

**STUDY TITLE**

**Children's Acute Surgical Abdomen Programme**

**SHORT STUDY TITLE**

**CASAP**

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**Sponsored by:**

University College London (UCL)

**Protocol version number and date: 1.2 (11.09.2019)**

**R&D / Sponsor Reference Number(s): 18/0342**

**Study Registration Number:**

## PROTOCOL VERSIONS

Version Stage	Versions No	Version Date	Protocol updated & finalised by;	Appendix No detail the reason(s) for the protocol update
	1.2	11/09/2019	L. A. Sogbodjor	<p>Inclusion/Exclusion Criteria amended to provide more clarity (pages 14 and 15)</p> <p>Minor changes to contact details of study team</p>
	1.1	21/05/2019	Prof S.R. Moonasinghe	Response to initial ethics committee review: change from consenting to non-consenting model
Pre-study draft for ethics	1.0	14/05/2018	L. A. Sogbodjor	

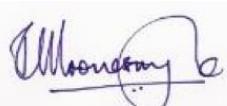
## DECLARATIONS

The undersigned confirm that the following protocol has been agreed and accepted and that the investigator agrees to conduct the study in compliance with the approved protocol and will adhere to the Research Governance Framework 2005 (as amended thereafter), the Trust Data & Information policy, Sponsor and other relevant SOPs and applicable Trust policies and legal frameworks.

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

I (investigator) also confirm that an honest accurate and transparent account of the study will be given; and that any deviations from the study as planned in this protocol will be explained and reported accordingly.

**Chief Investigator:**



Signature:..... Date....11/09/2019

Print Name(in full): Prof Ramani Moonesinghe.....

Position: Professor of Perioperative Medicine, UCL

**On behalf of the Study Sponsor:**



Signature: Date 16/09/2019

Print Name(in full): Pushpsen Joshi

Position: Research Management and Governance Manager

## STUDY SUMMARY

<b>Identifiers</b>	
IRAS Number	234524
REC Reference No	19/LO/0267
Sponsor Reference No	18/034
Other research reference number(s) (if applicable)	
Full (Scientific) title	Children's Acute Surgical Abdomen Programme
Health condition(s) or problem(s) studied	Perioperative Medicine, Paediatric Surgery, Anaesthesia
Study Type i.e. Cohort etc	Prospective Observational Cohort Study
Target sample size	5000
<b>STUDY TIMELINES</b>	
Study Duration/length	10 years and 6 months
Expected Start Date	Jul 2019
End of Study definition and anticipated date	Dec 2029: Following completion of 10 year mortality follow up obtained via data-linkage with NHS Digital / Office of National Statistics mortality database.
Key Study milestones	
<b>FUNDING &amp; Other</b>	
Funding	National Institute of Academic Anaesthesia (APAGBI Project Grant) £40,000
Other support	Health Services Research Centre Email: <a href="mailto:CASAP@rcoa.ac.uk">CASAP@rcoa.ac.uk</a> Address: The Royal College of Anaesthetists, Churchill House, 35 Red Lion Square, London WC1R 4SG

<b>STORAGE of SAMPLES (if applicable)</b>	
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## KEY ROLES AND RESPONSIBILITIES

**SPONSOR:** The sponsor is responsible for ensuring before a study begins that arrangements are in place for the research team to access resources and support to deliver the research as proposed and allocate responsibilities for the management, monitoring and reporting of the research. The Sponsor also has to be satisfied there is agreement on appropriate arrangements to record, report and review significant developments as the research proceeds, and approve any modifications to the design.

**FUNDER:** The funder is the entity that will provide the funds (financial support) for the conduction of the study. Funders are expected to provide assistance to any enquiry, audit or investigation related to the funded work.

**CHIEF INVESTIGATOR (CI):** The person who takes overall responsibility for the design, conduct and reporting of a study. If the study involves researchers at more than one site, the CI takes on the primary responsibility whether or not he/she is an investigator at any particular site.

The CI role is to complete and to ensure that all relevant regulatory approvals are in place before the study begins. Ensure arrangements are in place for good study conduct, robust monitoring and reporting, including prompt reporting of incidents, this includes putting in place adequate training for study staff to conduct the study as per the protocol and relevant standards.

