)

About 7-10% of the transplanted kidneys are lost to complications in the first three months after transplantation and is termed as early graft loss (EGL)[8-10]. Vascular complications are one of the contributing factors accounting for 30-35% of EGL [11, 12]. Other studies have reported that vascular complications result in 20% of the total kidney grafts lost during the first 30 days after implantation [13-16].

EGL is a medical catastrophe in kidney transplant recipients with 30-day and 90-day mortality rates of 5.2% and 11.1% respectively [10]. Other studies have reported an increase of 12.28% in the first-year mortality of kidney transplant recipients that suffer EGL. This is due to the physiological stress of returning to dialysis, cardiovascular complications, infections, and morbidity encountered for the removal of the failed graft [14, 15]. Also, EGL is an emotionally devastating outcome for both the patients and the transplant team [17]. About 20% of the National kidney transplant waiting list compromise of the patients that have fallen back after graft loss and activated for re-transplantation that leads to a burden on the limited pool of suitable donor organs [18, 19]. This cascade of complex repercussions also decreases the survival of the patients already present on the transplant waiting list (TWL) who are running out of their dialysis options by increasing the waiting time [19].

6.3. THE PROPOSED TECHNIQUE TO PREVENT THE PROBLEM

Early identification of vascular complications in a kidney transplant is crucial to reduce EGL, as a prompt surgical correction is vital to salvage a compromised graft [20]. However, this can be challenging as in the early stage, the kidney transplant recipients with the vascular complications are clinically asymptomatic and other indicators of graft function like the drop

in serum creatinine level and production of urine are unreliable in most cases [21, 22]. The role of the continuous monitoring of graft perfusion can be paramount in the diagnosis of this complication but as yet, no such surveillance device is formally tested in kidney transplant practice [23].

The implantable Doppler probe is a vascular monitoring device (Figure 1). It produces audible Doppler signals that can be used to monitor blood flow to the attached grafted tissues [20]. Due to the simplicity of its function, it has been used successfully in plastic and breast reconstructive surgery. Following the same principle of vascular monitoring, this device may also be used in kidney transplantation [24-27].

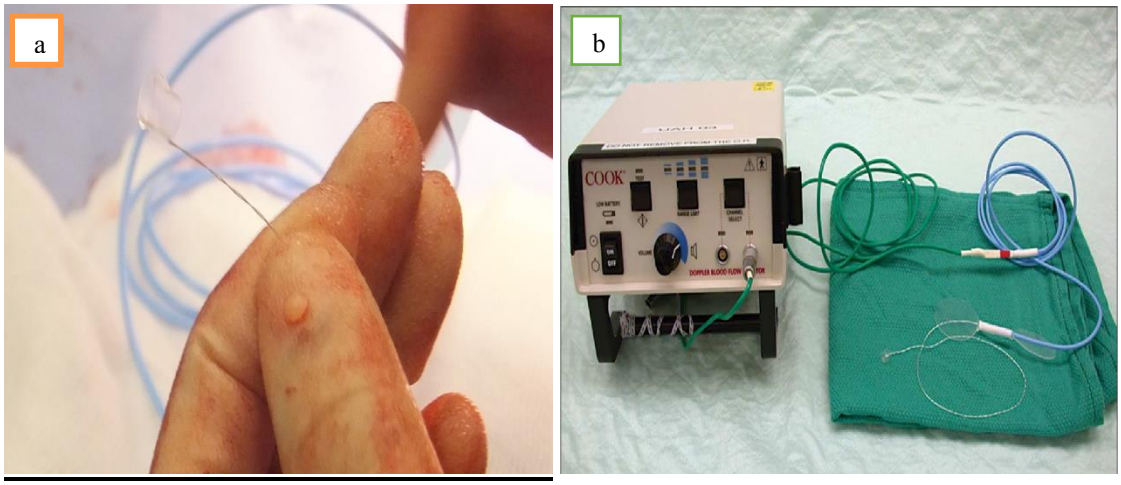


Figure 1: (a) Cook-Swartz® Implantable Doppler flow probe showing silicon cuff and flexible wire in the background (b) Cook-Swartz® Implantable Doppler flow probe, connecting wire and external monitoring device.

During surgery, it can be attached to the blood vessels supplying the graft (renal artery). The kinetic energy of the blood flowing towards the graft is converted into electric energy and translated into audible Doppler signals (Figure 2). The audible signals are produced continuously till the blood flows in the vessels. The audible signals stop as soon as the blood flow is hampered. This **change in the audible signals is the key** that may suggest vascular complications as they hamper blood supply to the graft. Unless corrected immediately the graft hypoperfusion results in loss of the graft due to irreversible ischemic injury. A compromised graft would require immediate re-exploration if the patient is still in the theatre or further confirmatory radiological investigations (Ultrasound, CT Angiogram) in case the patient has returned to the ward.

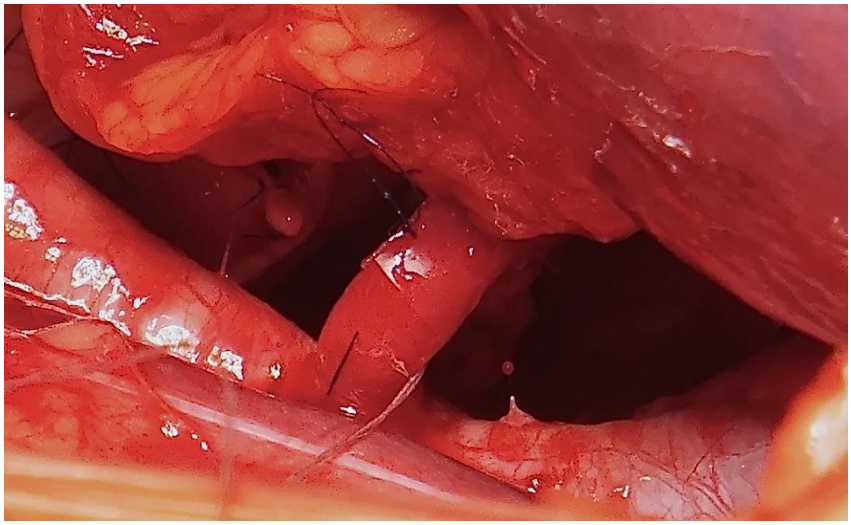


Figure 2: Cook-Swartz® Implantable Doppler flow probe *in situ* around the renal artery

The application of an implantable continuous vascular monitoring device is quite recent in kidney transplantation. There are only two studies in the medical literature on this topic. The first study [28] was an observational study conducted in 2011 while the other [20] was a follow-up case report published in 2016.

