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Identification of emergency and urgent care system characteristics affecting preventable unplanned admission rates

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1. Aims/Objectives:

To identify system factors explaining variation in preventable unplanned admissions in different emergency and urgent care systems. (We will call them 'avoidable emergency admissions' from now on).

1. Calculate the 'standardised avoidable emergency admission rate' for each emergency and urgent care system in England.

2. Explore the relationship between this indicator, the rate of emergency admissions, and the Nuffield Trust indirectly standardised admission ratio.

3. Explain variation in 'standardised avoidable emergency admission rates' in different systems using routine data on population, health and system characteristics.

4. Undertake in-depth research in systems with high and low 'standardised avoidable emergency admission rates' to identify the more complex system factors which may be influencing variation.

5. Identify modifiable factors which affect avoidable emergency admissions to help policy makers, commissioners and service providers implement changes to reduce avoidable admissions.

2. Background:

Provision for some emergency hospital admissions is a necessary and important part of the National Health Service (NHS). However, there is a belief that not all emergency admissions are necessary and can result in hospital acquired infections, distress to patients and their families, difficulties for service providers trying to balance elective and emergency care, and unnecessary high cost intervention in a resource limited health service. As a consequence, reducing unnecessary admissions has been a focus of policy makers, commissioners and service providers for many years. Furthermore, the NHS faces an immediate problem of a large increase in these types of admissions. The recent Nuffield Trust report on emergency admissions in England (Blunt et al, 2010) identified a 12% increase in emergency admissions between 2004 and 2008. They explored a range of possible reasons for this increase and estimated that the aging population accounts for at most 40% of this increase. They looked at service-related factors that could account for the increase and found that the increase largely occurred in short stay admissions of under a day (see their Fig 5). They also found considerable variation in an indirectly standardised admission ratio for primary care trusts. Two limited case studies suggested integration of services was associated with reduced increase in admissions.

Clearly, in order to manage and reduce emergency admissions, an understanding of the factors that influence this activity is needed. A recently published review of the

research evidence around avoiding emergency admissions highlighted a number of factors associated with the risk of either admission or avoidable admission (Purdy, 2010). This was not a systematic review and attention was not given to the quality of the evidence base. Nonetheless it is a very helpful exploration of the evidence base. Factors shown to affect emergency admission rates included population factors such as socio-economic status, possibly ethnicity, and rates of morbidity which tend not to be standardised for when variation between groups is explored; geographical differences in urban and rural areas; and service-related factors such as integration between health and social care, integration between secondary and primary care, continuity of care in general practice and possibly the way in which GP out-of-hours services operate. There have also been attempts to evaluate interventions to reduce emergency admissions. Two recent reviews (not systematic) identified limited research evidence on a wide range of approaches aimed at reducing emergency admissions in people with long term conditions and frail elderly (Ham, 2006) but rather more research evidence of effectiveness for a range of interventions for emergency admissions overall (Purdy, 2010). Examples of effective interventions included telemedicine for heart failure and hospital at home.

Whilst these research efforts contribute to understanding the factors influencing emergency admissions, and strategies to reduce them, there are three issues which require more attention. First, that only some admissions are avoidable. Second, explanations are required for the wide variation in admission rates between different trusts (Blunt et al, 2010). Third, there has been limited attention to the fact that emergency admissions occur in the context of a system of emergency and urgent care (Nicholl et al, 2009; O'Cathain et al, 2008). Problems in the early stages of a patient's help seeking pathway (e.g. unable to access timely GP appointment, lack of awareness of walk-in centres) may result in a presentation to an emergency department as the problem worsens and this may lead to an increased risk of admission. Indeed both the Nuffield Trust (Blunt et al, 2010) and the recent review (Purdy, 2010) make significant reference to integration of services affecting admission rates. This is related to a wider interest in the international evidence base on integration at the macro as well as micro level of health care provision (Curry & Ham, 2010).

