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Incisional Hernia prevention: Risk-benefit from a patient's perspective (INVITE) trial protocol: A single centre, mixed-methods cohort study aiming to determine if using prophylactic mesh in incisional hernia prevention is acceptable to patients.

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Incisional Hernia prevention: Risk-benefit from a patient's perspective (INVITE) trial protocol: *A single centre, mixed-methods cohort study aiming to determine if using prophylactic mesh in incisional hernia prevention is acceptable to patients.*

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Trial registrations and Sponsor information

IRAS: 310695, registered on 12/04/2022

ClinicalTrials.gov: NCT05384600, Registered on 20/05/2022

INVITE Protocol v1.0, 05/03/2022

Sponsor: Cardiff and Vale University Health Board, Cardiff, United Kingdom

Abstract

Introduction

Incisional Hernia (IH) is a common complication of abdominal surgery affecting between 10-20% of patients and is associated with significant morbidity along with cost to the NHS. With high recurrence rates following repair, focus must be on prevention of IH rather than cure. There is increasing evidence that patients at high risk of developing IH may benefit from prophylactic mesh placement during their index operation. With recent controversy surrounding the use of mesh in the UK, however, there is little understanding of whether this intervention would be acceptable to patients.

Methods

This is a mixed-methods cohort study to explore patient perceptions of the use of mesh as prophylaxis to prevent incisional hernia. Patients with and without IH who have undergone colorectal surgery between 2017-2020 will be approached to participate. Participants will be asked to complete a questionnaire and 8-12 participants will be invited to semi-structured interviews. The primary outcome is to assess the acceptability of prophylactic mesh to patients. Secondary outcomes include understanding patient's knowledge of IH, and factors that may influence or alter the acceptability of mesh.

Analysis

Questionnaires have been developed using a 5-point Likert scale to allow quantitative analysis. Qualitative analysis of interviews will be conducted using NVIVO software and thematic analysis. Data will be presented using the Journal Article Reporting Standards (JARS) for mixed-methods research.

Ethics & Dissemination

Ethical approval has been granted, and the trial is currently in set-up. Results from this study will be used to aid the design of future interventional trials using prophylactic mesh

Strengths and Limitations of this study

- The study aims to address a key area of understanding, necessary to further research into mesh prophylaxis.
- Mixed-methods study design will allow the research question to be investigated from different perspectives leading to a more comprehensive understanding of the outcome.
- Lack of validated questionnaires in literature means that novel, unvalidated questionnaires have been developed.

Keywords:

Incisional Hernia, Mesh, Abdominal surgery, Prevention

Introduction

Incisional Hernia (IH) is defined as a bulge or protrusion that occurs through a previously made incision and affects 10-15% of patients following abdominal surgery (1). IH carries a substantial cost to healthcare services, estimated at between $21,000-$26,000 per patient, and impact on patient's health and wellbeing (2). Patient morbidity arises from symptoms related to the hernia, such as pain and incarceration, alongside reduced quality of life in areas of emotional and social functioning, as well as body image concerns (3)(4). Whilst IH repair has been linked to an improvement in QOL, operations are technically difficult and associated with high recurrence rates of between 10-30%, suggesting that prevention may be better than cure (3)(5)(6).

The main risk factors for IH are well understood. Raised BMI and smoking status, post-operative surgical site infection (SSI) and location of incision are all associated with higher risk of developing IH (7)(8)(9). Large multicentre randomised control trials have focused on identifying optimal closure methods and suture choice to try and reduce incidence of incisional hernia. These have lowered the incidence of incisional hernia, but not eliminated it completely (10) (11).

Several studies have attempted to identify patients at high risk for IH pre-operatively and assess whether these patients may benefit from different closure methods, or the use of prophylactic mesh (12) (13). The development of risk-predictive tools for IH, such as the model produced by Basta *et al.,* may help clinicians to quantify risk to patients, use prophylactic mesh in high-risk cases and subsequently reduce the incidence, and therefore economic burden of IH on healthcare services (14) (15). Evidence for the use of mesh prophylaxis is increasing, with systematic reviews demonstrating an overall risk reduction in incisional hernia when compared to primary suture closure in elective midline incisions, alongside evidence to suggest low rates of complications, yet despite this evidence, uptake of mesh prophylaxis remains slow.

The use of mesh in surgery in the United Kingdom has come under scrutiny following media coverage and public concerns relating to the use of mesh in uro-gynaecological procedures, culminating in the Cumberledge report in 2020 (16). With the growing controversy and media coverage, public concerns about the use of mesh in hernia surgery lead to the RCS issuing a statement in 2018 defending its use for hernia surgery (17) (18). Currently, there is little published on the patient's perspective of the use of prophylactic mesh in the prevention of incisional hernia.

Aims

1. To determine if the use of prophylactic mesh is acceptable to patients who have undergone, or are undergoing, abdominal surgery.
2. To identify factors that patients consider important when considering the use of mesh as a prophylaxis for the prevention of incisional hernias.

Methods and Analysis

Study design

This is a prospective, mixed-methods cohort study with two components:

1. A patient survey assessing patient's knowledge and understanding of IH and the acceptability of management options including prophylactic mesh using quantitative research methods
2. Semi-structured qualitative interviews to explore patient's opinions further and determine factors that would affect acceptability of mesh to patients.

A sub-group of patients will be approached to take part in a qualitative interview based on their answers to the questionnaire and their willingness to participate further as indicated on their consent form. These patients will be invited to take part in semi-structured interviews with a member of the research team who is trained in qualitative research methods.

Due to the nature of the data collected, a combination of qualitative and quantitive analytical methods will be employed in order to address the study aims. This will be supported by CEDAR, an in-house trials methodology group and analysed with the help of NVIVO software.

Study population

The clinical care team will identify patients who have undergone elective colonic resections for colorectal cancer and those who have undergone emergency laparotomy (Emlap) from established databases, including the Cardiff and Vale NELA (national emergency laparotomy audit) database, and the Cardiff and Vale University Health Board Colorectal MDT database over a three-year period (2017-2020). Patients who have died since their operation can be identified through this method, and will not be contacted. Most patients develop incisional hernia within 18 months of surgery and this will allow sufficient time from surgery without introducing excessive recall bias. A continuous cohort of patients who are scheduled for elective colonic resection will be identified prospectively through the Cardiff and Vale Colorectal and Inflammatory Bowel MDT database over a 3-month time period.

Patients with incisional hernia will be identified through retrospectively maintained colorectal databases containing elective and emergency patients that have undergone colorectal resections in Cardiff and Vale UHB. This will be cross-referenced with a list of primary care referrals for "Incisional Hernia" for the period 2017-2020 accessed through the General Surgical directorate.

Eligibility Criteria

Inclusion

Patients who have undergone elective or emergency colonic resection within Cardiff and Vale UHB.