Although conducted in London, these uncontrolled studies have limitations in terms of methodological quality, selection bias [29], sustained follow-up [30] sample size [31], level on the hierarchy of evidence in research [32], descriptive clarity of the study protocol [22], and measures taken to reduce confounding factors [33].

Despite the weaknesses, the studies consistently suggest that the monitoring vascular device may have a potential role in kidney transplantation. However, it needs further elaboration and clarity.

6.4. KNOWLEDGE GAP IN EGL:

Presently the clinicians caring for the transplant recipients postoperatively manage them by the standard care clinical observation. They keep a low threshold for requesting departmental ultrasound scans even for a minimal clinical suspicion of graft hypoperfusion however, there is a tendency to miss cases. A departmental ultrasound scan is a non-invasive radiological investigation that detects vascular complications with a sensitivity of 97%. Nevertheless, this investigation has limitations. It is operator-dependent, has patient limitations if the patient has a high BMI or is uncomfortable due to postoperative pain, takes time to be organised and multiple serial scans are required for continuous monitoring which can be administratively difficult [12, 34].

Although not widely used in transplant units across the UK, the implantable continuous vascular monitoring device has been used intermittently in our kidney transplant centre for the last nine years. We availed of this opportunity and conducted a service evaluation by undertaking a retrospective evaluation of the prospectively maintained medical notes to describe and compare clinical outcomes in all patients who underwent kidney transplant surgery at our unit with and without this monitoring device. Despite the methodological limitations, the results of this study were suggestive of the usefulness of the monitoring device.

There is a clinical requirement for a reliable continuous vascular monitoring mechanism in kidney transplant surgery. The literature revealed a lack of information and gaps in the evidence on the possible role of a continuous vascular monitoring device in kidney transplantation. Therefore, we propose feasibility RCT with an embedded qualitative study to inform the local practice and provide preliminary information for the definitive future RCT.

7.0. AIM OF THE STUDY

To evaluate the usefulness of an implantable continuous vascular monitoring device in kidney transplant surgery and to inform the protocol development of a definitive planned RCT**.**

8.0. OBJECTIVES

8.1. OBJECTIVE 1 (FRCT)

To assess the capability of the implantable vascular monitoring device in the early postoperative period of kidney transplant patients.

8.2. OBJECTIVE 2 (FRCT)

To assess the research methods used to compare vascular monitoring device with the standard care and to estimate surgical outcome measures essential to inform the sample size calculation for the definitive planned RCT.

8.3. OBJECTIVE 3 (FRCT)

To assess the availability of research resources, management support, potential barriers and challenges for the definitive planned RCT.

8.4 OBJECTIVE 4 (EMBEDDED QUALITATIVE STUDY)

To assess the acceptability of vascular monitoring device in clinical practice and get suggestions on the protocol development of the definitive planned RCT

9. TRIAL DESIGN

Mixed methodology two-arm feasibility randomised controlled trial with an embedded qualitative study.

10. RECRUITMENT

The participants will be recruited from the patients undergoing kidney transplant surgery at Southwest transplant centre, UHPNT. The transplant surgical fellow will review the patients, recruit the eligible participants and obtain their consent for the study. The normal care pathway followed at our transplant unit is designed in line with the unpredictable nature of the specialty. We are offered organs by NHS Blood and Transplant (NHSBT) from deceased donors with a notice period of 12-14 hours. The kidney transplant recipient is admitted to the hospital about 8-10 hours before the surgery. The patient is prepared and consented to surgery during this interval. The patient is then moved to the operation theatre for implantation. Afterwards, the patient is transferred to the renal ward for postoperative care. All patients receive standard care clinical observation to monitor their graft function. In addition to the standard care clinical observation, the clinician looking after the patients may request additional departmental ultrasound scans in the first 72 hours depending on the graft function and the condition of the kidney transplant recipient.

There will be no difference in the recruitment process, consent, and the postoperative care of kidney transplant patients with the monitoring device or with the standard care clinical observation.

11. TRIAL PARTICIPANTS

The participants of the study will consist of the patients who will have kidney transplant surgery with or without the implantable vascular monitoring device during the study duration at the Southwest transplant centre UHPNT.

12. ELIGIBILITY CRITERIA

12.1. INCLUSION CRITERIA

a. Patients who will have deceased or living kidney donor transplants
b. Patients aged 18 years or above.
c. Patients able and willing to comply with the trial requirements

12.2. EXCLUSION CRITERIA

a. Patients who will have a kidney transplant with more than two arteries (evident at the time of surgery).
b. Patients below 18 years of age.
c. Patients lacking capacity or unwilling to give consent.

13. TRIAL SETTINGS

Southwest transplant centre, University Hospitals of Plymouth NHS trust.

14. DURATION OF THE STUDY

24 months

15. SAMPLE SIZE

This is feasibility RCT; it is not compulsory to perform a formal power calculation. The sample size is chosen based on the practicalities of conducting a feasibility study. The sample size is a realistic recruitment figure for 24 months based on a recent retrospective study conducted at the Southwest transplant centre leading to this research project. The data suggested that about 65-70 kidney transplants were performed annually in our unit. After exclusion criteria, we anticipate that about 100 patients will be available for recruitment in two-year study duration. The data also suggests that in the last five years there were minimal number of kidney transplant patients that opted not to receive additional vascular monitoring or refused participation after their procedure. This allows us the reassurance of minimum dropout rates in the study.