Research is needed on how characteristics of the emergency and urgent care system - its configuration, integration, and accessibility - affect *avoidable* emergency admissions.

Need for the research

There is a need to understand more about why some emergency and urgent care systems have lower emergency admission rates than others. Many emergency admissions are not avoidable and therefore it is important to understand the causes of variation in *avoidable* emergency admissions. We believe it is important to commission research to identify population and health factors which affect avoidable emergency admission rates so that we can understand them and adjust for them when identifying potentially modifiable emergency admission rates. Purdy's review identified a number of factors about which there is uncertainty, or where it is unclear whether they affect avoidable as well as overall emergency admission rates. In summary we wish to address the remit of the SDO call point 3.1 'the regulation or control of health systems for control of unplanned admissions' by calculating a recently developed performance indicator for regulators and then exploring the effect of system characteristics on this indicator. The aim is to identify system characteristics which result in low rates of *avoidable* emergency admissions. This will provide the evidence based information that system managers need to change modifiable system characteristics to avoid some emergency admissions. It will also result in a performance indicator for use by regulators that has undergone validation.

Conceptual framework

The conceptual framework for the study is that patients, health professionals and health services operate within an emergency and urgent care system (Nicholl et al, 2009; O'Cathain et al, 2008). Although it is important to consider the role of individual services such as primary care and emergency departments in the prevention and avoidance of emergency admissions, each service operates within a wider local system including GP out of hours, walk-in centres, NHS Direct, same day GP urgent care, social care and 999 ambulance.

A better understanding is needed of the system factors affecting variation in avoidable emergency hospital admissions. System factors include

- the structure of the system (service configuration, temporal access and geographical access)
- the performance of individual services within the system (e.g. a change in access to urgent daytime GP services can impact on other services in the system)
- patient understanding of the system (if patients are not aware of all available services they may wait until crisis point or attend familiar services such as emergency departments)
- and co-ordination between services and between departments within services in the system (e.g. co-location of services, single point of access, informational continuity, integration between health and social care).

3. Need:

There is a need to understand more about why some emergency and urgent care systems have lower emergency admission rates than others. Many emergency admissions are not avoidable and therefore it is important to understand the causes of variation in avoidable emergency admissions. We believe it is important to commission research to identify population and health factors which affect avoidable emergency admission rates so that we can understand them and adjust for them when identifying potentially modifiable emergency and urgent care system characteristics which result in lower avoidable emergency admission rates. Purdy's review identified a number of factors about which there is uncertainty, or where it is unclear whether they affect avoidable as well as overall emergency admission rates. In summary we wish to address the remit of the SDO call point 3.1 'the regulation or control of health systems for control of unplanned admissions' by calculating a recently developed performance indicator for regulators and then exploring the effect of system characteristics on this indicator. The aim is to identify system characteristics which result in low rates of avoidable emergency admissions. This will provide the evidence [10/1010/08] [O'Cathain] protocol version: [1] [25JUL2011] 4 based information that system managers need to change modifiable system characteristics to avoid some emergency admissions. It will also result in a performance indicator for use by regulators that has undergone validation.

4. Methods:

Definition of a system

A health care system can be defined as a set of services linked by patient pathways. The emergency and urgent care system consists of services linked by patient pathways as people with a perceived need seek immediate advice or treatment. Key services in the system include emergency hospital beds, emergency departments, GP out of hours, walk-in centres, NHS Direct, same day GP urgent care, primary care, social care, and 999 ambulance. Local systems operate within this national emergency and urgent care system. Local emergency and urgent care systems can be virtual entities defined by their shared administration, or physical entities defined by geography. Currently, local emergency and urgent care systems can be defined in both ways, with primary care trusts (PCTs) – or groups of PCTs operating as an Urgent and Emergency Care Network – commissioning services for a defined geographical population (Nicholl et al, 2009). That is, the geographical boundaries of PCTs identify 152 local emergency and urgent care systems in England.

