Avoidable mortality from in-hospital cardiac arrest: Have interventions aimed at recognising and rescuing deteriorating patients made an impact on incidence and outcomes?

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This protocol describes the In-hospital cardiac arrest study and provides information about study processes and procedures. Every care was taken in its drafting, but corrections or amendments may be necessary. These will be circulated to Trusts involved in the study. Problems relating to this study should be referred, in the first instance, to the Chief Investigator.

This study will adhere to the principles outlined in the NHS Research Governance Framework for Health and Social Care (2nd edition). It will be conducted in compliance with the protocol, the Data Protection Act and other regulatory requirements as appropriate.

Background

Far reaching changes affecting hospitals in the last decade have challenged the pace of improvement in the care of acutely ill patients. Most significantly the implementation of the European Working Time Directive has led to a reduction of the number of hours junior doctors are able to work with unease that senior doctor coverage has not expanded adequately to fill the gap.[1] The introduction of shift systems as part of these changes has also impacted on teamwork and continuity of care. Although there have been service developments aimed at ameliorating some of these problems such as the Hospital at Night scheme [2] concern has remained that these pressures on the system are a challenge to patient safety and increase the risk of patients experiencing serious harm including death. The importance of reducing avoidable mortality is highlighted in the Department of Health's aspiration to create a new indicator for measuring "deaths as a result of problems in care" as part of the NHS Outcomes Framework 2013/14.[3] This will also be reflected in the Commissioning Outcomes Indicator Framework which the NHS Commissioning Board will use to assess the performance of CCGs. In doing so, the Government will be seeking assurances on behalf of patients and the public that avoidable deaths are minimised.[4] Failure to recognise and respond to the deteriorating patient one of the most common causes of avoidable mortality within hospitals.[5]

It is estimated that resuscitation teams are called to between 1 and 5 in-hospital arrests per 1000 hospital admissions, equivalent to around 20,000 arrests in NHS hospitals in England each year, with survival to discharge after arrest of around 15%.[6,7] Reviews of such cases have shown that clear signs of deterioration (physiological changes or level of consciousness) are often present and not acted on for up to 8 hours before an arrest.[8,9] A further 100,000 ward patients are visited by Critical Care Outreach Teams (CCOT) annually because of concerns for their clinical state. A quarter of these patients will be dead within 28 days.[10] Inadequate monitoring and failure to detect and react promptly to patient deterioration account for up to a third of avoidable deaths in the NHS hospitals and is an area prioritised for improvement by the National Patient Safety Agency.[5] Unchecked deterioration is costly for both patients and the service resulting in need for extra treatments, prolonged lengths of stay and additional exposure to hazards such as drug side effects and hospital acquired infection.

Concerns over the quality of care for acutely ill patients in the NHS and its relationship with avoidable mortality have been repeatedly voiced over the last two decades.[11,12] In 2000, the Department of Health's report 'Comprehensive Critical Care' set out a strategy to provide an

integrated hospital-wide approach to critical illness.[13] This led to the introduction of CCOTs in a bid to improve response to the needs of deteriorating patients on the wards. These teams were also tasked with strengthening critical care skills amongst ward staff and promoting the uptake of early warning scoring systems (EWS) to track patient observations and trigger appropriate responses. In 2005, despite the progress made on the management of critically ill patients during the early 2000s, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) report ' An Acute Problem' found that some patients were still receiving suboptimal care.[14] In some hospitals, junior doctors continued to be largely responsible for providing emergency care on the ward with inadequate consultant input and communication failures between teams contributing to delays in escalating care to a higher level. The report estimated that 21% of admissions to ICU from general wards could have been avoided with better care. In response, NICE issued guidance on the care of the acutely ill patient which reiterated the need for CCOTs and the widespread use of EWS.[15] Subsequently, the Royal College of Physicians[16] and the NCEPOD[17], have called for consultant assessment shortly after admission and policies related to treatment limitation and Do Not Attempt Resuscitation (DNAR) decisions to be put in place. The NHS Institute for Innovation and Improvement has also promoted the widespread use of the situation, background, assessment and recommendation (SBAR) approach to improve the quality of communication of urgent patient information amongst clinicians.[18]