The COVID-19 pandemic has resulted in an unprecedented increase in our kidney transplant activity. It is due to the reason that the Southwest region has remained the least affected in the UK and our transplant centre remained open. On the contrary, most transplant units across the UK had to be closed down due to infection and resource constraints. This led to the increased

diversion of organ resources to the Southwest transplant centre. As a result, our End-stage renal disease (ESRD) patients availed themselves of the opportunity of more graft offers than usual. This allowed us to perform more transplant surgeries as compared to previous years.

The randomised controlled feasibility trial aims to recruit 50 kidney transplant patients within a 24-month period; 25 in intervention group and 25 in control group. In our study, we propose to attach an implantable continuous vascular monitoring device to half (i.e. 25) of the kidney transplant patients (intervention Group) during their surgery. Postoperatively, these patients will receive graft surveillance by the monitoring device in addition to the standard care clinical observation. The other half (i.e. 25) of the kidney transplant patients (control Group) will receive the standard care clinical observation.

16. CONSENT

A kidney transplant is an urgent surgery as the deceased donor organs are offered by the NHS Blood and Transplant at 12-14 hours' notice. After the offer is accepted by the recipient transplant centre, the patient is called in. There is a waiting period of only 8-10 hours during which the recipient is consented and optimised for the surgery.

After the routine surgical consent, it will be the responsibility of the chief investigator (CI) to inform the patients about the study and invite them to participate. In case he is not present due to any emergency, the responsibility will be delegated to the on-call Transplant Consultant who is a regular part of the patient's clinical care team.

Consent to enter the study will be sought from each participant only after a full explanation of recruitment, randomisation, instructions elaborating on the functioning of the device, and allotment to intervention or control group has been given. The participants will be made aware that if they fall in the intervention group, they will have implantable Doppler probe monitoring in the first 72 hours after the surgery in addition to the standard care clinical observation. An information leaflet will also be offered, and time allowed for consideration that would be about six to eight hours. A duly signed informed consent form will be obtained from patients that agree to participate in the study.

All participants will be made aware that they can withdraw from the study anytime from when they give consent to participate till the first 72 hours after the surgery at which the monitoring device will be removed. This will be done regardless of their allotted group, without giving reasons, and prejudicing their treatment. They will also be informed that they have the option to not participate in the study without any change in their postoperative care. The right of a patient to refuse participation in the study without giving reasons will be respected.

All the potential kidney transplant patients are assessed thoroughly at the Southwest transplant centre before activating them on the transplant waiting list. If there is a requirement for special communication needs (i.e. language barrier), an interpreter will be arranged in advance.

17. RANDOMISATION

The patients who consent to participate in the study will be randomised into two groups (i.e. intervention and control) by a secure online computer sequence generator system (https://www.randomizer.org/#randomize). Randomisation will be completed in a 1:1 ratio using random permuted blocks. Randomisation will be the responsibility of the delegated on-call Transplant Consultant.

The patients allotted to the Intervention group will have kidney transplants with the implantable continuous vascular monitoring device while those allotted to the Control group will have kidney transplants with standard care clinical observation (i.e. without implantable continuous vascular monitoring device). Following kidney transplant surgery, all patients will be managed in the standard way followed at the Southwest transplant centre as per the Trust protocol.

18. TRIAL ARMS

18.1. INTERVENTION GROUP (KIDNEY TRANSPLANT PATIENTS WITH THE IMPLANTABLE CONTINUOUS VASCULAR MONITORING DEVICE)

The intervention that is intended to be investigated is the implantable continuous vascular monitoring device manufactured by COOK Medical Company. Its principle intended use is continuous monitoring of the graft perfusion (i.e. transplanted kidney) for the first 72 hours postoperatively. The kidney transplant patients in the intervention group will receive implantable continuous vascular monitoring device surveillance for the first 72 hours in addition to the standard care clinical observation as part of their postoperative care.

The continuous audible Doppler signals produced by the monitoring device represent the blood flowing in the renal artery. This is an indicator of graft perfusion. Cessation of audible Doppler signals is the key that may suggest hampered blood flow due to vascular complications. In the intervention group, the monitoring device will be used as an added mechanism to monitor graft perfusion. Theoretically, the vascular complications should be identified early, the patients should undergo prompt surgical correction, and better outcomes with less graft loss should be noted in the intervention group as compared to the control group. This scientific basis of the intervention will be tested in this study.

The audible Doppler signals representing the graft perfusion will be monitored continuously by the transplant surgeon till the wound closure in the theatre. In the recovery, the signals will be monitored continuously by the duty nurse till the time patient is transferred to the ward. After that, it will be monitored intermittently as required by the clinician on call in the ward.

The vascular monitoring device is already in use at our hospital by the plastic and reconstructive surgery department, so we do not anticipate any administrative problems with the use of this device. The host renal ward has already trained the nurses and funds have already been allocated to acquire the monitoring devices for the duration of the study. The removal of the monitoring device is a simple and uncomplicated procedure. It will be undertaken 72 hours postoperatively by the duty nurse looking after the patient.

18.2. CONTROL GROUP (KIDNEY TRANSPLANT PATIENTS WITH STANDARD CARE CLINICAL OBSERVATION):

The kidney transplant patients in this group will receive the standard care clinical observation as part of their postoperative care. Their graft will be monitored postoperatively by the standard care clinical observation as per the NHS protocol.

19. BLINDING

Blinding of the participants (kidney transplant patients) to the outcome of the randomisation will not be possible due to the nature of the intervention. Similarly, the healthcare professionals (clinicians and nurses) taking care of the patients and collecting the data postoperatively cannot be blinded. However, the Southwest transplant team acts in the best interest of the kidney transplant patients and declares no conflict of interest with the device.