The Chief Investigator is responsible for submission of annual reports as required. The Chief Investigator will notify the RE of the end of the study, including the reasons for the premature termination. Within one year after the end of study, the Chief Investigator will submit a final report with the results, including any publications/abstracts to the REC.

**STUDY COORDINATOR:** Responsible for day to day project management and general queries.

**PRINCIPLE INVESTIGATOR (PI):** Individually or as leader of the researchers at a site; ensuring that the study is conducted as per the approved study protocol, and report/notify the relevant parties – this includes the CI of any breaches or incidents related to the study.

## KEY WORDS

Anaesthesia; Paediatrics; Perioperative Medicine; Surgery

## LIST OF ABBREVIATIONS

AE	Adverse Event
AR	Adverse Reaction
CASAP	Children's Acute Surgical Abdomen Programme
CI	Chief Investigator
CRF	Case Report Form
CRO	Contract Research Organisation
DMC	Data Monitoring Committee
GAfREC	Governance Arrangement for NHS Research Ethics
HSRC	Health Services Research Centre
IB	Investigator Brochure
ICF	Informed Consent Form
NIAA	National Institute for Academic Anaesthesia
NIHR	National Institute for Health Research
PID	Patient Identifiable Data
PI	Principle Investigator
PIS	Participant Information Sheet
QA	Quality Assurance
QI	Quality Improvement
RCoA	Royal College of Anaesthetists
REC	Research Ethics committee
SAR	Serious Adverse Reaction
SAE	Serious Adverse Event
SDV	Source Data Verification
SOP	Standard Operating Procedure
SSI	Site Specific Information
TMF	Trial Master File

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## **1 INTRODUCTION**

CASAP will review the type and quality of care provided to children undergoing emergency abdominal surgery in the United Kingdom. In doing so it will measure baseline compliance against evidence-based recommendations and identify variations in care between individual hospitals. This study will test the feasibility of gathering and analysing such data with a view to establishing a longer term national quality improvement programme for this high-risk patient group. An additional aim of this study is to develop a risk-adjustment model for children having this kind of surgery.

CASAP is a prospective observational cohort study. Data will be collected on all patients (aged 1 - 16 years on the day of surgery) undergoing unplanned abdominal surgery in the UK until we reach our target recruitment of 5000 patients. We will measure postoperative morbidity during the inpatient stay and will establish longer term outcomes in these children by linking prospectively collected in-hospital data and longer-term hospital episode statistics and mortality data held by NHS Digital.

CASAP will be led by a UCL-employed Chief Investigator working with the Health Services Research Centre, of which the CI is the director, based at the Royal College of Anaesthetists. The management of the study will be supported by a steering group comprised of key stakeholder representatives including paediatric intensivists, surgeons, anaesthetists, and members of the public.

## **2 BACKGROUND AND RATIONALE**

There is a recognised gap in the quality of care delivered to elective and emergency surgical patients: this has been highlighted as a priority for health services research by patients and clinicians.<sup>(1)</sup> The care provided to adults undergoing emergency abdominal surgery has been the focus of a comprehensive national effort to quality assure clinical practice, identify variation between institutions and in so doing, improve patient outcomes. The National Emergency Laparotomy Audit (NELA; [www.nela.org.uk](http://www.nela.org.uk) ) was established in 2011 to audit against national recommendations for the care of adult patients undergoing emergency abdominal surgery, and

continues to date, having collected data on over 90,000 patients in 183 hospitals in England and Wales.(2-6) Bolt-on local quality improvement (QI) initiatives which have used NELA data to implement changes in practice have been associated with significant reductions in adverse outcomes.(7) Deficiencies in the quality of emergency surgical care provided to children were highlighted in a NCEPOD report in 2011 and more recent evidence suggests that whilst there has been a reduction in the number of some emergency procedures undertaken, this has been accompanied by an increase in the overall incidence of adverse outcomes.(8,9) As a result, paediatric emergency general surgery has been identified by the Association of Paediatric Anaesthetists and the British Association of Paediatric Surgeons as a priority area for quality assurance and quality improvement, but until now, there has been no consolidated national effort to measure or report processes and outcomes in this patient group.