With the proposed change to commissioning, from PCT to GP consortia by April 2013, the administrative definition of a system will no longer be defined by a PCT. However, we propose that it is valid to use PCT geographical boundaries to define local systems because their current and historical relevance is likely to persist in affecting patient pathways in any future reconfiguration of health and social care. Having said that, it is also important to be flexible in the face of planned changes to how local systems will be managed. Our research could be criticised for using PCTs which will be abolished even though this is the right system definition to use (see above). We feel it is essential to show that our findings are robust to different definitions of a system. General acute hospitals are the focus of emergency admissions and a key part of the local emergency and urgent care system within their catchment area. Therefore we define two types of system in this project, using two denominators of system populations:

- A. PCT resident populations (our primary definition)
- B. Hospital catchment area populations, based on the postal districts of emergency admissions to hospitals.

There will be considerable overlap between our two system definitions. However we feel that London in particular will produce different systems with each definition. We feel that working with two system definitions will 'future proof' our findings.

a. Setting

All emergency and urgent care systems in England.

b. Design

A mixed methods design known as 'ethnographic residual analysis' or 'qualitative [10/1010/08] [O'Cathain] protocol version: [1] [25JUL2011]

residual analysis' will be used (Fry et al, 1981; Onwuegbuzie & Teddlie, 2003). The first phase is quantitative, involving the identification of factors which explain variation in avoidable emergency admissions. For this phase we will calculate a standardised avoidable emergency admission rate for each system. Then we will identify population, health and system characteristics measured using routine data and test whether they explain variation. This analysis of variance will explain some of the variation. However, some systems will have large residuals within the analysis. That is, some systems will have high avoidable admission rates or low avoidable admission rates which cannot be explained by the population or system characteristics. For the second phase we will identify the systems with *unexplained* avoidable emergency admission rates and explore them more fully using in-depth case studies to identify further more complex system characteristics which might explain variation. A potential third phase is to test any new factors identified in phase two in the analysis of variance, although this is dependent on having these factors – or proxies - available in routine data.

c. Data collection

PHASE 1 Regression analysis

Calculation of performance indicator

(i) Selecting the right performance indicator

The Nuffield Trust used an indirectly standardised emergency admission ratio to consider variation in change in emergency admissions between PCTs (Blunt et al, 2010). They standardised by age and sex. This is an important performance indicator because it identified differences in changes in overall rates after factoring out different age and sex profiles of populations. However, because only some emergency admissions are avoidable, it is important to focus on a group of admissions that are 'rich in avoidability'. Other researchers have made a similar argument about mortality based performance indicators (Lilford & Pronovost, 2010).

When researchers have attempted to identify such admissions they have considered preventable or avoidable admissions. Some admissions are preventable if primary care prevents exacerbations that might eventually lead to admission e.g. admission may be prevented if primary care asthma nurses monitor asthma patients regularly to ensure optimum health. Some admissions are avoidable if, when someone has an exacerbation, it is dealt with without resort to admission e.g. an asthma attack is dealt with immediately in a walk-in centre or general practice before it becomes serious enough to require admission. Purdy discusses the use of emergency admission rates for 'ambulatory and primary care sensitive conditions', that is, admissions which could be prevented by interventions in primary care (Purdy, 2010). She highlights problems with this indicator and recommends that commissioners clarify exactly what admissions can be prevented. Our focus is wider than primary care - we are interested in conditions where admissions can be avoided by a good performing emergency and urgent care system. In a previous study we used a Delphi exercise to identify health conditions where experts believed that exacerbations can be managed by a wellperforming emergency and urgent care system without admission to an inpatient bed (Coleman & Nicholl, 2010). We then developed a system performance indicator of

'hospital emergency admission rates for acute exacerbation of urgent conditions that can be managed out of hospital or in other settings without admission to an inpatient bed'. This indicator, which we will call the 'standardised avoidable emergency admission rate' from now on, provides a measure that will allow us to identify variation in avoidable admission rates in different systems and learn from systems which appear to manage them well.