20. DATA COLLECTION

Data collection will take place in the immediate period after the kidney transplant in recovery, at 24, 48, and 72 hours postoperatively in the ward and at the three-monthly postoperative clinic visit.

The data will be collected prospectively and independently for both groups over a two-year period. Data collection may culminate earlier if the required sample size is achieved. It will include participant's demographic characteristics and the outcomes that will be measured to achieve the respective objectives of the study.

The outcomes will be measured to achieve the objectives of the study.

20.1. PARTICIPANT'S DEMOGRAPHIC CHARACTERISTICS

a. Age at the time of operation in years and months (not the date of birth), gender, and BMI.
b. Cause of renal deterioration.
c. Dialysis modality at the time of transplantation
d. Time on the kidney transplant waiting list
e. Source of the donated kidney (living versus deceased donor)
f. Prior renal transplant
g. Surgeon undertaking the procedure (coded to maintain anonymity)
h. Recipient risk factors for transplant surgery (age > 70 years, BMI > 30, cardiovascular disease, smoking, peripheral vascular disease, thromboembolic disease, hypertension (HTN), diabetes mellitus (DM), and urological obstructive symptoms)
i. Donor risk factors for transplant surgery (Donor age > 60 years, BMI > 30, cardiovascular disease, smoking, peripheral vascular disease, hypertension (HTN), diabetes mellitus (DM), cold ischemia time (CIT), cause of death, HLA mismatch, and the number of vessels on the graft).

20.2. OUTCOME MEASURES FOR OBJECTIVE 1: To assess the capability of vascular monitoring device in the early postoperative care of kidney transplant patients.

a) The number of early vascular complications identified and their management (incidence).
b) The period between the graft implantation and diagnosis of vascular complication (early or late).
c) The number of departmental ultrasound scans requested by the clinicians taking care of the patients in the first 24, 48, and 72 hours postoperatively.
d) The 03-month kidney graft survival (the number of grafts lost due to vascular complications in the first 03 months).

20.3. OUTCOME MEASURES FOR OBJECTIVE 2: To assess the research methods used to compare vascular monitoring device with the standard care and to estimate surgical outcome measures essential to inform the sample size calculation for the definitive planned RCT.

a. Suitability of eligibility criteria and recruitment process.
b. Refusal rates for participation and randomization
c. Retention and follow-up rates during the research process

d. Assessment of the study methods, procedures, and follow-up schedules (researcher and participants)
e. Assessment of the procedures for monitoring variation and fidelity in the delivery of the intervention. A fidelity checklist will evaluate the adherence to the standardised protocol of intervention delivery (i.e. consent of the participants, delivery of the intervention, and conduct of the serial Doppler signal monitoring).
f. Assessment of the feasibility, appropriateness and performance of the potential outcome measures for the definitive multi-centre RCT.
g. Calculation of the means and standard deviation of the outcome measures arising from the differences between the intervention and control arm essential to inform sample size calculation for the definitive planned RCT.

20.4. OUTCOME MEASURES FOR OBJECTIVE 3: To assess the availability of research resources, management support, potential barriers, and challenges for the definitive planned RCT.

a) Assessment of ease and simplicity of the participant documentation (i.e. participant information sheet, consent form, data collection sheet) through the study
b) Availability of equipment and medical staff in the host centre to handle the number of participants and the research procedures
c) Technological capacity for communication and adequate software to randomize, record, process, and store research data.
d) Availability of management support for the research project and back up plans for any extenuating circumstances.
e) Documentation of any technical glitches or postoperative complications related to application of the monitoring device.
f) To explore factors that will enable future economic evaluation of the vascular monitoring device in the definitive planned RCT (i.e., testing procedures that can collect information to inform a cost effectiveness analysis).

Data will be collected by the chief investigator using a standardised proforma in the Microsoft Office Excel Database (Microsoft Corporation, San Jose CA, USA. All collected data will be pseudonymised using unique anonymised codes. It will be kept strictly confidential and will not contain any participant identifiers.

Data Collection (Measures, Time-points and Location)

Measures	Time- Points				
	Immediate Postop	At 24 hours Postop	At 48 hours Postop	At 72 hours Postop	At 03 Months Postop
1.Quantitative Study					
a. The number of early vascular complications identified (incidence).	X	X	X	X	
b. The period between the graft implantation and diagnosis of vascular complication (early or late).	X	X	X	X	
c. The number of departmental ultrasound scans requested in the first 24, 48, and 72 hours postoperatively.	X	X	X	X	
d. The 03-month kidney graft survival					X
2. Qualitative Study Exploring the views of stake holders regarding					
a. Experience with the intervention				X	
b. participating in the study, and				X	
c. acquiring their suggestions to improve the design of definitive future RCT				X	
Location	Operation theatre recovery	Ward	Ward	Ward	Clinic

21. INTENTION TO TREAT ANALYSIS

The data of the participants who will be randomised into the two groups (i.e. Intervention Group and Control Group) will be summarised separately in their respective groups. This method preserves the benefits of randomisation and prevents confounding factors (i.e. non-compliance, missing outcomes, losses to follow up, etc.) [35].

22. DATA ANALYSIS

It is inappropriate to use inferential statistics in feasibility study data to formally test the effectiveness of an intervention [36, 37]. Data analyses using descriptive statistics will be performed in IBM SPSS version 25.0 [38]. The means and standard deviations will be

considered as the representative value of the continuous variables (i.e. participant's demographic characteristics) [39]. The categorical variables (i.e. surgical outcomes) will be expressed by frequency distributions (percentages) and elaborated using tables and graphs [40].

The outcomes for each objective in both groups (i.e. intervention and control) will be summarised using descriptive statistics. The numerical data from both groups will be compared to describe the feasibility of the intervention and generate realistic estimates of important parameters for the definitive multi-centre RCT.