Any initiative which aims to measure quality (with the aim of improvement) in paediatric emergency abdominal surgery will need to achieve several goals. First, the metrics used should be comprehensive, appropriate for this patient group and based on evidence or national/international recommendations. The measurement of quality can be divided into structure, process and outcome indicators according the criteria established by Donabedian.(10) The structures and processes which influence outcome in a paediatric cohort of patients undergoing emergency abdominal surgery are sufficiently different from adult surgery that the direct mapping of adult audit, QA or QI initiatives to children's perioperative care is likely to be of limited value. For example, the centralisation of paediatric surgical services has resulted in increased referral rates of emergency patients to specialist centres and a subsequent increase in demand for inter-hospital transfers,(8) which are not generally required in adult emergency abdominal surgery. Second, the outcomes assessed also require tailoring to this population, and need to be feasible and valid for use in a pragmatic multi-centre evaluation without specialist training of staff. Measures traditionally used in adult perioperative health-services research such as inpatient or 30-day mortality are not appropriate as the sole outcomes of interest in this population, as short-term mortality is so uncommon in children having this type of surgery. Instead, measures such as postoperative morbidity and the requirement for longer-term nutritional supplementation are likely to be more meaningful for both patients and clinicians. Finally, engagement from several specialities is needed to capture all aspects of such a pathway. This includes paediatricians and intensivists as well as both general and specialist paediatric surgeons and anaesthetists.

### **3 AIMS and OBJECTIVES**

#### **3.1 Aims**

1. To measure compliance against process measures which have been recommended for the delivery of clinical care to children undergoing emergency abdominal surgery in the U.K.
2. To develop and internally validate a risk prediction/adjustment tool for paediatric emergency abdominal surgery using a comprehensive paediatric U.K. sample.
3. To determine the feasibility of a longer term national QI programme in this patient group

#### **3.2 Research Questions**

1. What is the level of compliance with national and international recommendations for processes relevant to the care of children undergoing emergency abdominal surgery in the U.K.?
2. What are the independent risk factors for adverse postoperative outcomes in paediatric patients undergoing emergency abdominal surgery?

#### **3.3 Objectives**

##### **3.3.1 Research:**

- To collect quality and outcome data on paediatric patients whose parents have provided informed consent, undergoing emergency abdominal surgery in all UK hospitals

- To measure and analyse patient-level estimates of perioperative risk using previously identified risk factors, to develop and internally validate a risk-prediction model for children's emergency abdominal surgery

### **3.3.2 Feasibility for longer term national quality improvement programme:**

- To test the feasibility (screening to recruitment ratio) of a consenting model for collecting this type of quality data in paediatric patients undergoing emergency abdominal surgery
- To test the feasibility of data linkage for paediatric patients between prospectively collected in-hospital data and longer-term hospital episode statistics and mortality data held by NHS Digital (England), the Patient Episode Database for Wales (PEDW) and the NHS Central Register (Scotland)

## **4 STUDY DESIGN**

Prospective observational cohort study

## **5 STUDY SCHEDULE**

### **5.1 Enrolment process**

Screening for patients who meet the inclusion criteria will be conducted on a daily basis by local researchers, through locally determined processes but which are likely to include screening of emergency operating theatre lists and ward occupancy lists. Once identified, parents/legal guardians and children will be provided with participant information sheets informing them of the study and they will be given at least one hour to consider the information before parents are approached to provide consent.

### **5.2 Data collection and data linkage**

There are two points of data collection during the inpatient stay (Case Report Form parts 1 and 2)

- Part 1: data about preoperative status and intraoperative care – to be completed as soon as possible during or after surgery

- Part 2: postoperative follow-up data – to be completed either on discharge from hospital or at 30 days postoperatively, whichever occurs first. This CRF requires information about the patient's post-operative journey which will be routinely documented in the notes (such as the ongoing use of pain medication). The Clavien-Dindo classification system will be used to grade the severity of postoperative complications encountered.(11)

Inpatient stay will be censored at 30 days post-surgery. Therefore, the final entry in the CRF will be whichever of the following three options is the chronologically earliest date: date of discharge from hospital, date of death while in hospital, or 30 days' post-surgery if the patient remains in hospital on that date.