Group 1 (with incisional hernia): 60 patients

- Over the age of 18 years old
- Able and willing to provide valid informed consent
- Undergone elective or emergency colonic resection >12 months ago
- Clinical or radiological diagnosis of incisional hernia.

Group 2 (without incisional hernia): 60 patients

- Over the age of 18 years old
- Able and willing to provide valid informed consent
- Undergone emergency abdominal surgery > 12 months ago OR elective colonic resection > 12 months ago
- Do not have a clinical or radiological diagnosis of Incisional hernia (or suspected incisional hernia)

Group 3 (About to undergo laparotomy): 20 patients

- Over the age of 18 years old
- Able and willing to provide valid informed consent
- Scheduled for elective colonic resection in Cardiff and Vale UHB.
- No history of previous laparotomy.

Where possible, attempts will be made to identify patients undergoing colonic resection for benign disease.

Exclusion

All participants (groups 1, 2 & 3)

- Patients who are unable or unwilling to give informed consent
- Any patient with a palliative diagnosis either at time of surgery, or since
- Inability to understand or complete study questionnaires
    - Due to intellectual or cognitive impairment
    - Due to insufficient English-language skills

Recruitment

Eligible patients will be first approached by a member of the clinical team either face-to-face, if identified at routine clinical appointments, or by post. Potential participants approached by post will receive a letter of invitation signed by their treating clinician, along with a copy of the participant information sheet and reply slip. All those that wish to participate in the study will be instructed to contact the research team either by phone, or by return of the reply slip.

We anticipate a response rate of 40%. 12 patients from each group will be invited to participate in face-to-face interviews, and will be selected based on their responses to the questionnaire, and their willingness to participate further as indicated on their consent form.

Patients who indicate they would like to participate will be contacted either by post or email with a patient information sheet, consent form and questionnaire. Participants will be given a pre-paid envelope to return the consent form and questionnaire. If there has been no response after 2 weeks, further information will be sent. If there is still no response, then no further attempt at contact will be made.

Assessments

Questionnaire:

Following a review of literature, no validated tools were identified relating to incisional hernia and patient perspective on medical mesh. A questionnaire was subsequently developed using the "Health Belief Model" as a framework for understanding health-related behaviours and drivers for change, alongside input from a Public and Patient Involvement (PPI) representatives. The Questionnaire will be composed of baseline demographics and surgical history, including assessing for presence of incisional hernia and the patient's previous knowledge of IH. The acceptability of risk-predictive models, and acceptability of prophylactic mesh will also be assessed.

We will seek feedback on the questionnaire, from the first 10 participants that receive it. Their feedback will be collated, analysed and, if necessary, used to revise the questionnaire.

A copy of the questionnaire can be seen in Appendix 1

Qualitative Interviews:

12 patients from each group will be invited to take part in semi-structured interviews with a trained researcher. Only patients that indicate they would like to be contacted further on their questionnaire will be approached. Interviews will take part remotely on a one-to-one basis through Microsoft Teams. Topic guides and pre-prepared questions will be developed by the interviewers, with input from stakeholders, and will be used to ascertain participant's views on risk-predictive models, along with acceptability of prophylactic mesh and factors that might make it more acceptable.

Interviews are anticipated to last approximately 30-60 minutes and will be recorded and transcribed verbatim using a transcription service. Thematic analysis will be conducted on the qualitative data using NVivo by suitably trained and experienced researchers in order to identify any relevant themes in relation to acceptability and what constitutes high risk.

Discontinuation/Withdrawal of Participants

Participants have the right to withdraw from the study at any time and the investigator may also withdraw participants from the study at their discretion. If a participant withdraws, or is withdrawn, their medical treatment of legal rights will not be affected.

Anonymised research data from withdrawn participants may continue to be used and stored for use in this and future research projects. This will not include personal information, which will be destroyed at the point of withdrawal.

Expenses and Benefits

Participants will not be offered any form of incentive (financial or otherwise) in return for their participation in this study. Those that are involved in the qualitative interview section of the study will be offered reimbursement for any additional travel expenses incurred as a result of their participation in this study. All questionnaires or letters that require responses by post will be provided with pre-addressed and pre-paid envelopes.

End of Study

Participant's involvement in the study will end on completion of interviews.

The study will end once the final interview has been transcribed, passed quality assurance procedures and is ready for analysis

Patient and Public Involvement

PPI representatives have been involved at all aspects of study design and set-up, in particular, in development of patient information leaflets and in the design and testing of study questionnaires.

Data Analysis

Number of Participants

As the primary objective of this study relates to qualitative research methods, no power calculation has been performed.

Quantitative data

The questionnaire will be assessed using a 5-point Likert scale and basic descriptive statistics will be used to analyse participant responses and provide meaningful output.

Qualitative data

Recorded interviews will be transcribed and prepared for analysis. Quality assurance procedures will include simultaneously reading the transcript while listening to the audio recording.

Braun and Clarke's framework of thematic analysis will be used to address the research question. Initially, patterns will be identified by reading transcripts and summary notes. Line

by line coding will allow further identification of emerging theme clusters, which will be refined as the analysis progresses. The process will be aided with the use of NVivo Qualitative Data Analysis software.

Data analysis will be supported by researchers from Cedar Health Technology Research Centre, and data will be presented using the American Psychological Association's (APA) Journal Article Reporting Standards (JARS) for mixed-methods research as a framework.[19]

Ethics and Dissemination

This protocol and related documents (and any subsequent amendments) has received approval from REC Wales. Annual progress and safety reports and a final report at the conclusion to the trial will be submitted to the REC within the timelines requested.

Data Management and Use

Data will be entered into an Excel database by a member of the research team. The database will be password protected. Anonymised data will only be accessible by investigators at the sponsor site. Data entry will be double checked to ensure accuracy of data entry. If there are discrepancies identified the entire data collection will be double checked to ensure complete accuracy.

Data collected during the course of the research will be kept strictly confidential and accessed only by members of the trial team. Participant's personal details (name, address) will be stored by sites under the guidelines of GDPR. Participants will be allocated an individual specific trial number which will be used to identify their data. Audio recordings from the focus group will only be kept until they have been transcribed. Transcripts will be stored on a password protected computer. Qualitative interviews data will be stored for a minimum of 5 years and a maximum of 10 years for audit purposes.

Participant's anonymized research data will be stored for a period of 5 years following the end of this study, for use in future research. Data will be stored, curated and managed in-line with the sponsor data management policies and procedures. No personal identifiable information will be shared with external researchers. Sharing data with other bona-fide researcher(s) will be subject to appropriate contractual agreements.

We plan to publish the results of this study in the form of peer-reviewed scientific and medical journal articles, and the clinical study report will be used for publication and presentation at scientific meetings.

Summaries of results will also be made available to Investigators for dissemination within their clinical areas (where appropriate and according to their discretion), and a newsletter with study outcomes will be distributed to participants who indicate they would like to receive it.