22.1. PARTICIPANT'S DEMOGRAPHIC CHARACTERISTICS

The participant's demographic or baseline characteristics in both groups will be summarised separately using descriptive statistics. The numerical data for both groups will be compared in the tabular form to demonstrate whether or whether not the participant's baseline characteristics in the Intervention and Control groups are identical.

22.2. OUTCOME MEASURES FOR OBJECTIVE 1: To assess the capability of vascular monitoring device in the early postoperative care of kidney transplant patients.

The first step will be to evaluate if the vascular monitoring device truly works in the sense of achieving its intended outcome (i.e. vascular monitoring in kidney transplant patients). According to the MRC Framework assessing a clear theoretical basis for the intervention is paramount for further evaluation of complex interventions [41]. The percentages of the surgical outcomes in the Intervention and Control groups will be compared in tabular form. From this comparison, it will be noted whether the vascular monitoring device can safely identify vascular complications and prevent graft loss.

The relative risk or risk ratio for the surgical outcomes will also be calculated using the following formula.

Risk ratio:

$$\frac{\%\text{ in Intervention Group}}{\%\text{ in Control Group}}$$

The risk difference will be calculated by the following formula.

Risk difference:

% in Intervention Group - % in Control Group

By doing so we will note if any substantial change in the outcome of the Intervention Group is observed as compared to the control group. Inferential statistics would be valuable in this regard however they will not be applied due to the study design [37].

22.3. OUTCOME MEASURES FOR OBJECTIVE 2: To assess the research methods used to compare vascular monitoring device against the standard care and to estimate surgical outcome measures essential to inform the sample size calculation for the definitive planned RCT.

The research process assessment will be measured by the selected outcomes. It will determine the suitability of the study methods and procedures adopted in this feasibility study. The outcomes will generate realistic estimates for the definitive multi-center RCT (i.e. eligibility,

recruitment, consent, follow-up rates, etc.). Any limitations or inadequacies will be highlighted for improvement in the latter.

22.4. OUTCOME MEASURES FOR OBJECTIVE 3: To assess the availability of research resources, management support, potential barriers and challenges for the definitive planned RCT.

The availability of the research resources and management support in this feasibility study will be evaluated by the selected outcomes. Any limitations or inadequacies will be highlighted for improvement in the definitive multi-center RCT.

The results of the data analysis will be following the CONSORT updated guidelines for reporting feasibility and pilot trials [35].

23. EMBEDDED QUALITATIVE STUDY

23.1. AIM

This component of the trial is aimed at exploring the experiences (receiving/delivering the intervention) and suggestions of the stakeholders on participating in the study.

23.2 OBJECTIVE

To assess the acceptability of vascular monitoring device in clinical practice and to acquire suggestions and innovative ideas of the stakeholders on refining the design of definitive RCT, functioning of the implantable vascular monitoring device, and improving postoperative patient care.

23.3. STUDY DESIGN

An exploratory inductive approach will be used with the qualitative study design of phenomenology. Semi-structured interviews with open-ended questions will be used. This method of data collection involves face-to-face, controlled, and open interaction between the participants that stimulates perceptions and ideas that might not have been otherwise recognised [42].

23.4. PARTICIPANTS

To ensure the selection of information-rich cases and to attain an all-around perspective consistent with the aim of this study, a purposeful sampling consisting of participants from all groups involved with the device will be done [43].

The participants of the study must have experience with the vascular monitoring device and will be selected according to whoever is on-call on the day of kidney transplant according to the clinicians and nurse's duty rotation plan. They will comprise four clinicians, four nurses, and four kidney transplant patients. Maximum sample number (12) is described however, recruitment will be discontinued early if theoretical saturation is attained [44].

Consent for the interview and further correspondence for member-checking will be obtained at the time.

23.6. DATA COLLECTION

Qualitative interviews are the most effective way to explore the views of the participants [45]. The qualitative study will consist of semi-structured interviews with open-ended questions and conducted in line with the NIHR's instructions laid out in the health and social care research handbook for researchers [46]. The interview guide used will compromise key steps

like introduction, a brief description of the proposed study, explanation of the purpose of the study, consent, and interview questions which will be aided by probing questions if further elaboration is required [47]. The interview guide will be flexible, and the participants will be encouraged to raise any other issue that they might consider pertinent to the topic [48].

All qualitative interviews will be conducted by the chief investigator. The duration of the interviews will last 40-45 minutes. The interview proceedings will be audio recorded with the participant's consent and will be deleted following transcription. The participants will be informed that any quotes used in the report would be pseudonymised and kept strictly confidential. Field notes will be taken during all interview sessions to ensure the richness of data [49].

Interviews will be conducted in the kidney ward, which is selected to enable participants to relax and open up in their routine setup. The privacy of the interviews will be maintained to allow participant anonymity and will take place during the lunch break to avoid distractions from the clinical commitments. Qualitative interviews are most beneficial in the timings and settings that are comfortable for the participants [50].

23.7. Data Analysis

Thematic analysis will be performed in NVivo 12 qualitative analysis program. It is regarded as a foundational method for qualitative analysis as it provides a practical and flexible approach for identifying, analysing, and reporting themes within qualitative data [51]. The interviewer has a theoretical interest in the device. To reduce the potential for interviewer bias, the thematic analysis will be conducted by the inductive approach of data-driven identification of themes [52]. Since all participants will have experience with the device, the thematic analysis will be done at the latent level to identify the underlying ideas and assumptions. Data extracts will be coded and categorised into themes, following the six-phase guide to doing thematic analysis. [53].

The result of this study will be reported in accordance with the Consolidated criteria for reporting qualitative research (COREQ) checklist, which is the recommended reporting guidelines for qualitative studies [54].