(ii) Description of the performance indicator

Our indicator is the 'standardised avoidable emergency admission rate'. It is based on 14 health conditions which are 'rich in avoidable emergency admissions': non-specific chest pains (ICD10 codes RO 7.3,7.4), non-specific abdominal pains (R10), acute mental crisis (F00-F99), falls (W00-W19), COPD (J40-J44), angina (I20), minor head injuries (S00), urinary tract infections (N39.0), DVT (I80-82), epileptic fit (G40-1), cellulitis (L03), pyrexial child (R50), blocked urinary catheter (T83.0), and hypoglycaemia (various E10-E16.2). Five of these appear in the top ten diagnostic groups contributing to the overall increase in emergency admissions (Blunt et al, 2010, p20).

The indicator is population based and is calculated using a combination of Hospital Episode Statistics (HES) and Office of National Statistics (ONS) data to produce directly standardised admission rates for conditions rich in avoidability by a good emergency and urgent care system. We have already calculated it for all 152 PCTs for the four year time period of 2004/5 to 2007/8 for a Department of Health funded programme of research on the emergency and urgent care system (Nicholl et al, 2009). We standardised for age and sex only using final mid-2007 estimated resident population by quinary age groups and sex for PCTs in England. When looking at crude rates we found a factor of 2.5 between the lowest rate (45.8 per 1000 per 4 years) and the highest rate (121.3 per 100 per 4 years) for PCTs. We identified that the direct age sex standardisation had little effect on ranking of PCTs.

For our proposed study we intend to calculate the performance indicator standardised for age, sex and clinical condition for the three year period 2006/7 to 2008/9 for our two definitions of systems – PCTs and hospital catchment areas. We may be able to calculate it for the additional year of 2009/10 because HES data are usually released in November of the following year and can be pre-ordered. However if delays occur in obtaining the data we will use 2006/7 to 2008/9 only. We will calculate it for the full three year period and for each individual year. We will check the reliability of the data by looking for consistency between years within each system. In the Nuffield Trust study and our own previous study, boundary changes in some PCTs accounted for some changes in admission rates over time. Boundary changes will be less problematic in our proposed study because the time period we are studying is after the 2005/6major reconfiguration of PCTs.

When calculating the indicator for hospital catchment areas we will consider general acute trusts only because they account for the majority of emergency admissions (Blunt et al, 2010, p24). 150 general acute trusts were found to account for 95% of admissions (Blunt et al, 2010). There will be considerable challenges when doing this because of trust mergers over time but we have experience of dealing with these challenges (McDonnell et al, 2005). Catchment area will be defined by the resident [10/1010/08] [O'Cathain] protocol version: [1] [25JUL2011] 7 population in postal districts where the general acute hospital accounts for the highest proportion of admissions from that postal district.

(iii) Exploring the relationship between different performance indicators

It will be important to understand how different indicators rank different systems. We will compare the <u>ranking</u> of PCTs for our indicator, overall emergency admissions rates, and increases in admission rates using the Nuffield Trust standardised admission ratio. This will offer information about the sensitivity of ranking to indicator type.

(iv) Explaining variation in system performance

We will use the standardised avoidable admission rate only for this analysis. We will attempt to explain variation first in the three year standardised avoidable admission rate by PCT, and then – where possible - in the three year standardised avoidable admission rate for hospital catchment areas.

The first step is to identify the range of factors that might affect avoidable emergency admission rates. We will do this in two ways. First, we will use factors studied in the research literature on all emergency admissions (Purdy, 2010). Second, we will seek stakeholders' views of potential factors. We will convene two groups for this purpose. A reference group of professional stakeholders will be convened, drawing on the Injuries and Emergency Local Priority Group. We will request representation from nursing, ambulance, emergency department and research from this group. We will add in representation from general practice, commissioning, social care and a minor illness service. A reference group of patients and the public will be convened, consisting of our patient & public involvement group – Sheffield Emergency Care Forum – to offer the lay patient and carer perspective of potential factors. Each group will last for up to two hours. Some examples of factors are listed below, including factors identified by our PPI applicant.