Despite national guidance,[19] regional collaborations[20] and additional resources to facilitate change over the last decade,[21] data from the National Cardiac Arrest Audit (NCAA) show four to six fold variation in in-hospital cardiac arrest (IHCA) incidence and outcomes between hospitals are persisting.[22] In 2012, NCEPOD reviewed a sample of deaths associated with IHCAs and found that a lack of early assessment by consultants, inadequate management and monitoring plans, a lack of decision making around appropriate ceilings of care or suitability for resuscitation and failure to escalate care in response to deterioration continue to contribute to these events.[17] The majority of deaths in the review came from Trusts reporting high compliance with NICE guidance suggesting that either the effectiveness of these recommended interventions is not as great as anticipated or problems with implementation decrease their effectiveness. The former is evident from the inconsistent findings of evaluations of even the most scrutinised interventions such as CCOTs, with the early promising results from single site studies not replicated in larger trials.[23,24] The growing literature on complex interventions also points to the importance of implementation fidelity if such interventions are to achieve predicted outcomes in different settings.[24,25] Studies have confirmed that variation exists within the composition and roles of CCOT teams, the levels of uptake of EWS across wards and in the process of making DNAR decisions.[26] The

importance of implementation fidelity is apparent in a local collaborative (University College London Partners Deteriorating Patient Collaborative) that reported significant reductions in IHCA incidence through the introduction of standardised approaches to management of acutely ill patient across the patient pathway in 13 hospitals.[27]

As the use of packages of multiple interventions is already well-established across the NHS, it is impossible to evaluate the impact of each component intervention using experimentation (i.e. a randomised controlled trial). However, by combining the principles of natural experimentation,[28] which exploits existing variation in health care, and assessment of the implementation fidelity of interventions,[29] which explores what aspects of an intervention were delivered and how well they were delivered, we will be able to establish associations between interventions and packages of interventions and outcomes. Understanding which of the interventions designed to detect and respond to patient deterioration are associated with the lowest IHCA incidence and best outcomes will not only contribute to avoiding some of the 20,000 deaths following IHCA each year but also to the prevention of serious harm related to deterioration. The recent NCEPOD report highlighted continued weaknesses in the provision of care for acutely ill patients.[17] The report generated some useful hypotheses in relation to where further developments are necessary. This study is designed to test these hypotheses. By identifying which packages of interventions and which contexts produce the best outcomes we will determine best practice. Implementation of such practice has the potential to reduce avoidable serious harm and mortality. This is the first major study to be able to use data collected as part of the NCAA.[30] This audit, which started in 2009, is now receiving reports from over 60% of hospitals in England, representative of the range of hospitals found in the NHS.

Aims and Objectives

Aim

This research aims to use the principles of natural experimentation to identify which packages of interventions aimed at detection and management of patient deterioration in acute hospitals are associated with the lowest in-hospital cardiac arrest (IHCA) incidence and best outcomes and in doing so identify models of care that are likely to have most impact on decreasing avoidable mortality.

Our objectives are:

1. To design a typology of interventions based on previous research and an understanding of how interventions are implemented in practice

2. To determine the association between different intervention types and IHCA incidence and outcomes
3. To identify intervention features associated with the lowest IHCA incidence and best outcomes and disseminate the findings across the NHS to guide service design

The research is divided into four work packages:

Work Package 1: Systematic literature review of evaluative studies of interventions designed to decrease the incidence of and improve outcomes from IHCAs

Research Questions:

What is the scientific evidence for interventions designed to decrease the incidence of and improve outcomes following IHCA?

What are the essential components of effective interventions and key contextual factors that influence their impact (effectiveness)?

Work Package 2: Developing and piloting a questionnaire for assessing the use of interventions in acute hospitals based on the combined findings from Work Package 1 and qualitative work in 20 hospitals

Research Question:

How are interventions aimed at deteriorating patients implemented in practice (how do the content, coverage and contextual moderating factors vary across hospitals)?

Work Package 3: National survey of hospitals

Research Question:

How much current variation is there in types of intervention across hospitals taking part in the National Cardiac Arrest Audit (NCAA) and how has this changed over time?