23.8. Rigour and Trustworthiness

Demonstration of rigour and trustworthiness is necessary for qualitative research to make an impact on clinical practice and policy as they add credibility to the sample and validity to the results [55]. The following methods will be adopted to ensure rigour and confer respectability to the qualitative research [56].

23.9. Purposeful sampling with triangulation

The sample will comprise of participants from all the groups involved with the device to facilitate information collection from every perspective validating credibility to the sample and richness of the data [57]. It will be ensured that the sample is representative of the target population, necessary for the external validity of a study.

23.10. Reflexivity

Reflexivity is fundamental to the credibility of qualitative research [58]. The interviewer will be carrying out an embedded qualitative study as a part of a PhD degree. He is a transplant surgery registrar with an interest in vascular monitoring of kidney transplant patients. A working relationship exists between the researcher and the participants who will be informed

of the purpose of this study. To ensure transparency with the responses and improve the validity of the results, a reflexive diary will be kept to bracket out any bias from the author's perspective [59].

23.11. RESPONDENT VALIDATION

This is bringing finding back to the members and getting their opinions on interpretations drawn from their interviews [60]. Member checking will be done by ensuring that the participants review the results of the thematic analysis. Peer reviewing of the themes will also be done independently by a PhD. research colleague, who will not have a background in renal medicine. Their suggestions will be incorporated into the results [61].

24. PATIENT PUBLIC INVOLVEMENT AND ENGAGEMENT

Patients admitted in the Southwest transplant centre, undergoing kidney transplant surgery and the local staff were involved in the design of the study. During the planning stage, a PPI consultation with the stakeholders (kidney transplant patients, clinicians, and nurses directly involved with the monitoring device) was conducted through semi-structured interviews at Southwest transplant centre UHPNT. There was overwhelming feedback from the stakeholders who acknowledged the need and usefulness of a continuous vascular monitoring device in clinical practice. They gave valuable suggestions that informed protocol development of the feasibility RCT and selection of outcome measures.

The stakeholders reviewed and contributed to the study questionnaires, semi structured interview guide and the participant information sheet. The PPI also identified potential barriers to research like insufficient knowledge of nursing staff regarding the monitoring device. The suggestions were taken up with the Steering group committee of the Southwest transplant centre that subsequently lead to improvement in the staff training.

25. ANTICIPATED FINDINGS OF THE STUDY

The feasibility RCT and the embedded qualitative component will be conducted concurrently. The outcomes will be measured with descriptive statistics, qualitative analysis, and summarisation of basic data related to the objectives of the study. The findings of both will be integrated at the time of interpretation of the results.

It is anticipated that the results will describe the feasibility of implantable continuous vascular monitoring device in kidney transplant surgery. This study will fill gaps in the evidence, gather necessary information, and test potential research processes to inform the protocol development of a definitive multi-centre RCT.

To summarize, the results of this feasibility study will elaborate on the possible role of vascular monitoring device to improve patient safety, increase graft survival, advance service quality improvement, increase financial savings, and conserve ultrasound resources. They will also highlight learning points from the experiences of stakeholders, inform local practice, and lead to a definitive multicentre RCT in collaboration with other transplant centres.

26. RESEARCH TEAM

The research team consists of CI (senior surgical fellow from the Southwest transplant centre), a clinical supervisor (consultant from the Southwest transplant centre), and an academic supervisor (Professor from the University of Plymouth).

The findings of this study will be periodically presented to the Trial Steering Committee (TSC) at the Southwest transplant centre. The TSC will comprise the supervisory team, a consultant team from the Southwest transplant centre (funder of the research project) and a representative from the R&D department of University Hospitals Plymouth NHS Trust (sponsor of the study).

27. STUDY TIMELINE

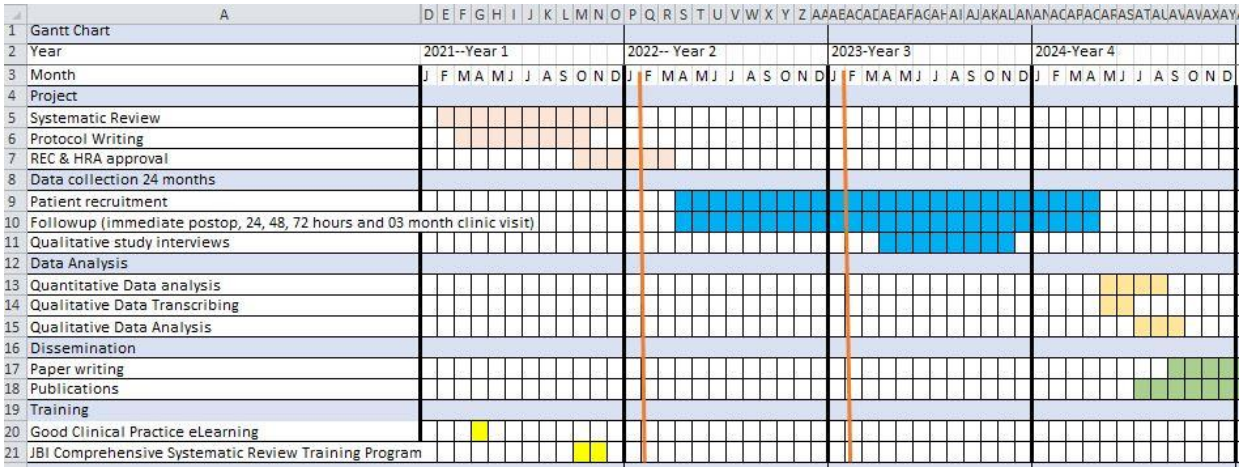
A study timeline including tasks and milestones is summarised. A supervisory meeting will be arranged after every milestone or quarterly whichever comes earlier.

a. **REC-HRA Approval** (IRAS application): Dec 2022-March 2022.

b. **Data Collection**: April 2022-April 2024 (02 years). Since the last follow-up of the kidney transplant patients will be after three months of the transplant surgery, no new recruitment will be done after Jan 2024).

c. **Data Analysis** & Interpretation of results: April 2024- July 2024.

d. **Dissemination:** July 2024-Dec 2024.