Type of factor	Factor	Justification
Population factors	Index of Multiple Deprivation	Associated with avoidable admission rate (Purdy, 2010) but not increasing rates (Blunt et al, 2010)
	%Ethnic minority	<u>Possibly</u> associated with admission rate (Purdy, 2010)
	Size of households/ %living alone	People living by themselves are admitted because clinicians cannot leave them in their own homes when ill.
Geographical	Population dispersion using a rurality index	Urban areas have higher admission rates (Purdy, 2010)
Health/morbidity	Standardised mortality ratio for our 14 conditions	The more ill people are, the more likely they are to seek health care and hospital admission

System configuration	Number of emergency beds per 1000 population	The higher the availability of beds the higher the avoidable admission rate.
	Number of GPs per 1000 taking vacancies into account	GP continuity <u>may</u> lower admission risk (Purdy, 2010)
	Variety of emergency and urgent care services available	Accessible urgent care services lead to less admissions
	Social care availability and quality, particularly nursing homes	'Playing safe' in nursing homes may lead to admissions
System integration	Joint commissioning between health and social care	Integration between health and social care leads to less admissions
System access	National GP survey on access to general practice	Recent research shows association between access to own GP and overall emergency admission rates

The second step is to identify which factors can be measured using routinely available data. Factors must be available by PCT or calculable using postal district. Some social care related factors are available by local authority (e.g. Care Quality Commission local authority level assessment of the quality of care homes) and mapping onto PCTs will be required. The Information Centre and Department of Health website are key sources of data.

The third step is to test the extent to which population factors can explain variation – these are not modifiable by the health service and it is important to measure their effect and to adjust for them when testing system factors. We will then test system factors which are more likely to be modifiable by system managers.

Finally we will identify systems with large residuals, that is unexplained high or low rates, for both PCT and hospital defined systems.

PHASE 2 In-depth exploration of systems with high and low rates

Case studies

We will undertake six case studies of systems - 3 with high and 3 with low unexplained standardised emergency admission rates - to identify more complex system factors affecting variation. We will apply Yin's multiple case study approach (Yin, 2003) to describe the system configuration, demand, integration and perceptions of key issues affecting avoidable emergency admissions.

Sample and sample size

The analysis of variance undertaken in Phase 1 will identify a number of candidate systems for in-depth case study, that is, with low or high standardised avoidable emergency admission rates which cannot be explained by population and system factors tested. We will select eight potential case studies, reserving two in the event that research governance approval is not given for some of the first six selected. There is a need to balance selecting a large enough number of case studies to allow patterns to be determined across cases and a small enough number to make full use of the strength of the case study approach to explore issues in-depth. Six case studies have been chosen to offer balance between pattern finding across cases and depth study within each case. Six case studies may seem like a small number. However, Yin points out that "A fatal flaw in doing case studies is to conceive of statistical generalisation as the method of generalising the results of the case study" (Yin, 2003, p32). Rather analytic generalisation is important, where a theory is generated within one case study and replication of theory considered in the other case studies. Pattern matching will be important across these six cases to consider whether theories are replicated in the three 'high' systems and contrasted in the three 'low' systems. It will also be important to consider the six cases in the context of the full 152 cases in the analysis of variance to consider the numbers of systems in which the generated theories might be relevant.