Work Package 4: Evaluating the impact of interventions through cross-sectional, before:after/time series and difference-in-difference approaches

Research Question:

How is variation in interventions associated with variation in IHCA incidence and outcomes found in the NCAA?

Method

Design and Theoretical Framework

The design of this study draws on three theoretical approaches. The first is natural experimentation, an approach that exploits variation in healthcare service provision and outcomes to determine associations between different service models and those outcomes.[28] It is particularly useful when a range of services are already in place and it has become impossible to undertake randomised trials to determine which have the best outcomes.[31] Secondly, Rogers[32] "theory of diffusion transfer" postulates that developing effective interventions is only the first step in improving outcomes. Apart from dissemination and adoption, interventions need to be implemented effectively and then sustained. The literature on complex interventions in healthcare indicates that implementation is a key determinant of discrepancies between expected and observed outcomes.[33] To address this, the third theory we will employ is that of implementation fidelity - the degree to which programmes are implemented as intended[34] - which has received relatively little attention to date.[35] To identify how interventions have been implemented in practice we will use Carroll et al's conceptual framework for implementation fidelity.[29] The framework defines adherence in terms of intervention content, coverage, frequency of use and duration all of which are influenced by four contextual moderators: intervention complexity, facilitation strategies, quality of delivery and staff engagement. Through understanding how interventions have been implemented in practice, we will be able to go beyond what hospitals report they have in place and identify key differences in how these interventions have developed and are currently organised and run. This information will support the development of a typology of interventions which will form the basis of our major quantitative analyses focused on associations between intervention types and outcomes.

Work package 1: Systematic literature review

A literature review of evaluative studies of interventions designed to decrease the incidence of and improve outcomes from IHCAs will be undertaken. The review will have two purposes: to explore the effectiveness of specific interventions; and to collect evidence on how these interventions were implemented. Consultation with experts and review of national policy documents will identify interventions and search terms.

The search terms will comprise three elements; intervention term, outcome and organisation (hospital). Relevant bibliographic and publication-based databases including Medline, Embase, CINAHL and Cochrane will be systematically searched and the sensitivity of search terms tested by two researchers. Other sources will include bibliographies of reports, hand

searches of specialist journals and expert informants. A snowball approach will ensure comparator and ancestor studies found in articles will be followed up. As it is likely that information on the details of implementation will be missing from some published reports, we anticipate the need to make contact with authors more frequently than is the case with most systematic reviews.

Searches will be conducted from 1980 to the present and restricted to English language papers. Exclusions will include studies relating to children, those outside the hospital setting and those with no outcome data of relevance. Two researchers will independently assess studies for inclusion based initially on title, then on abstract and finally on the full text. Inter-rater reliability will be calculated. Disagreements will be resolved through discussion and consensus. The process will be managed using EndNote and Excel software.

We will rate the quality of included studies using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach based on study limitations, inconsistency of results, indirectness of evidence, imprecision and publication bias.(38) Information from articles will be extracted into tables which will summarise aim, setting, participants, intervention components, design, findings and GRADE assessment. In addition, any details of how the intervention was implemented will be captured under the headings: operational processes, levers and barriers, contextual factors, and information on how implementation might have influenced outcome. Evidence for particular interventions will be grouped together. The two researchers will meet regularly to discuss progress and ensure consistency in information extraction.

Due to the expected heterogeneity of studies, the findings will be organised using a narrative synthesis approach which will describe the studies and findings, their quality, missing details and heterogeneity.[36]

For each intervention, outcomes will be stratified by implementation characteristics (structures and processes). Based on this analysis we will begin to develop a typology of interventions.

Work package 2: Developing and piloting a questionnaire for assessing the use of interventions in acute hospitals

Semi-structured interviews and document review will be used to build up a precise picture of the implementation fidelity of interventions aimed at preventing IHCA in 20 English acute hospitals. Purposive sampling will be used to identify a range of hospitals of different size, location, teaching versus non teaching and foundation versus non-foundation status. This

will maximise the likelihood of understanding the full range of interventions that have been used and the ways in which they have (or have not) been implemented. Drawing on the findings of the literature review which highlights essential intervention elements and contexts for the best outcomes and Carroll et al's framework for implementation fidelity an interview schedule will be designed.[29] Carroll's Framework is used to measure implementation fidelity which in turn describes how far actual interventions adhere to their intended designs. The framework will allow examination of different aspects of interventions. An example below shows how it might be applied in practice to one such intervention the Critical Care Outreach Team (CCOT).