Prospectively collected patient data will be linked to NHS Digital's mortality data using the Bespoke Data Linkage service. We will specifically aim to establish survival at 30 days, 90 days, and 1 year as well as longer term survival (up to 10 years). Follow up at 10 years will represent the last study activity for each individual participant.

### **5.3 Participant Withdrawal**

Participants will be able to withdraw their participation by notifying the local teams.

### **5.4 Study Closure**

Study recruitment will end after 5000 children have been recruited. Follow up at 10 years will represent the last study activity for each individual participant and CRFs will be destroyed 10 years after the last study activity.

### **5.5 Study Management**

The project team is chaired by the Chief Investigator and will meet monthly to deliver the day-to-day organization of the study. This team includes a student researcher who has collated the quality metrics for the dataset through conducting a systematic review of structures and processes measures, and who will be involved in the data analysis and reporting of the study findings. A study steering committee with an independent chair (Professor Mark Peters, Paediatric Intensive Care Consultant at Great Ormond Street Hospital) will meet bi-annually and

advise on study design and conduct; this consists of multi-disciplinary, professional and lay representation.

## 6 CONSENT

The parents of children aged between 1 year and 16 years on the planned or actual date of surgery will be approached to provide informed consent to participate. Patients will first be identified by research nurses or by clinical nurses, emergency medicine doctors, critical care specialists, anaesthetists and/or surgeons involved in their care. Potential participants will be provided with a participant information sheet (one for the parent/legal guardian and, where appropriate, one for the child aged 10 - 15 years old). They will be given at least one hour to consider the information provided before the adult is approached for informed consent. All participating hospitals will be provided with posters explaining that the study is ongoing which should be displayed in public areas (e.g. emergency departments, wards, operating theatre waiting rooms)

As this study involves only the collection of data which is part of routine clinical care, distribution of participant information sheets and approach for consent can take place at any point between time that the decision for surgery is made (the earliest point of approach) and the patient's discharge from hospital after surgery – however, local research teams are encouraged to approach patients/carers as early as possible.

## 7 ELIGIBILITY CRITERIA

### 7.1 Hospital Level

All NHS hospitals which provide care to children who may require emergency abdominal surgery will be eligible to take part.

### 7.2 Patient Level

#### Inclusion Criteria:

Children between 12 months and 16 years of age undergoing unplanned abdominal surgery, where the preoperative diagnosis was considered to be related to a non-traumatic bowel (including appendix), hepatobiliary, and/or splenic pathology. Unplanned is defined as non-

elective (i.e. the patient presented requiring emergency or urgent intervention, either as a primary presentation or as a complication of previous surgery). Surgery is defined as a procedure undertaken by a surgeon in an operating theatre requiring the support of an anaesthetist. Any surgical approach (e.g. open, laparoscopic, robotic assisted etc) is acceptable.

**Exclusion Criteria:**

Patients / parents who do not provide consent. Children <12 months old on day of surgery, elective procedures, operations where the preoperative indication for surgery was considered to be traumatic, urological or gynaecological in origin, organ transplants, insertion/removal of dialysis catheters, interventional radiology procedures and Caesarean sections. Herniotomies are also excluded if the procedure does not involve access to the intra-abdominal cavity.

## **8 RECRUITMENT**

### **8.1 Hospital recruitment**

Hospitals will be recruited using the NIAA HSRC's Quality Audit and Research Coordinator (QuARC) network, aiming for 100% coverage across the UK.

### **8.2 Participant recruitment**

All patients who meet our inclusion criteria in participating hospitals will be approached for participation. A screening log will be kept at local level to enable us to ascertain the feasibility of recruiting paediatric patients having emergency surgery.

## **9 STATISTICAL METHODS**

### **9.1 Analysis plan**

#### **Assessment of feasibility**

The main assessment of feasibility will be screening to recruitment ratios. The second assessment will be quality of data linkage between our prospective dataset and nationally held registries of processes and outcomes.