Data collection

There are six key sources of evidence for case studies: documents, records, interviews, direct observation, participant-observation, and physical artefacts (Yin, 2003, p83). Because of the complexity and size of each system, observation techniques will be difficult. Therefore within each case we will use documents, routine data and interviews. We will undertake documentary analysis of any documents describing system configuration and integration. These will be obtained from commissioners and service providers. We will also request local data on demand for key services within the system during the previous financial year. Finally we will undertake semi-structured face-to-face interviews with key stakeholders in the system to describe the system configuration, demand, integration between services and perceptions of key issues affecting avoidable emergency admissions.

It is important that a wide variety of stakeholders are interviewed to offer different perspectives of the system. The sample will include commissioners, emergency department staff (consultant, junior doctor, lead nurse, manager), emergency ward/bed manager, GPs, GP out of hours service, GPs with a special interests in nursing homes, district nursing, 999 emergency ambulance, social care, emergency and urgent care network board lead if available, managers of urgent care services such as single point of access, and Patient Advice and Liaison Services (PALS) lead. Approximately 15 interviews will be undertaken per case, totalling around 90 interviews across the six case studies. Again, we need to have a sample size per case which balances variety of views with depth of interview and analysis. If at the end of 15 interviews within a case we feel that we need to interview more people to understand how the system works then we will do so.

Interview content

We will not tell interviewees whether we have selected their system because it had a high or low rate. It may not be obvious to interviewees which group they belong to in our study because they may have high emergency admission rates but low avoidable [10/1010/08] [O'Cathain] protocol version: [1] [25JUL2011] 10

admission rates. Interviews will cover key drivers of emergency admissions, avoidable admissions and increases (socio-demographic, services, and particularly system), admission thresholds in hospitals, problem points in the system, coordination between services, access to the system, strategies used to manage demand, and further solutions needed. Factors identified in the literature, and by our two reference groups, which have not been discussed by interviewees will be used as prompts at the end of an interview. A topic guide will be developed and piloted in the first few interviews but must be used with flexibility within each case study. We expect each interview to last around 60 minutes to ensure that we have time to prompt and probe the interviewees.

Attention to validity

Construct validity can be increased by using multiple sources of evidence, and chains of evidence, within a case (Yin, 2003, p36). During the interviews stakeholders will be asked to give their perceptions of the pressures faced by their system and what works well or not with their system. Their views will be taken as valid individual perceptions but we will also cross reference the views of one stakeholder with those of other stakeholders in the system. Where we have patterns across stakeholders we will attempt to verify perceptions using national and local data. For example, if a number of stakeholders raise the issue of a large transient population of refugees as a key cause of high admission rates because they tend to be admitted to hospital rather than supported at home due to not being able to speak English, then we will look for data sources that might support or refute this claim.

d. Data analysis

Interviews will be digitally recorded with the permission of interviewees and transcribed verbatim. Interviews will be analysed using framework analysis (Ritchie & Spencer, 1994) which is appropriate for policy research because it allows for the exploration of both a priori and emergent issues. Then the data for each case (documents, routine data and interviews) will be analysed together to identify key issues affecting avoidable emergency admissions. Some of these issues will have been tested within the analysis of variance in phase 1 and others will be new. Some will be verifiable using other data sources and others not. After analysing each case separately we will undertake a multiple case study analysis by using 'pattern matching logic' (Yin, 2003, p116) to look for cross-case patterns, particularly issues that appear distinctly in one type of case (unexplained high rate) and not the other (unexplained low rate). Part of the analysis of the multiple case studies will involve paying attention to why each case was selected from the set of 152 systems; that is, we will pay attention to considering both the quantitative and qualitative findings as a whole in order to increase overall understanding of variation between the six cases. During this process it will be vital to test rival explanations.

PHASE 3 Revisiting the quantitative analysis

Qualitative residual analysis offers a formal approach to integrating the qualitative and quantitative components. Sometimes in qualitative residual analysis it is possible to identify issues in the qualitative component that can be tested in the quantitative component. For example, if migration is identified in the case studies as a driver for high levels of avoidable emergency admissions then there may be a national data set [10/1010/08] [O'Cathain] protocol version: [1] [25JUL2011] 11

on migration estimates which could be used to measure the effect of this factor. We are more likely to identify further population factors that can be tested than system factors. It will be important to test further population factors as well as system factors because this will help to explain variation. During the case studies we will ask stakeholders to think about whether there is a source of routine data which measures the key factor they have identified. We expect to identify 3 or 4 extra variables for testing within the regression from Phase I.