Intervention specific factors

Content of intervention: What are the objectives? Are there standards and protocols? What is the structure of the team? What are the team processes including triggering?

Frequency: How often is the team called and to which wards?

Duration: When was the team implemented? How was it implemented (in stages or full roll out)?

Coverage: What are the hours of operation?

Context Factors

Facilitation Strategies: What is the nature of training and organisational support given to the CCOT?

Quality of delivery: Are there monitoring and feedback mechanisms in place?

Participant responsiveness: How are CCOT regarded by ward staff? Do ward staff feel supported? How do ward staff respond to visits? Staff attitudes to escalating care.

The interviews will principally assess (i) adherence to evidence-based models of care and any changes over time, and (ii) contextual factors such as leadership and management, staff training and engagement, strategic goals, monitoring and evaluation. In addition, other contextual moderating factors such as internal or external organisational features and resources will be investigated. Both through interviews and consultation of documents we will elicit the time line for implementation of different interventions and how this was achieved. Interviews will be undertaken with relevant members of staff at each hospital sampled purposively. The Project Advisory Group and collaborators will help identify

interviewees and facilitate contact with hospitals. Several staff will be interviewed at each site to get a complete picture of how interventions are organised and operate in practice. This is likely to include a range of staff such as a consultant intensivist; an outreach nurse; a ward sister; a consultant physician; SpRs in intensive care and in general medicine. If these interviews suggest other informants would be helpful in providing a valid account of intervention implementation, additional people will be interviewed. Interviews will be arranged by email or telephone and take place in a private location on site, or by telephone. Written consent will be obtained before interviews after fully informing participants of the objectives of the study and providing an information sheet. Field work notes will be taken during the interviews and audio-recorded material will supplement notes. Findings will be analysed using the framework approach which takes key thematic headings from the interview schedule and compares responses within each predetermined theme.[37]

The survey will be developed from the findings of the literature review and the qualitative enquiry in the 20 sites conducted using semi-structured interviews. The latter will help hone questions related to each intervention that will clarify how they have been implemented. The survey will also explore management structures within the hospitals that are critical for the delivery of interventions affecting cardiac arrest (governance arrangements including integration with other organisational safety initiatives , communication processes, resources as well as external factors such as belonging to a clinical network or collaborative. This information will allow us to stratify our survey data on acute Trusts based on graduation of implementation intensity and then look for associations between the different strata and outcomes. A draft questionnaire will be developed which will gather information on interventions used, their content and dose, together with key contextual features. These descriptors will be operationalised, along with other potential explanatory factors (e.g. ICU availability) needed for the quantitative analyses. The questionnaire will comprise both closed questions based on pre-determined practices and open questions to allow respondents to report variations. The questionnaire will be piloted in four hospitals to test face and content validity. After which any necessary revisions will be made.

Work package 3: National survey of hospitals

The questionnaire will be sent to all acute hospitals participating in the NCAA (reflecting a broad range of organisational types). ICNARC already has clinical contacts at every hospital who act as respondents for the NCAA. They will be asked to identify three relevant people from different professions e.g. physician, ward nurse and member of CCOT to receive the questionnaire (which may well include themselves). Questionnaires will be mailed and emailed to the identified people along with a covering letter and information sheet. Non

responders will be contacted after 3 weeks and further copies of the questionnaire mailed as requested. Using best practice in maximising response rates we expect to achieve a response rate of 80%. This target response rate of 80% was based on experience from surveys administered by ICNARC in two earlier NIHR SDO programme studies. The Critical Care Outreach Services survey (SDO/74/2004) achieved a response rate of 80% and the Critical Care Modernisation survey (SDO 08/1604/133) achieved a response rate of 83.7%. These high rates are achievable because of the long-standing relationship that ICNARC has with all the Trusts.