Summary and future work

The results of this study will be used to aid clinicians in understanding if mesh placement to prevent incisional hernia is acceptable to patients, along with factors, including the role of risk-predictive tools, that may influence the acceptability of mesh. This in turn will aid in the design and set-up of future interventional trials looking at prophylactic mesh placement in the UK.

Contributorship Statement

LS: Trial design, Protocol development, Questionnaire synthesis, testing and development, Drafted and revised paper. AM: Protocol development, Trial registration and ethical applications. TW: Questionnaire development, Development of qualitative methodology, Draft paper revisions. LK: Qualitative interview design and support, Qualitative analysis, Draft paper revisions. JC: Trial design, Chief Investigator, Questionnaire development, Draft paper revisions.

Competing Interests

None of the named authors have any competing interests or disclosures to make

Funding

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References

1. Bosanquet DC, Ansell J, Abdelrahman T, Cornish J, Harries R, Stimpson A, et al. Systematic Review and Meta-Regression of Factors Affecting Midline Incisional Hernia Rates: Analysis of 14 618 Patients. PLOS ONE. 2015 Sep 21;10(9).
2. Alli V v., Zhang J, Telem DA. Impact of incisional hernia development following abdominal operations on total healthcare cost. Surgical Endoscopy. 2018 May 12;32(5).
3. Jensen KK, Emmertsen KJ, Laurberg S, Krarup P-M. Long-term impact of incisional hernia on quality of life after colonic cancer resection. Hernia. 2020 Apr 24;24(2).
4. van Ramshorst GH, Eker HH, Hop WCJ, Jeekel J, Lange JF. Impact of incisional hernia on health-related quality of life and body image: a prospective cohort study. The American Journal of Surgery. 2012 Aug;204(2).
5. Romain B, Renard Y, Binquet C, Poghosyan T, Moszkowicz D, Gillion J-F, et al. Recurrence after elective incisional hernia repair is more frequent than you think: An international prospective cohort from the French Society of Surgery. Surgery. 2020 Jul;168(1).
6. Köckerling F. Recurrent Incisional Hernia Repair—An Overview. Frontiers in Surgery. 2019 May 14;6.
7. Walming S, Angenete E, Block M, Bock D, Gessler B, Haglind E. Retrospective review of risk factors for surgical wound dehiscence and incisional hernia. BMC Surgery. 2017 Dec 22;17(1).
8. Lee L, Abou-Khalil M, Liberman S, Boutros M, Fried GM, Feldman LS. Incidence of incisional hernia in the specimen extraction site for laparoscopic colorectal surgery: systematic review and meta-analysis. Surgical Endoscopy. 2017 Dec 25;31(12).
9. Itatsu K, Yokoyama Y, Sugawara G, Kubota H, Tojima Y, Kurumiya Y, et al. Incidence of and risk factors for incisional hernia after abdominal surgery. British Journal of Surgery. 2014 Sep 8;101(11).
10. Deerenberg EB, Harlaar JJ, Steyerberg EW, Lont HE, van Doorn HC, Heisterkamp J, et al. Small bites versus large bites for closure of abdominal midline incisions (STITCH): a double-blind, multicentre, randomised controlled trial. The Lancet. 2015 Sep;386(10000).
11. Cornish J, Harries RL, Bosanquet D, Rees B, Ansell J, Frewer N, et al. Hughes Abdominal Repair Trial (HART) – Abdominal wall closure techniques to reduce the incidence of incisional hernias: study protocol for a randomised controlled trial. Trials. 2016 Dec 15;17(1).
12. Jairam AP, Timmermans L, Eker HH, Pierik REGJM, van Klaveren D, Steyerberg EW, et al. Prevention of incisional hernia with prophylactic onlay and sublay mesh reinforcement versus primary suture only in midline laparotomies (PRIMA): 2-year follow-up of a multicentre, double-blind, randomised controlled trial. The Lancet. 2017 Aug;390(10094).
13. Cano-Valderrama O, García-Alonso M, Sanz-Ortega G, Rojo M, Catalán V, Domínguez-Serrano I, et al. Is prophylactic mesh closure effective to decrease the incidence of incisional hernia after laparotomy in colorectal surgery? Acta Chirurgica Belgica. 2020 Nov 16;
14. Basta MN, Kozak GM, Broach RB, Messa CA, Rhemtulla I, DeMatteo RP, et al. Can We Predict Incisional Hernia? Annals of Surgery. 2019 Sep;270(3).

15. Gillion J-F, Sanders D, Miserez M, Muysoms F. The economic burden of incisional ventral hernia repair: a multicentric cost analysis. Hernia. 2016 Dec 1;20(6).

16. Mesh working group interim report. https://www.england.nhs.uk/wp-content/uploads/2015/12/mesh-wg-interim-rep.pdf. 2015.

17. NHS hernia mesh repairs "leaving patients in chronic pain." https://www.bbc.co.uk/news/health-40132638. 2017.

18. RCS statement on hernia mesh complications. https://www.rcseng.ac.uk/news-and-events/media-centre/press-releases/rcs-response-to-hernia-mesh-complications/. 2018.

19. Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R., & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. *American Psychologist*, *73*(1), 26–46. https://doi.org/10.1037/amp0000151

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Cardiff and Vale
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INVITE

Incisional Hernia: Risk-benefit from a patient's perspective

Participant Questionnaire

Version 1.0, 11/05/2022

Please circle your choice of answer in each case.

Section 1: Background

We are trying to understand a bit more about you and the effects of your operation on your health.

What is your height? _____ cm / ft What is your weight? _____ Kg / Stone

Have you ever smoked on a daily basis?

Yes, currently a smoker Yes, but an ex-smoker Never Smoked

Do you currently feel pain at the site of the scar from your operation?

Yes No Sometimes

Do you ***feel*** a swelling or bulge at the site of your scar?

Yes No Sometimes

Do you ***see*** a swelling or bulge at the site of your scar?

Yes No Not sure

Section 2: Knowledge of Incisional Hernia

After having abdominal surgery, there is a risk that some of the abdominal contents can push through a weakness left in the muscle at the site of the operation. This is called an incisional hernia.

Did you know what an incisional hernia was before your first operation?

Yes No Don't know/Unsure

Were you told that Incisional Hernia was a risk for your operation?

Yes No Unsure/Don't know

How much information regarding incisional hernia was given to you before the operation?

None Not enough The right amount Too much

Have you heard of doctors using mesh as part of a hernia repair?

Yes No Don't know/Unsure

Is what you've heard about mesh...

Positive Negative Neutral Not Applicable

Do you know someone who has had a hernia repair?

Yes No

If yes, did it involve mesh?

Yes No Don't know/unsure

Was their outcome positive or negative?

Positive Negative Not sure Not applicable

If you have heard of mesh, where have you heard about it from?

Doctor/Healthcare professional News/Media Friend/relative

Other:_____ Not applicable

If you have any other comments about mesh, please feel free to record them below.