## **Descriptive and inferential analysis**

### Prospectively collected data

Our primary outcome will be postoperative complications measured using the Clavien-Dindo grading system. Secondary outcome measures will include: type of complication (e.g. pulmonary, infectious), length of hospital stay, inpatient mortality.

### Data linkage

Through subsequent data linkage we will ascertain at 30 days, 90 days and 1 year; longer term survival (up to 10 years) and hospital readmission.

Logistic regression will determine independent predictors for our primary and secondary outcomes, including both patient risk factors and structure / process level indicators with attention being paid to the hierarchical structure of the data (patients nested within hospitals). We will use multivariable regression with bootstrapping to develop and internally validate a risk prediction model to predict short-term morbidity. The purpose of this analysis is to develop models which can be used as a basis for risk adjustment in a future longer-term study, and to remove unnecessarily measured variables.

### **Sample size calculation**

As this is an observational pilot study we are not including a formal sample size calculation. However, we will aim to recruit 5000 patients to enable sufficiently large cohort to achieve our goals of being able to develop a risk adjustment model and validate the outcome measures. We have also considered likely recruitment rates when determining the duration of this pilot phase. A previous study (12) recruited 703 patients undergoing emergency appendectomy over 2 months in 98 U.K. hospitals. Previous audits of emergency laparotomy in large children's hospitals have indicated that approximately one emergency laparotomy is undertaken per week. A previous study collected data from children of all ages undergoing anaesthesia in the UK and Europe.(13) 31,127 cases were recruited across Europe of which 5893 (18.9%) were emergency cases, and 1475 (4.73%) were emergency or urgent abdominal surgery. Extrapolating this incidence to UK data based on Hospital Episode Statistics, which shows that 565,373 children within our inclusion ages underwent surgery in the year 2015-16, we estimate that the annual number of emergency abdominal procedures which would fit our criteria in England alone would be 26,742. Therefore in 3 months in England alone we would hope to capture information on approximately 6500 children. Based on these data, we estimate that

approximately 5000 children will be recruited to the study over a 3 month period from across the 4 devolved nations. We aim to recruit 5000 children and the study will continue to run until this target has been met. This is important to be able to estimate the feasibility of recruitment, avoidance of sampling bias and to be able to demonstrate sustainability of recruitment with a view to a longer-term programme.

## **9.2 Additional analyses and data sharing**

Once the primary analysis of the CASAP dataset is complete, requests for anonymised datasets from investigators outside the core study team and steering group with the purpose of conducting secondary analyses will be considered. This will entail formal review of such requests by both the study project team and the steering committee. If the request comes in after these structures have been disbanded, the responsibility for reviewing such requests will rest with the Chief Investigator.

## **10 PATIENT AND PUBLIC INVOLVEMENT (PPI)**

We have sought patient and public involvement from the NIAA Health Services Research Centre PCPIE group and the NIHR Young Persons Advisory Group in the West Midlands. Both groups have kindly reviewed our protocol and our patient information leaflets. A representative from the YPAG, Ms Mohini Samani, has also joined the study steering committee.

## **11 FUNDING AND SUPPLY OF EQUIPMENT**

The study funding has been reviewed by the UCL Research Office, and deemed sufficient to cover the requirements of the study. NHS costs will be supported via UCLH and/or the Local Clinical Research Network.

The research costs for the study have been supported by the National Institute for Academic Anaesthesia (APAGBI Project grant).

Insurance for all participating sites will be provided through NHS Indemnity.

## **12 DATA HANDLING AND MANAGEMENT**

### **12.1 Patient level data**

All investigators and study site staff will comply with the requirements of the Data Protection Act 1998 with regards to the collection, storage, processing and disclosure of personal information and will uphold the Act's core principles.

Data will be collected on all patients who meet the inclusion criteria and whose parent/legal guardian provides consent. Each hospital taking part will have nominated staff who will be responsible for data collection and postoperative follow up.