To increase the validity of questionnaire responses, follow up telephone calls will be made to seek clarification if responses from the three respondents in a hospital do not concord. In addition, site visits will be made to a 10% random sample of hospitals to verify questionnaire response through face to face interviews.

Quantitative data will be entered onto an Epidata database and analyses conducted in Stata. Responses to open questions will be subject to content analysis.

Work package 4: Evaluating the impact of interventions

We will exploit variation in implementation of interventions and the variation in IHCA incidence and outcomes across hospitals to evaluate which particular packages of interventions are associated with the best outcomes. The main source for data on interventions will be the survey and the NCAA database will provide data on outcomes.

The NCAA database includes information on all individuals (excluding neonates and arrests occurring in ITU/HDU and coronary care units) receiving chest compressions and/ or defibrillation and attended by a hospital-based resuscitation team (or equivalent) in response to a 2222 call.[30] It includes staff, visitors and out-patient attendees who have an arrest in the hospital (though these are few in number). The dataset includes: NHS number as a patient identifier; socio- demographic characteristics (sex, age, ethnicity); clinical characteristics (diagnosis on admission to hospital); and the time and place of the arrest. Data covers the status of a patient at the time of arrival of the resuscitation team through to the outcome (return of spontaneous circulation within 20 minutes of cardiac arrest and condition at hospital discharge).

Hospitals provide monthly data on numbers of inpatient hospital admissions for the denominator, the number of 2222 calls and the number of calls solely for cardiac arrests. Data collection is guided by a manual and entered via a secure web-based portal. Data are validated at point of entry to maximise accuracy.

Around 60% of acute hospitals in England are now participating in the NCAA, representing the range of hospitals found in the UK in terms of size, location, teaching and foundation status. Data from the NCAA will be available for 42 months (April 2011 to September 2014). Preliminary analysis of audit data indicates that for the year 2011/12 there is at least a fourfold variation in the incidence of IHCAs per 1000 hospital admissions and outcomes (% survival to hospital discharge).

Data in the NCAA will be linked to Hospital Episode Statistics at the patient level to the relevant hospital spell, i.e. all finished consultant episodes within the relevant spell. This will provide data on co-morbidity and hospital treatments. It is also proposed to link at the hospital level to the SPOT(light) study database providing information on the timeliness of CCOT provision and the ICNARC Case Mix Programme (CMP) for exploration of aspects of care such as the condition of patients at time of admission to ICU. A current NIHR HS&DR project (ref 09/2000/65) is developing risk prediction models for NCAA and the outputs of this research will be used for case-mix adjustment.

The NCAA and HES linked data should provide information on around 150 hospitals (30,000 patients) in England and Wales from April 2011 to Sept 2014 based on hospitals currently in NCAA. If we restrict analysis to hospitals that submit data for the full 42 months we estimate we will have data on over 20,000 patients in 100 hospitals. Linkage to the CMP will be near complete (national participation in the CMP is 95%) whereas we estimate around half of hospitals can be linked to SPOT(light).

Analysis: The overall analytical approach will use cross-sectional, before:after/time-series, and difference-in-difference (DID) approaches to evaluate the association between interventions and outcomes. The approach to the analysis acknowledges the difficulties of inferring causality in natural experiments; the aim is to produce a feasible (including estimated power calculations) and robust analysis that is sensitive to the limitations of the data and done in a transparent way. The analysis will be carried out in three stages.

The first stage will use evidence and data from Work Packages1-3 to derive independent variables and identify a limited set of plausible primary hypotheses for testing. This will include the likely nature of any impact with respect to an intervention (e.g. how immediate, step change or change in trend, relationship with fidelity) and how other factors (e.g. other interventions, temporal trends) should be controlled for. This work will allow initial models to be specified and a Statistical Analysis Plan will be produced.

Stage two will involve linking intervention data with NCAA data (but with mortality removed.) Analysis will focus on examining associations between interventions and changes in process

measures, e.g. volume of calls, case-mix, source/location of patient, etc. One issue to consider is the inter-relationship between IHCAs, DNAR policies and the volume of 2222 calls/inclusion in NCAA and the scope for selection bias. The relationship with CCOT provision will be examined in the subset of hospitals in both NCAA and SPOTlight. Data quality and completeness will be assessed and criteria for inclusion of patients and hospitals will be specified. The output from this stage will be a revised Statistical Analysis Plan.