Section 3: Risk and prevention

What is a risk-prediction tool?

Risk-prediction tools are used by doctors to work out a person's risk of developing a medical condition, for example the risk of having a heart attack based on the risk factors that they have. This allows doctors to convey the risk to patients in the form of a number, for example 10% or 1-in-10.

Risk-prediction and Incisional Hernia

Risk-prediction tools are being developed with the aim of working out a person's risk of developing an incisional hernia **before** their operation. We hope that this will allow surgeons to give patients an idea of what their risk is before the operation. Patients can then understand if they are at high, medium or low risk, and what they might be able to do about it before the operation.

For patients that are predicted to be "high risk" for developing an incisional hernia, it may be possible to use a synthetic mesh, similar to those used to fix groin hernias. This would be placed in the wound at the end of the initial operation to strengthen the wound to try and reduce the chance of developing an incisional hernia.

Aims of the study

We want to know whether mesh placed to prevent hernias during the initial surgery would be acceptable to patients, and if patients would find a risk-prediction tool helpful when learning more about risk of incisional hernia before surgery.

Please read the questions below and circle the answer that best applies to you.

Q1. If you were told before your operation that you were "high risk" of developing an incisional hernia, and that using mesh might help to reduce that risk, to what extent would you agree or disagree with the following statements?

a. **"I would be worried about the safety of mesh"**

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

b. "**I would be worried about the mesh causing me pain"**

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

c. "I would be worried that if the mesh was implanted, it would not be easy to remove at a later date if it didn't work"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

d. "I would be worried about how much benefit I will get from mesh"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

e. "I do not think I have enough information about mesh to make a decision about it"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Q2. Thinking back to your original operation, please read the questions below and circle the answer that best applies to you.

a. "I would have found risk-scoring before an operation useful in helping me understand my risk of developing incisional hernia"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

b. "Understanding my risk of developing incisional hernia would have helped me to make decisions about different treatment options"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

c. "The idea of using mesh to strengthen the wound before a hernia develops would be acceptable to me"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

d. "I would want to find out more information regarding mesh before deciding if it would be acceptable to me"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

What additional information about mesh would you want to know in order to make a decision about it?
Please record your answer in the box below

Thank you for taking the time to complete this questionnaire.

If you have any further comments about any of the topics discussed, please feel free to contact the research team phone on 02921 842934 or email ColorectalResearch.CAV@wales.nhs.uk.

Reporting checklist for protocol of a clinical trial.

Based on the SPIRIT guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the SPIRITreporting guidelines, and cite them as:

Chan A-W, Tetzlaff JM, Gøtzsche PC, Altman DG, Mann H, Berlin J, Dickersin K, Hróbjartsson A, Schulz KF, Parulekar WR, Krleža-Jerić K, Laupacis A, Moher D. SPIRIT 2013 Explanation and Elaboration: Guidance for protocols of clinical trials. BMJ. 2013;346:e7586

		Reporting Item	Page Number
Administrative information			
Title	#1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1

Trial registration	#2a	Trial identifier and registry name. If not yet registered, name of intended registry	1
Trial registration: data set	#2b	All items from the World Health Organization Trial Registration Data Set	1
Protocol version	#3	Date and version identifier	1
Funding	#4	Sources and types of financial, material, and other support	8
Roles and responsibilities: contributorship	#5a	Names, affiliations, and roles of protocol contributors	1
Roles and responsibilities: sponsor contact information	#5b	Name and contact information for the trial sponsor	1
Roles and responsibilities: sponsor and funder	#5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	8
Roles and responsibilities: committees	#5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and	N/A

		other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	
Introduction			
Background and rationale	#6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	3
Background and rationale: choice of comparators	#6b	Explanation for choice of comparators	4
Objectives	#7	Specific objectives or hypotheses	3
Trial design	#8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, non-inferiority, exploratory)	4
Methods: Participants, interventions, and outcomes			
Study setting	#9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will	4

		be collected. Reference to where list of study sites can be obtained	
Eligibility criteria	#10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	5
Interventions: description	#11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	6
Interventions: modifications	#11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving / worsening disease)	N/A – qualitative trial.
Interventions: adherance	#11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return; laboratory tests)	5/6
Interventions: concomitant care	#11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	N/A – qualitative trial
Outcomes	#12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome.	3

		Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	
Participant timeline	#13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	6
Sample size	#14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	7
Recruitment	#15	Strategies for achieving adequate participant enrolment to reach target sample size	6
Methods: Assignment of interventions (for controlled trials)			
Allocation: sequence generation	#16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who 5nroll participants or assign interventions	N/A qualitative analysis

Allocation concealment mechanism	#16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	N/A
Allocation: implementation	#16c	Who will generate the allocation sequence, who will 6nroll participants, and who will assign participants to interventions	N/A
Blinding (masking)	#17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	N/A
Blinding (masking): emergency unblinding	#17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	N/A
Methods: Data collection, management, and analysis			
Data collection plan	#18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity,	7

		if known. Reference to where data collection forms can be found, if not in the protocol	
Data collection plan: retention	#18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	6/7
Data management	#19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	6/7
Statistics: outcomes	#20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	7
Statistics: additional analyses	#20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	7
Statistics: analysis population and missing data	#20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation)	7
Methods: Monitoring			

Data monitoring: formal committee	#21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	
Data monitoring: interim analysis	#21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	N/A – not planned
Harms	#22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	8
Auditing	#23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	8
Ethics and dissemination			
Research ethics approval	#24	Plans for seeking research ethics committee / institutional review board (REC / IRB) approval	8

Protocol amendments	#25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC / IRBs, trial participants, trial registries, journals, regulators)	8
Consent or assent	#26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	5
Consent or assent: ancillary studies	#26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	N/A
Confidentiality	#27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	8
Declaration of interests	#28	Financial and other competing interests for principal investigators for the overall trial and each study site	8
Data access	#29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	8
Ancillary and post trial care	#30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	8

Dissemination policy: trial results	#31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	9
Dissemination policy: authorship	#31b	Authorship eligibility guidelines and any intended use of professional writers	9
Dissemination policy: reproducible research	#31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	N/A
Appendices			
Informed consent materials	#32	Model consent form and other related documentation given to participants and authorised surrogates	12
Biological specimens	#33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	

BMJ Open

Incisional hernia prevention: risk-benefit from a patient perspective (INVITE)—protocol for a single-centre, mixed-methods, cross-sectional study aiming to determine if using prophylactic mesh in incisional hernia prevention is acceptable to patients

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Incisional hernia prevention: risk-benefit from a patient perspective (INVITE)—protocol for a single-centre, mixed-methods, cross-sectional study aiming to determine if using prophylactic mesh in incisional hernia prevention is acceptable to patients

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Abstract

Introduction

Incisional hernia (IH) is a common complication of abdominal surgery affecting between 10-20% of patients and is associated with significant morbidity along with cost to the NHS. With high recurrence rates following repair, focus must be on prevention of IH rather than cure. There is increasing evidence that patients at high risk of developing IH may benefit from prophylactic mesh placement during their index operation. With recent controversy surrounding the use of mesh in the UK, however, there is little understanding of whether this intervention would be acceptable to patients.