A Gantt chart is elaborating the sequence of events in this study

28. RISK ASSESSMENT

It is anticipated that minimal risks are associated with this research project. The vascular monitoring device has been used intermittently by two out of our four surgeons in the Trust for the last five years and no complication related to the device was recorded (potential problems associated with the device are listed in the safety reporting section of this protocol).

The risk associated with confidentiality and data handling will be alleviated by meticulously following the UK General Data Protection Regulations (GDPR).

Extra time of six months has been allocated in the timeline of the study to accommodate any contingency or unexpected delays.

29. CONFIDENTIALITY

The collected information will be used fairly, stored safely, and not disclosed to any unauthorised person. This applies to both manual and electronically held data. There will be complete compliance with the Data Protection legislation. The Chief Investigator will preserve the confidentiality of participants taking part in the study and ensure compliance with the UK General Data Protection Regulation (GDPR) in conjunction with the UK Data Protection Act 2018, which sets out the statutory requirements for the processing of personal data.

30. INDEMNITY

This is an NHS-sponsored research study. If an individual suffers negligent harm as a result of participating in the study, NHS indemnity covers NHS staff and those people responsible for conducting the trial who have honorary contracts with the relevant NHS Trust. In the case of non-negligent harm, the NHS is unable to agree in advance to pay compensation, but an *ex-gratia* payment may be considered in the event of a claim.

31. SPONSOR

The Research & Development department of University Hospitals Plymouth NHS will act as the main sponsor for this study assuming overall responsibility for the initiation and management of the study. Delegated responsibilities may be assigned to other relevant parties taking part in this study and appropriately documented.

32. FINANCIAL CONSIDERATIONS

The Southwest transplant centre, University Hospitals Plymouth NHS Trust is funding this study. The Implantable vascular monitoring devices have already been procured and placed in the renal department. Since the study involves the NHS protocol of managing the kidney transplant patients in the ward, there is no additional financial, equipment, or medical workforce involved in the day-to-day running of the study. The Chief investigator is a permanent employee and paid by University Hospitals Plymouth NHS Trust. The cost of stationary involved in this study and presenting the findings of this research in medical conferences will be borne by the Southwest transplant centre. A completed Schedule of Events Costs Attribution Template (SoECAT) is attached.

33. MONITORING

The study will be subject to monitoring by the Research & Development department of University Hospitals Plymouth NHS (sponsor of the study) to ensure adherence to the UK Policy Framework for Health and Social Care Research (2017). All UHP studies will be initially monitored at 25 days (+/- 7 days) after R&D capability and capacity has been given. The subsequent level of monitoring will be determined by a risk assessment, or on a for cause basis. The study may also be audited/ inspected by regulatory bodies to ensure compliance with national regulations.

34. STUDY MANAGEMENT

The day-to-day management of the study will be coordinated through the chief investigator.

35. DATA MANAGEMENT PLAN

A data management plan for this study was prepared under the University of Plymouth's information governance Policy, the UK General Data Protection Regulation (GDPR-2018), and Good Clinical Practice (GCP). It consisted of a complete plan for data protection, retention, and erasure after 10 years.

During the data collection, patient information in fRCT and embedded qualitative study will be pseudonymised and kept strictly confidential by the CI using a unique anonymised code, ensuring it does not contain any patient identifiers.

In the fRCT, the renal database (Vital Data) will be used for the information extraction and is password protected present only on the Trust intranet. The patient's medical notes will be accessed by the CI who is a member of the staff at UHPNT. The notes will not be removed from the premises of the record room. The quantitative data will be logged in the Microsoft spread sheet. In the embedded qualitative study the interviews will be audio-recorded and transcribed verbatim. The pseudonymised transcripts will be noted in the NVivo software.

After transcription of the data, the restriction of access to the Microsoft spread sheet and NVivo software will be maintained by encryption. All data protection measures will be undertaken to maintain the confidentiality of the participants. The official NHS email address will be used for the transfer of any pseudonymised information if required. Data processing and analysis will be performed in the Microsoft Excel worksheet, IBM SPSS version 25.0, and NVivo software. It will be stored in a password secured drive on the Trust intranet.

If there is a requirement to share data with the University of Plymouth or the higher-level data asset owners, the anonymised data file will be exported to the One Drive account of the CI (data asset steward) under the University of Plymouth license.

Two copies of the duly signed written informed consent will be taken from the eligible participants. One copy will be attached in the patient's medical notes along with the routine consent for the kidney transplant surgery. The other copy will be given to the participant. The CI will scan the consent form and keep an electronic copy along with other research documents in a password secured drive on the Trust intranet.

The CI will be the custodian of the data and the R&D department UHP will be the data controller. There is no license or restrictions other than when the research is published. The study data will be backed up regularly with the R&D department UHP and this source will be used for data recovery in the event of a disaster.

In line with the R&D department UHP and University of Plymouth's policy, all data will be stored for 10 years in a password secured drive on the Trust intranet after which it will be deleted. All the resources required to deliver the data management plan for this study are available.

36. DISSEMINATION

The results of this study will be presented at the relevant scientific conferences (i.e. Southwest Annual Transplant day, European Transplant Conference, and the British Transplant Society (BTS) Conference. The findings will also be sent in the form of original research papers to be published in international peer-reviewed scientific research journals.

An internal report will also be presented the Steering Group Committee of the Southwest transplant center. This information will inform the local clinical practice and provide evidence that will be shared with all the transplant units across the UK. Other units will also

be invited to collaborate in the definitive multi-centre RCT that will be supported by on-going patient and public involvement.

The participant's ideas that may lead to improvement in any aspect of the vascular monitoring device will be shared with the manufacturing company and the suggestions for improvement in the postoperative care will be shared with the Steering care group and the Quality improvement team of the Southwest transplant centre.