The final stage is the evaluation of the impact of interventions on outcomes. Mortality data will be added to the dataset. The analysis will be defined in the Statistical Analysis Plan but is likely to involve regression analysis that allows for the structure of the data: hierarchical (patients, hospital locations, hospitals, trusts), temporal (up to 42 months of data from 2011), and case-mix adjusted outcome (IHCA rates, mortality) using multilevel modelling in, e.g., Stata or MLWin. Key components will be the robustness of findings to alternative assumptions, testing (in)consistency of findings (e.g. between processes/outcomes, between subgroups), and presence of dose-response relationships (e.g. larger effects with increased fidelity/compliance.)

The quality and missingness of data in the NCAA database are issues that are currently being examined in the NIHR-funded study on risk prediction in the NCAA (HSDR 09/2000/65) led by one of the team (David Harrison) Our approach will follow recommendations from this work and team members (David Harrison and Andrew Hutchings) who are familiar with issues in, and methods for, handling missing data. Early indications from the NCAA are that data completeness is good as submitted data is subject to rigorous data validation processes by ICNARC before being accepted and added to the NCAA database

Ethical Issues

This study will be managed in accordance with the requirements of the Research Governance Using the MRC/HRA Tool (Appendix 1) indicates that this research does not require Research Ethics Committee approval.

Informed consent will be acquired from all NHS staff respondents. We will seek approval from their managers, where appropriate, for release of staff to undertake interviews. All data collected as part of this study will be stored securely. LSHTM and ICNARC have Information Security Policies which govern the handling of data for research purposes.

Analyses will be conducted on anonymised data. ICNARC already have some linked data (SPOTlight and the Case Mix Programme (CMP)).Linkage between NCAA, CMP and Hospital Episode Statistics is being undertaken by ICNARC as part of another study and we will confirm with the HRA Confidentiality Advisory Group whether the Section 251 approval needed for the linkage can be extended to this study. If not, we will submit an application for Section 251 approval. The linkage between CMP/NCAA and HES would have to be done by the Health and Social Care Information Centre (HSCIC) as a 'bespoke data linkage'.

Study data entered on the LSHTM computer network will be stored on a secure server that the University has available for confidential datasets. This system allows the tracking of access to the data and the secure electronic shredding of these data on the deletion date. Access to the computerised data will be password protected and computer terminals are located in lockable rooms. The research data will be backed up regularly.

The CI will monitor the conduct of the study and if any breech of research governance were to arise it will be reported to the Steering Group and local R& D staff and action to remedy will be taken.

Indemnity

The London School of Hygiene and Tropical Medicine holds Public Liability Policies and Employer Liability Policies issued by the Royal Sun Alliance and ACE and a Medical Malpractice Policy issued by Lloyd's of London. The School is covered for its legal liability for claims arising from work carried out by any of its employees, on and off the School's premises, always subject to the policy terms, exceptions and conditions. The School's indemnity limit for Public Liability is £30,000,000, Employers Liability £30,000,000 and Medical Malpractice £7,500,000. The limit for non-negligent harm is £3,000,000.

Study Management

Helen Hogan as the chief investigator will take overall responsibility for leadership and management of the study. She will supervise a full time Senior Research Fellow/ Lecturer. Both Helen Hogan and the Senior Research Fellow/ Lecturer will be responsible for satisfactory completion of each work package. Nick Black and Andrew Hutchings will provide senior support day to day. Helen Hogan will have weekly meetings with Professor Nick Black. Professor Black also has an open door policy to deal with problems as they arise.

A Project Management Group, chaired by Nick Black, will convene monthly to discuss all practical matters related to the implementation of the study. This group will comprise Helen Hogan, the Research Fellow, and three co-applicants (Andrew Hutchings, David Harrison and John Welch).