Methods and analysis

INVITE is a mixed-methods, cross-sectional study to explore patient perceptions of the use of mesh as prophylaxis to prevent incisional hernia. Patients with and without IH who have undergone colorectal surgery between 2017 and 2020 in a single UK health-board will be approached to participate. 120 participants will be asked to complete a questionnaire and a sub-group of 24 participants will be invited to semi-structured interviews. The primary outcome is to assess the acceptability of prophylactic mesh to patients. Secondary outcomes include understanding patients' knowledge of IH, and factors that may influence or alter the acceptability of mesh. Questionnaires have been developed using a 5-point Likert scale to allow quantitative analysis. Qualitative analysis of interviews will be conducted using NVIVO software and thematic analysis. Data will be presented using the Journal Article Reporting Standards (JARS) for mixed-methods research.

Ethics and dissemination

Ethical approval has been granted by REC Wales (22/PR/0678), and the study is currently in set-up. All participants will be required to provide informed consent prior to their participation in the study. We plan to report the results of the study in peer-reviewed scientific and medical journals and via presentations at scientific meetings. Results from this study will aid the design of interventional trials using prophylactic mesh.

Study registration number

ClinicalTrials.gov, NCT05384600.

Keywords:

Incisional Hernia, Mesh, Abdominal surgery, Prevention

Strengths and limitations of this study

- The study aims to address a key area of understanding, necessary to further research into mesh prophylaxis.

- Mixed-methods study design will allow the research question to be investigated from different perspectives leading to a more comprehensive understanding of the outcome.
- Lack of validated questionnaires in literature means that novel, unvalidated questionnaires have been developed.

Introduction

Incisional hernia is defined as a bulge or protrusion that occurs through a previously made incision and affects 10-15% of patients following abdominal surgery (1). It carries a substantial cost to healthcare services, estimated at between $21,000-$26,000 per patient, and impact on patient health and wellbeing (2). Patient morbidity arises from symptoms related to the hernia, such as pain and incarceration, alongside reduced quality of life in areas of emotional and social functioning, as well as body image concerns (3)(4). Whilst incisional hernia repair has been linked to an improvement in quality of life, operations are technically difficult and associated with high recurrence rates of between 10-30%, suggesting that prevention may be better than cure (3)(5)(6).

The main risk factors for incisional hernia are well understood. Raised BMI and smoking status, post-operative surgical site infection (SSI) and location of incision are all associated with higher risk of developing incisional hernia (7)(8)(9). Large multicentre randomised control trials have focused on identifying optimal closure methods and suture choice to try and reduce incidence of incisional hernia. These have lowered the incidence of incisional hernia, but not eliminated it completely (10) (11).

Several studies have attempted to identify patients at high risk for incisional hernia pre-operatively and assess whether these patients may benefit from different closure methods, or the use of prophylactic mesh (12) (13). The development of risk-predictive tools for incisional hernia, such as the model produced by Basta *et al.,* may help clinicians to quantify risk to patients, use prophylactic mesh in high-risk cases and subsequently reduce the incidence, and therefore economic burden of incisional hernia on healthcare services (14) (15). Evidence for the use of mesh prophylaxis is increasing, with systematic reviews demonstrating an overall risk reduction in incisional hernia when compared to primary suture closure in elective midline incisions, alongside evidence to suggest low rates of complications, yet despite this evidence, uptake of mesh prophylaxis remains slow.

The use of mesh in surgery in the United Kingdom has come under scrutiny following media coverage and public concerns relating to the use of mesh in uro-gynaecological procedures, culminating in the Cumberledge report in 2020 (16). With the growing controversy and media coverage, public concerns about the use of mesh in hernia surgery lead to the RCS issuing a statement in 2018 defending its use for hernia surgery (17) (18). Currently, there is little published on the patients' perspective of the use of prophylactic mesh in the prevention of incisional hernia.

Aims

1. To determine if the use of prophylactic mesh is acceptable to patients who have undergone, or are undergoing, abdominal surgery.
2. To identify factors that patients consider important when considering the use of mesh as a prophylaxis for the prevention of incisional hernias.

Methods and analysis

Study design

INVITE is a prospective, mixed-methods cross-sectional study with two components:

1. A patient survey assessing patient knowledge and understanding of incisional hernia and the acceptability of management options including prophylactic mesh using quantitative research methods
2. Semi-structured qualitative interviews to explore patients' opinions further and determine factors that would affect acceptability of mesh to patients.

A sub-group of patients will be approached to take part in a qualitative interview based on their answers to the questionnaire and their willingness to participate further as indicated on their consent form. These patients will be invited to take part in semi-structured interviews with a member of the research team who is trained in qualitative research methods.

Due to the nature of the data collected, a combination of qualitative and quantitive analytical methods will be employed in order to address the study aims. This will be supported by CEDAR, an in-house trials methodology group and analysed with the help of NVIVO software.

Study population

The clinical care team will identify patients who have undergone elective colonic resections for colorectal cancer and those who have undergone emergency laparotomy (Emlap) from established databases, including the Cardiff and Vale NELA (national emergency laparotomy audit) database, and the Cardiff and Vale University Health Board Colorectal MDT database over a three-year period (2017-2020). Patients who have died since their operation can be identified through this method, and will not be contacted. Most patients develop incisional hernia within 18 months of surgery and this will allow sufficient time from surgery without introducing excessive recall bias. A continuous cohort of patients who are scheduled for elective colonic resection will be identified prospectively through the Cardiff and Vale Colorectal and Inflammatory Bowel MDT database over a 3-month time period.

Patients with incisional hernia will be identified through retrospectively maintained colorectal databases containing elective and emergency patients that have undergone colorectal resections in Cardiff and Vale UHB. This will be cross-referenced with a list of primary care referrals for "Incisional Hernia" for the period 2017-2020 accessed through the General Surgical directorate.

Eligibility criteria

Inclusion

Patients who have undergone elective or emergency colonic resection within Cardiff and Vale UHB.

Group 1 (with incisional hernia): 60 patients

- Over the age of 18 years old
- Able and willing to provide valid informed consent
- Undergone elective or emergency colonic resection >12 months ago
- Clinical or radiological diagnosis of incisional hernia.

Group 2 (without incisional hernia): 60 patients

- Over the age of 18 years old
- Able and willing to provide valid informed consent
- Undergone emergency abdominal surgery > 12 months ago OR elective colonic resection > 12 months ago
- Do not have a clinical or radiological diagnosis of Incisional hernia (or suspected incisional hernia)

Group 3 (about to undergo laparotomy): 20 patients

- Over the age of 18 years old
- Able and willing to provide valid informed consent
- Scheduled for elective colonic resection in Cardiff and Vale UHB.
- No history of previous laparotomy.