Completed questionnaires will be taken directly to a secure location accessible only by the local PI and other named members of the study team. On Day 30 postoperatively, local investigators will check the patient status (remains inpatient, vs. discharged from hospital, vs. died). The occurrence of postoperative complications will be determined through review of the patient record (medical notes, nursing charts and clinical / laboratory investigations). If the patient has been discharged from hospital or has died, this will be recorded on the CRF.

Inpatient stay will be censored at 30 days post-surgery. Therefore, the final entry in the CRF will be whichever of the following three options is the chronologically earliest date: date of discharge from hospital, date of death while in hospital, or 30 days post-surgery if the patient remains in hospital on that date.

### **12.3 Data handling and record keeping**

At individual hospital level, the completed CRFs will be held in a secure location accessible only by the local PI and other named members of the study team in accordance with GCP guidelines and local information and research governance frameworks. Information from the paper CRF will be entered via a secure web-based portal onto the study database. The uploading of data will occur in two steps. Firstly, a pseudonymised dataset with name, DoB, and date of surgery replaced by a unique CASAP Study ID, age and day of week on which surgery occurred will be uploaded onto the study database via UCL's Non-Data Safe Haven REDCAP web-based portal. This will be hosted on UCL servers. Local investigators will have access to enter and edit data from their own hospital. Secondly, a partial dataset containing the patient identifiers required for data linkage with NHS Digital will be uploaded by local investigators onto UCL's Data Safe

Haven using a secure file transfer portal. Only the core CASAP study team will have access to this data. Functionality of the CRFs and study database will be piloted in two hospitals in England prior to the start date of the study.

For the purposes of data linkage with NHS Digital the minimum amount of patient identifiable data will be extracted from the database on the UCL Data Safe Haven by the central investigation team, onto a password protected Excel spreadsheet. This will be emailed securely NHS Digital, to facilitate linkage to centrally held mortality data. Mortality will be tracked for all patients with a final censure date of 10 years after participant recruitment. Please see Data Flow Diagram for illustration (Figure1).