37. SAFETY REPORTING

37.1 DEFINITIONS

37.1.1 Adverse Event (AE):

An AE or adverse event is:
Any untoward medical occurrence in a patient or other clinical investigation participant taking part in a trial of a medical device, which does not necessarily have to have a causal relationship with the device under investigation.

An AE can therefore be any unfavourable and unintended sign (including an abnormal laboratory finding), symptom or disease temporally associated with the use of the device, whether or not considered related to the device.

37.1.2: Adverse Device Effect (ADE)

All untoward and unintended responses to a medical device.

The phrase "responses to a medical device" means that a causal relationship between the device under investigation and an AE is at least a reasonable possibility, i.e. the relationship cannot be ruled out.

All cases judged by either the reporting medically qualified professional or the sponsor as having a reasonable suspected causal relationship to the device qualifies as a device effect.

This also includes any event resulting from insufficiencies or inadequacies in the instruction for use or deployment of the device and includes any event that is a result of a user error.

37.1.3: Serious Adverse Event (SAE):

SAE is an adverse event that:

- Led to death
- Led to a congenital abnormality or birth defect.
- Led to serious deterioration in the health of the subject that:
    - Resulted in a life-threatening illness or injury

      NOTE: The term "life-threatening" in the definition of "serious" refers to an event in which the participant was at risk of death at the time of the event; it does not refer to an event which hypothetically might have caused death if it were more severe.
    - Resulted in a permanent impairment of a body structure or a body function
    - Required in-patient hospitalisation or prolongation of existing hospitalisation
    - Resulted in medical or surgical intervention to prevent permanent impairment to a body structure or a body function
    - Other important medical events*

**Other events that may not result in death, are not life threatening, or do not require hospitalisation, may be considered a serious adverse event when, based upon appropriate medical judgement, the event may jeopardise the patient and may require medical or surgical intervention to prevent one of the outcomes listed above*

To ensure no confusion or misunderstanding of the difference between the terms "**serious**" and "**severe**", which are not synonymous, the following note of clarification is provided:

The term "**severe**" is often used to describe the intensity (severity) of a specific event (as in mild, moderate, or severe myocardial infarction); the event itself, however, may be of relatively minor medical significance (such as severe headache). This is not the same as "**serious**," which is based on patient/event outcome or action criteria usually associated with events that pose a threat to a participant's life or functioning. Seriousness (not severity) serves as a guide for defining regulatory reporting obligations.

37.1.4: Serious Adverse Device Effects (SADE):

A serious adverse device effect (SADE) is any untoward medical occurrence seen in a patient that can be attributed wholly or partly to the device which resulted in any of the characteristics or led to the characteristics of a serious adverse event.

SADE is also any event that may have led to these consequences if suitable action had not been taken or intervention had not been made or if circumstances had been less opportune.

All cases judged by either the reporting medically qualified professional or the sponsor.

37.1.5: Unanticipated Adverse Device Effect (UADE):

Any serious adverse device effect on health or safety or any life-threatening problem or death caused by, or associated with a device, if that effect, problem, or death was not previously identified in nature, severity or degree of incidence in the investigational plan or application (including a supplementary plan or application), or any other unanticipated serious problem associated with a device that related to the rights, safety or welfare of the subject.

37.2 Reporting of AE

All AE's occurring during the study observed by the investigator or reported by the participant, whether or not attributed to the device under investigation will be recorded on the CRF. All ADE's will be recorded in the CRF.

The following information will be recorded: description, date of onset and end date, severity, assessment of relatedness to device, other suspect drug or device and action taken. Follow-up information should be provided as necessary.

The relationship of AEs to the device will be assessed by a medically qualified investigator or the sponsor/manufacturer and will be followed up until resolution or the event is considered stable.

All ADE that result in a participant's withdrawal from the study or are present at the end of the study, should be followed up until a satisfactory resolution occurs.

Where relevant, any pregnancy occurring during the clinical study and the outcome of the pregnancy should be recorded and followed up for congenital abnormality or birth defect.

37.3 Reporting Procedures for All SAEs/ SADEs/ UADEs

For studies of CE marked devices: All SAE/SADE/UADEs need to be reported to the sponsor R&D **within one working day** of the investigator team becoming aware of them.

Reports of related and unexpected SAEs should be submitted by the Sponsor to ethics within 15 days of the Chief Investigator becoming aware of the event, using the SAE report form for non-CTIMPs published on the NRES website.

All reporting to R&D should be by e-mail giving as much information about the incident as possible.

The R&D Department will undertake an initial review of the information. Events will be followed up until resolution, any appropriate further information will be sent by the research team in a timely manner.

Reporting to the Manufacturer will be done in liaison with the Chief Investigator.

The Manufacturer has a legal obligation to report all events that need to be reported to the Nominated Competent Authority immediately (without any unjustifiable delay) after a link is established between the event and the device, but no more than:

- 2 days following the awareness of the event for Serious Public Health Threat.
- 10 days following awareness of the event for Death or unanticipated serious deterioration in health.
- 30 days following the awareness of the event for all other event meeting the SAE criteria.

37.4: Annual Reports

In addition to the above reporting the Chief Investigator will submit once a year, throughout the trial, or on request a progress/safety report to the REC and R&D.

37.5: Cook-Swartz Doppler Flow Probe, Potential Adverse Events

Use of the Cook-Swartz Doppler Flow Probe involves potential risks normally associated with any implanted device, e.g., infection, perforation or laceration of vessels, erosion, implant rejection, or device dislodgement/migration. Device specific risks include separation of the Doppler crystal from the cuff, inability to percutaneously remove the crystal after monitoring is complete, loss of reception or transmission of ultrasound monitoring signal. It should be noted that none of these potential issues have been noted during the use of the device at the Trust.

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