Where possible, attempts will be made to identify patients undergoing colonic resection for benign disease.

Exclusion

All participants (groups 1, 2 & 3)

- Patients who are unable or unwilling to give informed consent
- Any patient with a palliative diagnosis either at time of surgery, or since
- Inability to understand or complete study questionnaires
    - Due to intellectual or cognitive impairment
    - Due to insufficient English-language skills

Recruitment

Eligible patients will be first approached by a member of the clinical team either face-to-face, if identified at routine clinical appointments, or by post. Potential participants approached by post will receive a letter of invitation signed by their treating clinician, along with a copy of the participant information sheet and reply slip. All those that wish to participate in the study will be instructed to contact the research team either by phone, or by return of the reply slip.

400 patients have been identified through databases as being eligible for inclusion. Based on an accepted response rate of 40%, we have set a recruitment target of 120 patients (60 with incisional hernia, and 60 without.) for the quantitative component. A sub-group of patients

will be invited to participate in face-to-face interviews, and will be selected based on their responses to the questionnaire and their willingness to participate further as indicated on their consent form. Interviews will be conducted with 12 patients per group, or until saturation occurs.

Patients who indicate they would like to participate will be contacted either by post or email with a patient information sheet, consent form and questionnaire. Participants will be given a pre-paid envelope to return the consent form and questionnaire. If there has been no response after 2 weeks, further information will be sent. If there is still no response, then no further attempt at contact will be made.

Assessments

Questionnaire

Following a review of literature, no validated tools were identified relating to incisional hernia and patient perspective on medical mesh. A questionnaire was subsequently developed using the Health Belief Model as a framework for understanding health-related behaviours and drivers for change, alongside input from a Public and Patient Involvement (PPI) representatives. The questionnaire will be composed of baseline demographics and surgical history, including assessing for presence of incisional hernia and the patient's previous knowledge of incisional hernia. The acceptability of risk-predictive models, and acceptability of prophylactic mesh will also be assessed.

We will seek feedback on the questionnaire, from the first 10 participants that receive it. Their feedback will be collated, analysed and, if necessary, used to revise the questionnaire.

A copy of the questionnaire can be seen in Appendix 1.

Qualitative interviews

12 patients from each group will be invited to take part in semi-structured interviews with a trained researcher. Only patients that indicate they would like to be contacted further on their questionnaire will be approached. Interviews will take part remotely on a one-to-one basis through Microsoft Teams. Topic guides and pre-prepared questions will be developed by the interviewers, with input from stakeholders, and will be used to ascertain participant's views on risk-predictive models, along with acceptability of prophylactic mesh and factors that might make it more acceptable.

Interviews are anticipated to last approximately 30-60 minutes and will be recorded and transcribed verbatim using a transcription service. Thematic analysis will be conducted on the qualitative data using NVivo by suitably trained and experienced researchers in order to identify any relevant themes in relation to acceptability and what constitutes high risk.

Discontinuation/withdrawal of participants

Participants have the right to withdraw from the study at any time and the investigator may also withdraw participants from the study at their discretion. If a participant withdraws, or is withdrawn, their medical treatment of legal rights will not be affected.

Anonymised research data from withdrawn participants may continue to be used and stored for use in this and future research projects. This will not include personal information, which will be destroyed at the point of withdrawal.

Expenses and benefits

Participants will not be offered any form of incentive (financial or otherwise) in return for their participation in this study. Those that are involved in the qualitative interview section of the study will be offered reimbursement for any additional travel expenses incurred as a result of their participation in this study. All questionnaires or letters that require responses by post will be provided with pre-addressed and pre-paid envelopes.

End of study

Participant's involvement in the study will end on completion of interviews.

The study will end once the final interview has been transcribed, passed quality assurance procedures and is ready for analysis

Data analysis

Number of Participants

As the primary objective of this study relates to qualitative research methods, no power calculation has been performed.

Quantitative data

The questionnaire will be assessed using a 5-point Likert scale and basic descriptive statistics will be used to analyse participant responses and provide meaningful output.

Qualitative data

Recorded interviews will be transcribed and prepared for analysis. Quality assurance procedures will include simultaneously reading the transcript while listening to the audio recording.

Braun and Clarke's framework of thematic analysis will be used to address the research question. Initially, patterns will be identified by reading transcripts and summary notes. Line by line coding will allow further identification of emerging theme clusters, which will be refined as the analysis progresses. The process will be aided with the use of NVivo Qualitative Data Analysis software.

Data analysis will be supported by researchers from Cedar Health Technology Research Centre, and data will be presented using the American Psychological Association's (APA) Journal Article Reporting Standards (JARS) for mixed-methods research as a framework.[19]

Patient and public involvement

Patient and public involvement (PPI) representatives have been involved at all aspects of study design and set-up, in particular, in development of patient information leaflets and in the design and testing of study questionnaires.

Ethics and dissemination

Ethics approval and consent

This protocol and related documents (and any subsequent amendments) has received approval from REC Wales (22/PR/0678). Annual progress and safety reports and a final report at the conclusion to the study will be submitted to the REC within the timelines requested.

Informed consent will need to be received from all participants before any personal data can be collected. Potential participants will be afforded as much time as necessary to consider the pros and cons of study participation before signing and returning the consent form.

Data management and use

Data will be entered into an Excel database by a member of the research team. The database will be password protected. Anonymised data will only be accessible by investigators at the sponsor site. Data entry will be double checked to ensure accuracy of data entry. If there are discrepancies identified the entire data collection will be double checked to ensure complete accuracy.

Data collected during the course of the research will be kept strictly confidential and accessed only by members of the study team. Participants' personal details (name, address) will be stored by sites under the guidelines of GDPR. Participants will be allocated an individual specific study number which will be used to identify their data. Audio recordings from the focus group will only be kept until they have been transcribed. Transcripts will be stored on a password protected computer. Qualitative interviews data will be stored for a minimum of 5 years and a maximum of 10 years for audit purposes.

Participant's anonymized research data will be stored for a period of 5 years following the end of this study, for use in future research. Data will be stored, curated and managed in-line with the sponsor data management policies and procedures. No personal identifiable information will be shared with external researchers. Sharing data with other bona-fide researcher(s) will be subject to appropriate contractual agreements.

Dissemination

We plan to publish the results of this study in the form of peer-reviewed scientific and medical journal articles, and the clinical study report will be used for publication and presentation at scientific meetings.

Summaries of results will also be made available to Investigators for dissemination within their clinical areas (where appropriate and according to their discretion), and a newsletter with study outcomes will be distributed to participants who indicate they would like to receive it.

Summary and future work

The results of this study will be used to aid clinicians in understanding if mesh placement to prevent incisional hernia is acceptable to patients, along with factors, including the role of risk-predictive tools, that may influence the acceptability of mesh. This in turn will aid in the design and set-up of future interventional trials looking at prophylactic mesh placement in the UK.