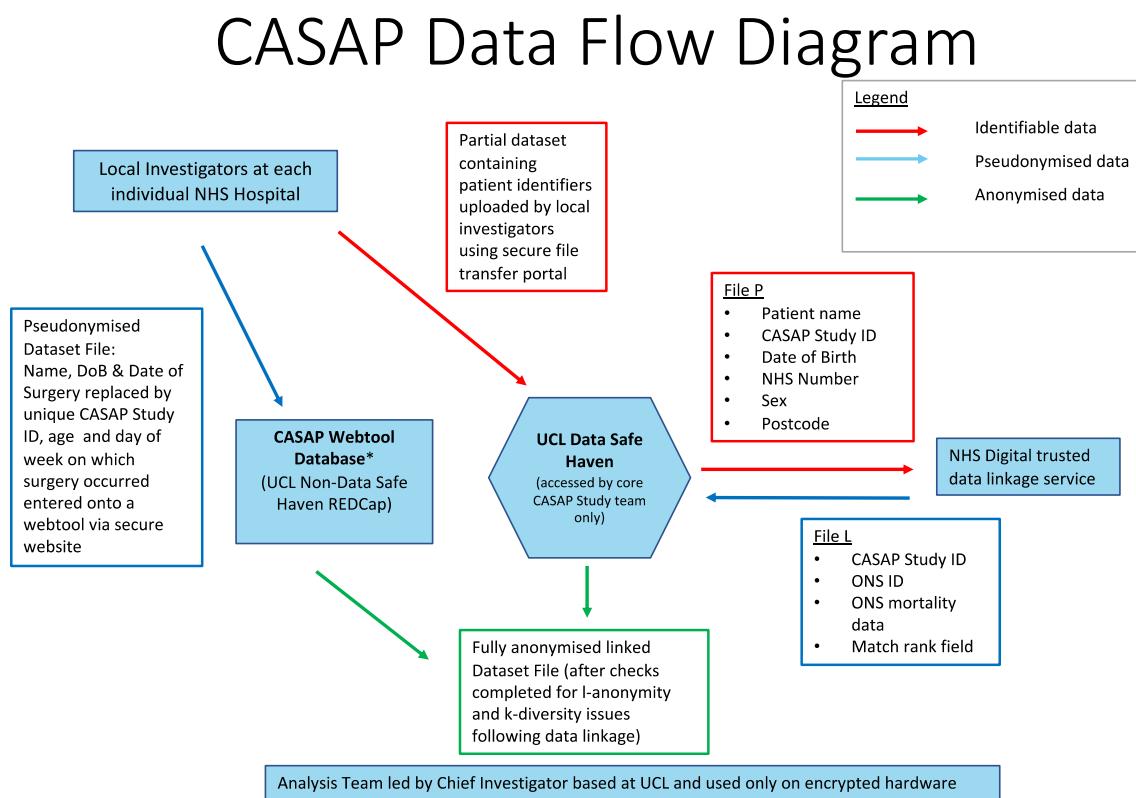


Figure 1: CASAP Data Flow Diagram

Patient identifiable data will be used to ensure individual patient records within the CASAP system are managed correctly, keeping distinct treatment episodes linked to the correct patient and will enable data linkage with the NHS Digital mortality tracking system. Four patient identifiers will be used: patient name, date of birth, NHS number and postcode.

The NHS number is not completely populated in the NHS Digital system and the other patient identifiers are used when the NHS number is absent. In addition, by using these four identifiers in combination, possible erroneous record linkages are flagged.

The following paragraphs describe the process of linkage to the NHS Digital mortality tracking system. The same process will be applied for linkage to HES data.

A file (P) containing patient identifiers only will be extracted from the full dataset hosted in the webtool, and will be sent securely to a trusted Data Linkage Service. For both mortality tracking data and HES data, this will be NHS Digital. File (P) will contain the following identifiers:

- CASAP anonymised identifier
- NHS number
- Date of Birth
- Sex
- Postcode

For each patient in the file, NHS Digital will identify the matching ONS ID. NHS Digital will return to UCL a 'look-up' file (L) containing only the CASAP identifier and the HESID identifiers, and a MATCH\_RANK field which indicates the strength of the match.

An extract of anonymised ONS mortality data will then be requested from NHS Digital for all the list of ONS IDs contained in file (L).

The file (L) will be placed in the secure UCL server accessible only to the project data manager. It will then be used to link the anonymised ONS data to the anonymised CASAP data for analysis.

The electronic patient datasets will be appropriately sent to Prof Ramani Moonesinghe for statistical analysis. Prof Moonesinghe will also act as the data custodian for the data collected as part of the CASAP study. UCL will process, store and dispose of all participant datasets in accordance with all applicable legal and regulatory requirements, including the Data Protection Act 1998 and any amendments thereto.

An anonymised dataset will be used by the central CASAP study team, led by Prof Ramani Moonesinghe, for analysis. In this dataset, the NHS number will be replaced by a unique study number, date of birth will be converted to 'Age at time of surgery' and postcode will be converted to PCT, SHA of residence and the Office for National Statistics Lower Super Output Area, which allows the allocation of the Index of Multiple Deprivation. Sex will be the only patient identifier used in the analysis. Some of the results of this study will be included in an academic project conducted by a member of the CASAP study team as part of a higher degree at UCL. Only anonymised data will be analysed. No patient identifiable data will be accessed.

## **13 PEER AND REGULATORY REVIEW**

The study has been peer reviewed in accordance with the requirements outlined by UCL.

- The Sponsor considers the procedure for obtaining funding from the National Institute for Academic Anaesthesia to be of sufficient rigour and independence to be considered an adequate peer review.

## **14 ASSESSMENT AND MANAGEMENT OF RISK**

We do not consider this observational study to carry any significant risks to participants or investigators.

## **15 INDEMNITY ARRANGEMENTS**

University College London holds insurance against claims from participants for harm caused by their participation in this clinical study. Participants may be able to claim compensation if they can prove that UCL has been negligent. However, if this clinical study is being carried out in a hospital, the hospital continues to have a duty of care to the participant of the clinical study. University College London does not accept liability for any breach in the hospital's duty of care, or any negligence on the part of hospital employees. This applies whether the hospital is an NHS Trust or otherwise.