5. Contribution of existing research:

The Nuffield Trust recommended that regulators should "consider using avoidable emergency admissions as an undesirable outcome measure to indicate adequacy of coordinated care across providers" (Blunt et al, 2010, p2). Our proposed research will test the use of such an indicator, establish a set of population factors that must be adjusted for when making judgements about the quality of care, and consider its ability to detect differences in quality between systems.

At the end of our study we will have tested the use of a performance indicator for the emergency and urgent care system. The Department of Health and College of Emergency Medicine have recently launched a set of indicators for emergency care (Department of Health, 2010). The current sets of indicators focus on the emergency department and the ambulance service. One indicator, focusing on ambulatory care, is aligned with ours because it selects two conditions that do not need emergency admission because they could be treated in the emergency department. The group that produced these indicators plans to develop population based indicators for the emergency and urgent care system in 2012. Janette Turner is a member of this group and will ensure all the knowledge gained from calculating our performance indicator is fed into this national endeavour.

The overall contribution of the proposed project will be

- A validated performance indicator for the emergency and urgent care system to feed into a national working group on performance indicators for emergency care.
- The identification of a set of evidence based modifiable factors which reduce avoidable emergency admissions. Policy makers, commissioners and service providers can promote these factors in systems with high rates to reduce avoidable admissions across England. Managers in health and social care will be key to changing modifiable system factors associated with high rates of avoidable admissions e.g. establishing ways of improving access to primary care.

6. Plan of Investigation:

Obtaining HES and ONS data takes a number of months so we will apply for this as soon as we hear if this application has been successful. The study will begin in [10/1010/08] [O'Cathain] protocol version: [1] [25JUL2011]

November 2011 to allow for contracts to be agreed and signed.

The first three months will be an intensive part of the study in which we will calculate the indicator, identify key factors for testing, and undertake the analysis of variance. It will be possible to undertake the quantitative analysis in this short time frame because we have experience of calculating the performance indicator. Our technical analyst will work on the study full time during this three month period.

We will start each case study as soon as the research governance approval for that site is complete. Our formal timetable allows for delays in obtaining approvals. The order of case studies will be determined pragmatically by the timing of research governance approvals.

Each case study is timetabled to take 2 months. This allows for data collection, transcription, checking of issues raised in interviews, and analysis. The timing of the case studies will not be as separate as indicated below in practice – there will be preparation for one case study as another ends, and some interviews may be difficult to obtain in the allotted time period. However it is important to spend focused time on each case to ensure a depth analysis.

Timetable	Key milestones
July 2011	Order HES data
Sept 2011	Apply to NHS ethics for phase I HES analysis
Nov 2011	Study starts
Nov- Jan 2012	Identify factors from literature
	Run two reference groups to identify factors
	Calculate indicator
	Gather routine data on factors
	Undertake analysis of variance
	Identify case studies
	Prepare for next ethics application (information sheets, topic
	guides etc)
	Apply to University ethics for Phase II case studies
	Project Advisory Group meeting 1
Feb – May 2012	Research governance notification in 6 sites
	Disseminate results from analysis of variance
	Prepare for case studies
	Write interim report based on quantitative analysis
Jun – Jul 2012	Undertake case study 1
	Project Advisory Group meeting 2
Aug-Oct 2012	Undertake case study 2 (3 months allowed due to holiday
	period)
Nov - Dec 2012	Undertake case study 3
	Write interim report
Jan - Feb 2013	Undertake case study 4

At the end of the case study analysis we will work again with the technical analyst to identify and test new variables in our analysis of variance.