** ** **

Contributors

LS: study design, Protocol development, Questionnaire synthesis, testing and development, Drafted and revised paper. AM: Protocol development, study registration and ethical applications. TW: Questionnaire development, Development of qualitative methodology, Draft paper revisions. LK: Qualitative interview design and support, Qualitative analysis, Draft paper revisions. JT: Study design, Questionnaire development, Draft paper revisions JC: study design, Chief Investigator, Questionnaire development, Draft paper revisions.

Competing interests

None of the named authors have any competing interests or disclosures to make.

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The study has received external funding from the European Hernia Society (EHS). Cardiff and Vale University Health board is the sponsor. Both EHS and the sponsor have had no input into study design, data collection, management or dissemination of findings.

Study registrations and sponsor information

IRAS: 310695, registered on 12/04/2022.

REC Wales approval number: 22/PR/0678.

ClinicalTrials.gov: NCT05384600 (registered on 20/05/2022).

INVITE Protocol v1.0, 05/03/2022.

Sponsor: Cardiff and Vale University Health Board, Cardiff, UK.

References

1. Bosanquet DC, Ansell J, Abdelrahman T, Cornish J, Harries R, Stimpson A, et al. Systematic Review and Meta-Regression of Factors Affecting Midline Incisional Hernia Rates: Analysis of 14 618 Patients. PLOS ONE. 2015 Sep 21;10(9).

2. Alli V v., Zhang J, Telem DA. Impact of incisional hernia development following abdominal operations on total healthcare cost. Surgical Endoscopy. 2018 May 12;32(5).

3. Jensen KK, Emmertsen KJ, Laurberg S, Krarup P-M. Long-term impact of incisional hernia on quality of life after colonic cancer resection. Hernia. 2020 Apr 24;24(2).

4. van Ramshorst GH, Eker HH, Hop WCJ, Jeekel J, Lange JF. Impact of incisional hernia on health-related quality of life and body image: a prospective cohort study. The American Journal of Surgery. 2012 Aug;204(2).

5. Romain B, Renard Y, Binquet C, Poghosyan T, Moszkowicz D, Gillion J-F, et al. Recurrence after elective incisional hernia repair is more frequent than you think: An international prospective cohort from the French Society of Surgery. Surgery. 2020 Jul;168(1).

6. Köckerling F. Recurrent Incisional Hernia Repair—An Overview. Frontiers in Surgery. 2019 May 14;6.

7. Walming S, Angenete E, Block M, Bock D, Gessler B, Haglind E. Retrospective review of risk factors for surgical wound dehiscence and incisional hernia. BMC Surgery. 2017 Dec 22;17(1).

8. Lee L, Abou-Khalil M, Liberman S, Boutros M, Fried GM, Feldman LS. Incidence of incisional hernia in the specimen extraction site for laparoscopic colorectal surgery: systematic review and meta-analysis. Surgical Endoscopy. 2017 Dec 25;31(12).

9. Itatsu K, Yokoyama Y, Sugawara G, Kubota H, Tojima Y, Kurumiya Y, et al. Incidence of and risk factors for incisional hernia after abdominal surgery. British Journal of Surgery. 2014 Sep 8;101(11).

10. Deerenberg EB, Harlaar JJ, Steyerberg EW, Lont HE, van Doorn HC, Heisterkamp J, et al. Small bites versus large bites for closure of abdominal midline incisions (STITCH): a double-blind, multicentre, randomised controlled trial. The Lancet. 2015 Sep;386(10000).

11. Cornish J, Harries RL, Bosanquet D, Rees B, Ansell J, Frewer N, et al. Hughes Abdominal Repair Trial (HART) – Abdominal wall closure techniques to reduce the incidence of incisional hernias: study protocol for a randomised controlled trial. Trials. 2016 Dec 15;17(1).

12. Jairam AP, Timmermans L, Eker HH, Pierik REGJM, van Klaveren D, Steyerberg EW, et al. Prevention of incisional hernia with prophylactic onlay and sublay mesh reinforcement versus primary suture only in midline laparotomies (PRIMA): 2-year follow-up of a multicentre, double-blind, randomised controlled trial. The Lancet. 2017 Aug;390(10094).

13. Cano-Valderrama O, García-Alonso M, Sanz-Ortega G, Rojo M, Catalán V, Domínguez-Serrano I, et al. Is prophylactic mesh closure effective to decrease the incidence of incisional hernia after laparotomy in colorectal surgery? Acta Chirurgica Belgica. 2020 Nov 16;

14. Basta MN, Kozak GM, Broach RB, Messa CA, Rhemtulla I, DeMatteo RP, et al. Can We Predict Incisional Hernia? Annals of Surgery. 2019 Sep;270(3).

15. Gillion J-F, Sanders D, Miserez M, Muysoms F. The economic burden of incisional ventral hernia repair: a multicentric cost analysis. Hernia. 2016 Dec 1;20(6).

16. Mesh working group interim report. https://www.england.nhs.uk/wp-content/uploads/2015/12/mesh-wg-interim-rep.pdf. 2015.

17. NHS hernia mesh repairs "leaving patients in chronic pain." https://www.bbc.co.uk/news/health-40132638. 2017.

18. RCS statement on hernia mesh complications. https://www.rcseng.ac.uk/news-and-events/media-centre/press-releases/rcs-response-to-hernia-mesh-complications/. 2018.

19. Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R., & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. *American Psychologist*, *73*(1), 26–46. https://doi.org/10.1037/amp0000151

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol
Cardiff and Vale
University Health Board

INVITE
Incisional Hernia: Risk-benefit from a patient's perspective

Participant Questionnaire

Version 1.0, 11/05/2022

Please circle your choice of answer in each case.

Section 1: Background

We are trying to understand a bit more about you and the effects of your operation on your health.

What is your height? _____ cm / ft What is your weight? _____ Kg / Stone

Have you ever smoked on a daily basis?

Yes, currently a smoker Yes, but an ex-smoker Never Smoked

Do you currently feel pain at the site of the scar from your operation?

Yes No Sometimes

Do you ***feel*** a swelling or bulge at the site of your scar?

Yes No Sometimes

Do you ***see*** a swelling or bulge at the site of your scar?

Yes No Not sure

Section 2: Knowledge of Incisional Hernia

After having abdominal surgery, there is a risk that some of the abdominal contents can push through a weakness left in the muscle at the site of the operation. This is called an incisional hernia.

Did you know what an incisional hernia was before your first operation?

Yes No Don't know/Unsure

Were you told that Incisional Hernia was a risk for your operation?

Yes No Unsure/Don't know

How much information regarding incisional hernia was given to you before the operation?

None Not enough The right amount Too much

Have you heard of doctors using mesh as part of a hernia repair?