The study will be advised by a Steering Group comprised of the Project Management Group and collaborators (clinical and patient representatives). The Steering Group will meet two to three times a year and review milestones and deliverables and consider the implications of and dissemination of findings. Members will also be available for consultation by Helen Hogan and the SRF/L at other times.

Patient Involvement

There are three patient representatives on the Steering Group. One of whom is also the patient representative on the National Cardiac Arrest Audit Steering Group (Viv Cummin). The other two representatives have had recent inpatient admissions for acute illness and were managed both on the ward and in the ITU (Irene Cook and Chris Whitman). Their combined experience will help us identify important aspects of care for acutely ill patients from the patient's perspective which can support the development of our typology of interventions.

From our previous experience of patient involvement, our representatives will also be helpful in identifying some of the likely impacts of the study findings and advising on the best ways to communicate these findings to the general public. Together with other members of the Steering Group they will be invited to take an active role in the dissemination of findings. They have already had the opportunity to provide input into this proposal.

To facilitate the patient representatives' involvement in the management of the research the CI will provide support to the patient representatives by clarifying any issues prior to Steering Group meetings and providing an opportunity for debriefing afterwards. The Project Management Group will provide resources and training for patient representatives if they wish to be involved in dissemination activities. Travel expenses and a fee for attending Steering Group meetings will be provided.

Dissemination

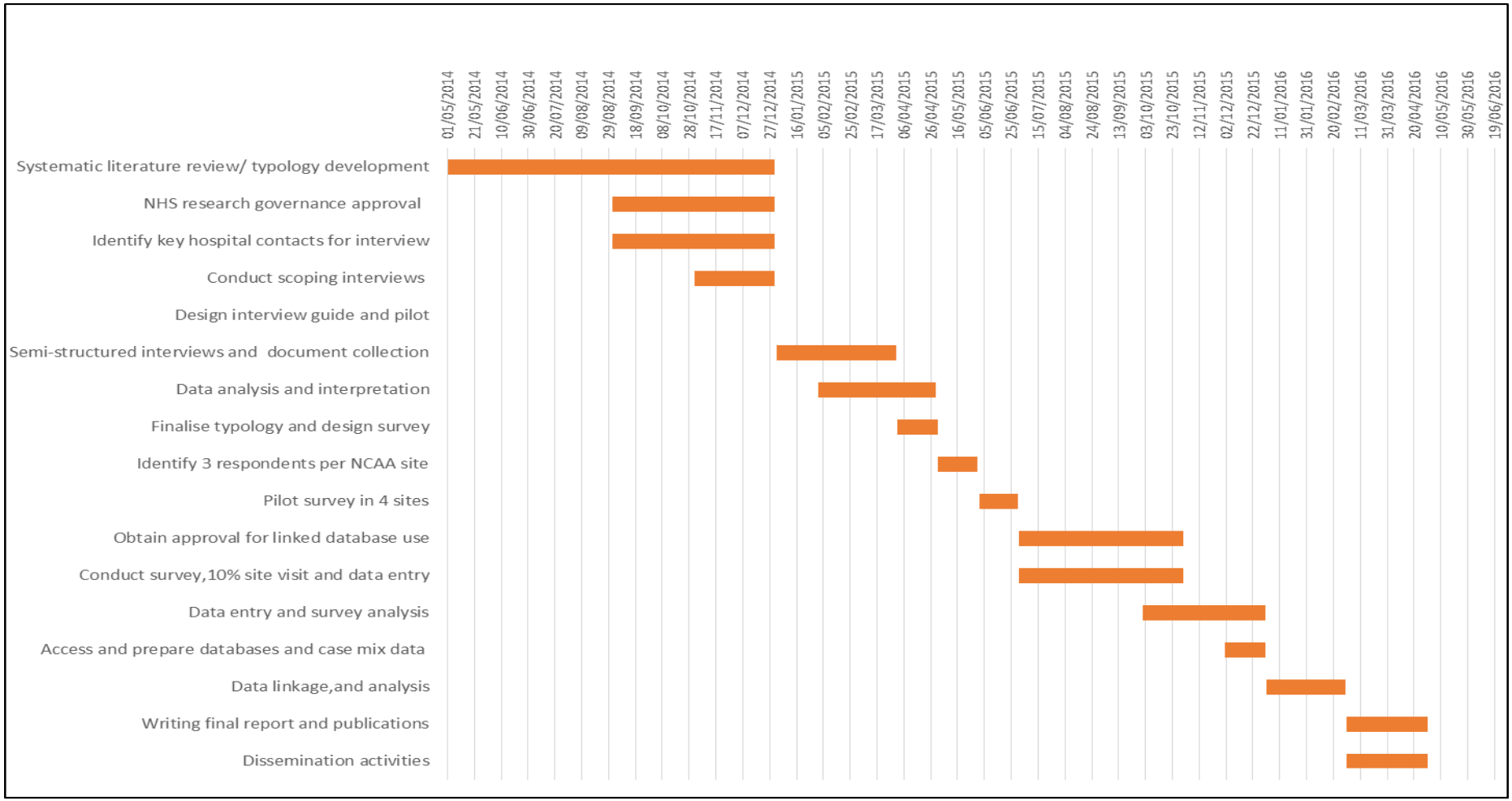
- The research will produce a detailed report for NIHR HS&DR programme detailing research methods, findings and conclusions. In addition, short summaries of the research will be produced. Summaries of the methodological approach will be made available.
- For national policy through our links with the NHS Commissioning Board and the Care Quality Commission (and its new Chief Inspector of Hospitals).
- Regionally through north London, Essex and Hertfordshire via the UCLP Academic Health Science Network (including 15 associated NHS hospital Trusts), the Clinical Senates and (if funded) a new Collaboration for Leadership in Applied Healthcare Research and Care (CLAHRC)
- Presentations will be made at national meetings of professional organisations including ICNARC, Resuscitation Council and Royal Colleges with individual co-applicants drawing on their extensive contacts to ensure the widest audience possible.
- Presentations to relevant patient and voluntary groups
- Production of papers for peer reviewed academic journals (such as Bristish Medical Journal, BMJ Quality and Safety, Resucitation, Heart, or Journal of Health Services Research and Policy) and conference presentations (International Forum on Quality and Safety, Patient Safety Congress etc).