Mar - Apr 2013	Undertake case study 5
	Write interim report based on early case studies
May – Jun 2013	Undertake case study 6
	Project Advisory Group meeting 3
Jul – Sept 2013	Begin final report writing
	Multiple case study analysis
	PPI group to consider analysis
Oct – Dec 2013	Project Advisory Group meeting 4
	Revisit analysis of variance
Jan 2014	Submit final report

7. Project Management:

Professor Alicia O'Cathain will lead the project, ensuring that all applicants and staff fulfil their commitments in a timely fashion. Her 20% wte for the project will ensure that she has time for full project management as well as leading the case studies. There will be monthly project meetings of all team members. The fact that this project is being undertaken by staff in a single institution who have worked together successfully on numerous projects will facilitate project management. Professor O'Cathain will supervise the full time researcher who will be one of our established ScHARR researchers with experience of emergency and urgent care research and qualitative research. AOC will work closely with the experienced qualitative researcher to ensure that the qualitative research is undertaken to a high standard and within timetable.

Team working will be essential to the success of this study. All members of the team have a history of successful team working. AOC, JT and JN have worked on a programme of emergency and urgent care research; SG and AOC have evaluated the National Angioplasty Pilots; SG and JN have worked on the DAVROS project; AOC, JN and Tim Pearson have worked on an evaluation of commuter walk in centres; JT, AOC and JN are evaluating the '111' pilots, a service with the aim of affecting demand for emergency care services; JT, JN, SG and AOC will start working in June 2011 on an applied research programme on outcomes for the ambulance service.

A Project Advisory Group will be established to include a leading researcher in this field, a policy lead, a commissioning manager with experience of emergency services, a clinician from the emergency and urgent care system, and a PPI representative, as well as three key members of the management team. An independent chair will be appointed. The Group will meet twice a year, that is, four times over the life of the project. A key time for meeting will be when candidates for the case studies have been identified so that the choice of case studies can be challenged and debated with external expertise. Another key time is after the first case study so that the results can be presented and any advice offered built in to later case studies.

8. Service users/public involvement:

The School of Health & Related Research (ScHARR) at the University of Sheffield has a large portfolio of emergency and urgent care research projects. In order to support patient and public involvement (PPI) activities across these projects a PPI group, the Sheffield Emergency Care Forum (SECF), has been established. This group provides direct support to research teams within ScHARR and also provides wider links to related PPI groups within the South Yorkshire CLRN and LINkS (to be replaced by Healthwatch).

We have utilised this group in the development of this proposal. Rosemary Harper and Enid Hirst have commented on a draft of the proposal. They highlighted a number of factors which they considered important to test within the study and were instrumental in the addition of the reference groups to the proposal in order to identify a wide range of factors. Enid Hirst is a co-applicant on this proposal and will lead PPI input including working closely with a new PPI member who will share leadership for PPI input into the project. During the study we will utilise this group to provide PPI support in a number of ways including:

- Membership of the Project Advisory Group The co-applicant or a deputy from the SECF will attend each advisory group meeting.
- At the beginning of the study we will convene a meeting of the full SECF group and ask for their ideas and suggestions about factors which they think, from a public & patient perspective, may contribute to avoidable emergency admissions. This will help us identify additional population and system factors which we may not have considered and can, if a suitable information source is available, be included in the phase 1 analysis of variance.
- SECF will contribute to interpretation of findings. In particular we will present the group with findings from the case studies and elicit their views on the interpretation of these findings.
- Dissemination SECF will have a key role in the development of a lay summary that presents the methods, findings and what this means for service users in an accessible format.

Appropriate costs to support the PPI involvement in the project including fees, travelling expenses and consumables (telephone calls, email) have been included using the recommended costs set by INVOLVE. The co-applicant Mrs Hirst will also be provided with appropriate clerical support to assist in setting up the SECF activities described above.

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