Yes No Don't know/Unsure

Is what you've heard about mesh...

Positive Negative Neutral Not Applicable

Do you know someone who has had a hernia repair?

Yes No

If yes, did it involve mesh?

Yes No Don't know/unsure

Was their outcome positive or negative?

Positive Negative Not sure Not applicable

If you have heard of mesh, where have you heard about it from?

Doctor/Healthcare professional News/Media Friend/relative

Other:_____ Not applicable

If you have any other comments about mesh, please feel free to record them below.

Bwrdd Iechyd Prifysgol Cardiff and Vale University Health Board

Section 3: Risk and prevention

What is a risk-prediction tool?

Risk-prediction tools are used by doctors to work out a person's risk of developing a medical condition, for example the risk of having a heart attack based on the risk factors that they have. This allows doctors to convey the risk to patients in the form of a number, for example 10% or 1-in-10.

Risk-prediction and Incisional Hernia

Risk-prediction tools are being developed with the aim of working out a person's risk of developing an incisional hernia **before** their operation. We hope that this will allow surgeons to give patients an idea of what their risk is before the operation. Patients can then understand if they are at high, medium or low risk, and what they might be able to do about it before the operation.

For patients that are predicted to be "high risk" for developing an incisional hernia, it may be possible to use a synthetic mesh, similar to those used to fix groin hernias. This would be placed in the wound at the end of the initial operation to strengthen the wound to try and reduce the chance of developing an incisional hernia.

Aims of the study

We want to know whether mesh placed to prevent hernias during the initial surgery would be acceptable to patients, and if patients would find a risk-prediction tool helpful when learning more about risk of incisional hernia before surgery.

Please read the questions below and circle the answer that best applies to you.

Q1. If you were told before your operation that you were "high risk" of developing an incisional hernia, and that using mesh might help to reduce that risk, to what extent would you agree or disagree with the following statements?

a. **"I would be worried about the safety of mesh"**

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

b. "**I would be worried about the mesh causing me pain"**

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

c. "I would be worried that if the mesh was implanted, it would not be easy to remove at a later date if it didn't work"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

d. "I would be worried about how much benefit I will get from mesh"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

e. "I do not think I have enough information about mesh to make a decision about it"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Q2. Thinking back to your original operation, please read the questions below and circle the answer that best applies to you.

a. "I would have found risk-scoring before an operation useful in helping me understand my risk of developing incisional hernia"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

b. "Understanding my risk of developing incisional hernia would have helped me to make decisions about different treatment options"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

c. "The idea of using mesh to strengthen the wound before a hernia develops would be acceptable to me"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Bwrdd Iechyd Prifysgol Cardiff and Vale University Health Board

d. "I would want to find out more information regarding mesh before deciding if it would be acceptable to me"

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

What additional information about mesh would you want to know in order to make a decision about it?

Please record your answer in the box below

Thank you for taking the time to complete this questionnaire.

If you have any further comments about any of the topics discussed, please feel free to contact the research team phone on 02921 842934 or email ColorectalResearch.CAV@wales.nhs.uk.

Reporting checklist for protocol of a clinical trial.

Based on the SPIRIT guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the SPIRITreporting guidelines, and cite them as:

Chan A-W, Tetzlaff JM, Gøtzsche PC, Altman DG, Mann H, Berlin J, Dickersin K, Hróbjartsson A, Schulz KF, Parulekar WR, Krleža-Jerić K, Laupacis A, Moher D. SPIRIT 2013 Explanation and Elaboration: Guidance for protocols of clinical trials. BMJ. 2013;346:e7586

		Reporting Item	Page Number
Administrative information			
Title	#1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1

Trial registration	#2a	Trial identifier and registry name. If not yet registered, name of intended registry	1
Trial registration: data set	#2b	All items from the World Health Organization Trial Registration Data Set	1
Protocol version	#3	Date and version identifier	1
Funding	#4	Sources and types of financial, material, and other support	8
Roles and responsibilities: contributorship	#5a	Names, affiliations, and roles of protocol contributors	1
Roles and responsibilities: sponsor contact information	#5b	Name and contact information for the trial sponsor	1
Roles and responsibilities: sponsor and funder	#5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	8
Roles and responsibilities: committees	#5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and	N/A

		other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	
Introduction			
Background and rationale	#6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	3
Background and rationale: choice of comparators	#6b	Explanation for choice of comparators	4
Objectives	#7	Specific objectives or hypotheses	3
Trial design	#8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, non-inferiority, exploratory)	4
Methods: Participants, interventions, and outcomes			
Study setting	#9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will	4

		be collected. Reference to where list of study sites can be obtained	
Eligibility criteria	#10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	5
Interventions: description	#11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	6
Interventions: modifications	#11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving / worsening disease)	N/A – qualitative trial.
Interventions: adherance	#11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return; laboratory tests)	5/6
Interventions: concomitant care	#11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	N/A – qualitative trial
Outcomes	#12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome.	3

		Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	
Participant timeline	#13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	6
Sample size	#14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	7
Recruitment	#15	Strategies for achieving adequate participant enrolment to reach target sample size	6
Methods: Assignment of interventions (for controlled trials)			
Allocation: sequence generation	#16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who 5nroll participants or assign interventions	N/A qualitative analysis

Allocation concealment mechanism	#16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	N/A
Allocation: implementation	#16c	Who will generate the allocation sequence, who will 6nroll participants, and who will assign participants to interventions	N/A
Blinding (masking)	#17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	N/A
Blinding (masking): emergency unblinding	#17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	N/A
Methods: Data collection, management, and analysis			
Data collection plan	#18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity,	7

		if known. Reference to where data collection forms can be found, if not in the protocol	
Data collection plan: retention	#18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	6/7
Data management	#19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	6/7
Statistics: outcomes	#20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	7
Statistics: additional analyses	#20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	7
Statistics: analysis population and missing data	#20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation)	7
Methods: Monitoring			

Data monitoring: formal committee	#21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	
Data monitoring: interim analysis	#21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	N/A – not planned
Harms	#22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	8
Auditing	#23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	8
Ethics and dissemination			
Research ethics approval	#24	Plans for seeking research ethics committee / institutional review board (REC / IRB) approval	8

Protocol amendments	#25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC / IRBs, trial participants, trial registries, journals, regulators)	8
Consent or assent	#26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	5
Consent or assent: ancillary studies	#26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	N/A
Confidentiality	#27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	8
Declaration of interests	#28	Financial and other competing interests for principal investigators for the overall trial and each study site	8
Data access	#29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	8
Ancillary and post trial care	#30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	8

Dissemination policy: trial results	#31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	9
Dissemination policy: authorship	#31b	Authorship eligibility guidelines and any intended use of professional writers	9
Dissemination policy: reproducible research	#31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	N/A
Appendices			
Informed consent materials	#32	Model consent form and other related documentation given to participants and authorised surrogates	12
Biological specimens	#33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	