## **16 ARCHIVING**

UCL and each participating site recognise that there is an obligation to archive study-related documents at the end of the study (as such end is defined within this protocol). The Chief Investigator confirms that she will archive the study master file at UCL for the period stipulated in the protocol and in line with all relevant legal and statutory requirements. The Principal Investigator at each participating site agrees to archive his/her respective site's study documents for 5 years and in line with all relevant legal and statutory requirements.

## **17 PUBLICATION AND DISSEMINATION POLICY**

We intend to present the results online via the study website, in peer reviewed scientific journals and in the form of conference presentations. In addition to academic publications we will provide specific summary reports for the following groups:

Healthcare policy makers – this will include medical and nursing Royal Colleges, specialist societies, Department of Health, NHS England, NHS Wales, NHS Scotland and Health and Social Care Ireland.

Patients and the Public – our lay representative and the lay representative group at the Royal College of Anaesthetists will provide support in our dissemination to the non-medical audience.

## **18 Participating NHS Trusts and Health Boards**

All NHS hospitals which provide care to children who may require emergency abdominal surgery will be eligible to take part. This includes those hospitals who may not perform such surgery themselves but will admit patients (either for planned care or via an emergency department) prior to transfer to a designated paediatric surgical centre.

## **19 REFERENCES**

1. Boney O, Bell M, Bell N, Conquest A, Cumbers M, Drake S, et al. Identifying research priorities in anaesthesia and perioperative care: Final report of the joint National Institute of Academic Anaesthesia/James Lind Alliance Research Priority Setting Partnership. *BMJ Open*. 2015;5(12):1–10.
2. NELA Project Team. Organisational Report of the National Emergency Laparotomy Audit. 2014. 1–90 p.
3. NELA Project Team. First patient report of the National Emergency Laparotomy Audit. 2015.
4. NELA Project Team. The second patient report of the National Emergency Laparotomy Audit. 2016;(November 2015):1–160.

5. Laparotomy E, Nela A. Third Patient Report of the National The third Patient Report of the National Emergency Laparotomy Audit ( NELA ) December 2015 to November 2016. 2017;(October).
6. NELA Project Team. Fourth Patient Report of the National Emergency Laparotomy Audit (NELA). 2017;(December 2016).
7. Huddart S, Peden CJ, Swart M, McCormick B, Dickinson M, Mohammed MA, et al. Use of a pathway quality improvement care bundle to reduce mortality after emergency laparotomy. *Br J Surg.* 2015;102(1):57-66.
8. Mason D, Wilkinson K, Gough M, Lucas S, Freeth H, Shotton H, et al. Are We There Yet? A review of organisational and clinical aspects of children's surgery. 2011;
9. Giuliani S, Cecil E V., Apelt N, Sharland M, Saxena S. Pediatric Emergency Appendectomy and 30-Day Postoperative Outcomes in District General Hospitals and Specialist Pediatric Surgical Centers in England, April 2001 to March 2012. *Ann Surg* [Internet]. 2016;263:184-90.
10. Donabedian A. Evaluating the quality of medical care. *Milbank Q.* 1966;44(No. 3, Pt. 2):166-203.
11. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg.* 2004;240(2):205-13.
12. Collaborative NSR. Multicentre observational study of performance variation in provision and outcome of emergency appendectomy. Bhangu A, Torrance A, Pinkney T, Battersby C, Beral D, Cornish J, Dent H, Hall N, Palser T, Panagiotopoulou I, Strong S, Velineni R, Panagiotopoulou I, Chatzizacharias N, Rana M, Rollins K, Ejtehadi F, Jha B, Tan Y, Fanous N, Markides G, Tan A, Marshal C, RC, editor. *Br J Surg* [Internet]. 2013;100(9):1240-52.
13. Habre W, Disma N, Virag K, Becke K, Hansen TG, Jöhr M, et al. Incidence of severe critical events in paediatric anaesthesia (APRICOT): a prospective multicentre observational study in 261 hospitals in Europe. *Lancet Respir Med.* 2017;5(5):412-25.

## 20 APPENDICES

1. Case Report Form
2. Participant Information Leaflets
3. Data Flow Diagram