Project Timetable

Tasks	Task Lead	Start	End
Recruit Senior Research Fellow/ Lecturer	HH	01/4/14	30/6/14
Work Package 1			
Milestone 1: Systematic literature review and typology development	SRF/HH	01/5/14	31/12/14
Milestone 2: Obtain research governance approval at each hospital and	SRF/HH	01/9/14	31/12/14
Milestone 3: Identify key contact at each hospital for interview	SRF/HH	01/9/14	31/12/14
Milestone 4:Conduct scoping interviews with members of project team	SRF/HH	01/11/14	31/12/14
Milestone 5: Design semi-structured interview guide and pilot	SRF /HH	01/03/14	31/03/14
Work Package 2			
Milestone 1: Undertake semi-structured interviews and collect relevant documents	SRF/HH	01/01/15	31/03/15
Milestone 2: Using Implementation Fidelity framework to organise interview findings	SRF	01/02/15	30/04/15
Milestone 3: Finalise typology and design survey	HH/SRF	01/04/15	01/5/15
Milestone 4: Identify 3 respondents per NCAA site	SRF	01/05/15	31/05/15
Milestone 5: Pilot survey in 4 sites	SRF	01/06/15	30/06/15
Work Package 3			

Milestone 1: Obtain approval for use of NCAA and other ICNARC databases	SRF/HH	01/07/15	31/10/15
Milestone 2: Conduct Survey including 10% site visit and data entry	SRF/HH	01/07/15	31/10/15
Milestone 3: Data Entry and Survey analysis	SRF/HH	01/10/15	31/12/15
Milestone 4: Access and prepare NCAA, HES, Spotlight and ICNARC Case mix data for analysis	HH/SRF	01/12/15	31/12/15
Work Package 4			
Milestone 1. Data linkage, cross sectional, time series and difference in difference analyses	HH	01/01/16	29/02/16
Milestone 2: Writing final report and publications	HH	01/03/16	30/04/16
Milestone 3: Dissemination activities	HH	01/03/16	30/04/16

Project Gantt Chart



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