

HS&DR Rapid Service Evaluation Team

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An evaluation of the implementation, effectiveness and cost effectiveness of a youth violence intervention programme for vulnerable young people (11-24 years) attending Emergency Departments in London

Summary

The NIHR RSET team propose to conduct an evaluation of the Redthread service at University College London Hospital (UCLH) using a mixed-methods, multi-phased design, combining qualitative, quantitative and economic data collection and analysis. The project will be undertaken in distinct stages over one year and has been adapted to ensure the evaluation is suitable for remote working during the Covid-19 pandemic.

The evaluation will involve collaboration with Redthread and clinicians at UCLH. It aims to generate insights about the impact and effectiveness of the Redthread intervention by exploring processes of implementation, staff perceptions and an economic evaluation. The team will also conduct quantitative analyses to ascertain suitable measures of impact to inform local stakeholders as well as future Redthread evaluations.

The questions for the evaluation are:

RQ1: What measurable impacts on the use of NHS services and wider benefits does implementation of the Redthread youth violence intervention programme have at UCLH for both staff and patients?

RQ2: What evidence exists in the published research and grey literature about the effectiveness, benefits and impact of interventions in urgent care and hospital settings that focus on violent crime and young people? What lessons can be learned from UK and international studies to help NHS Trusts implementing such interventions?

RQ3: How can a combination of routine secondary care and Redthread data inform an evaluation of the impact of the Redthread service on the use of NHS hospital services?

RQ4: What are the views of UCLH NHS staff (e.g. paediatric consultants, emergency department [ED] nurses, service managers) of the Redthread intervention, its feasibility, service-level impacts and overall effectiveness?

RQ5: What organisational factors, processes, resources and staff training are necessary for the successful implementation and delivery of the Redthread service?

RQ6: How cost-effective is the implementation of the Redthread service at UCLH?

RQ7: What evaluation approaches and methodological designs appear particularly well suited and feasible for evaluations of the Redthread service and similar services in the NHS?

Plain English Summary

The National Institute for Health Research (NIHR) Rapid Service Evaluation Team (RSET) will spend a year evaluating a service at University College London Hospital (UCLH) aimed at supporting young people at risk of violence and harm. A charity, called Redthread, involves a team of youth workers being placed in hospital emergency departments who work with hospital staff to support young people who are victims of violence or assault, such as knife crime. If hospital staff, such as emergency care doctors, are concerned about a vulnerable young person, they can refer them to the Redthread team. The Redthread team then reach out to the person – what is known as a ‘teachable moment’ - to bring about positive change, working with the young person on a one-to-one basis and with other support services or agencies as required.

The NIHR RSET will evaluate this intervention at UCLH by using different research methods, such as interviewing health care professionals and Redthread staff, through conducting statistical analysis of hospital data and by examining cost information. The evaluation will identify lessons and insights for Redthread and similar charity initiatives based in NHS hospitals. It will also contribute to the published research literature and evidence base about hospital interventions that aim to help young people at risk of violent injury and other types of harm.

Why is this evaluation important?

There are rising levels of knife crime and other serious injuries among young people in London and within metropolitan areas across the UK, and doctor and health professionals are viewed as having an important role to play in helping to prevent community violence (Sivarajasingam, V., 2010). Reviews of available published evidence indicate over 5000 consultant episodes recorded in English hospitals in 2017/2018 due to assault by a sharp object (Wortley and Hagell 2020) and a high incidence of penetrating injuries (PI) in London affecting young males that have become involved in gang violence compared to other regions of the UK (Whittaker et al. 2017). The latest available figures from the Office of National Statistics (ONS) confirm a 6%

increase in the number of offences involving knives or sharp instruments for the year ending March 2020 (ONS, 2020), signifying an ongoing upward trend since 2014.

In England, the charity Redthread has been and continues to develop programmes to embed crisis-intervention specialist youth workers within existing health systems, to capitalise on ‘teachable moments’, and engage young people who have been subject to violence and encourage positive behaviour change in their lives. Redthread has been working in major NHS trauma centres in London for over 10 years having started at King’s College London Hospital (2006) and expanded its services to St. Mary’s (2014) and St. George’s Hospital (2015). In recent years, the programme has been rolled out to other hospitals in London, such as the Homerton Hospital (2018), as well as major trauma centres in Nottingham and Birmingham (2018)¹. Redthread launched a service at University College London Hospitals (UCLH) in early 2020 prior to the coronavirus pandemic (henceforth referred to as ‘Covid-19’). The NIHR RSET were approached by Redthread and UCLH to evaluate the impact of the intervention locally.

What is the study design?

The evaluation will use a mixed-methods, multi-phased design, including an in-depth process evaluation case study and quantitative and economic analyses. The project will be undertaken in different stages over one year, starting with desk-based research and an exploratory phase suitable for remote working whilst Covid-19 is impacting NHS services and society. The second phase will provide in-depth insights about the impact and effectiveness of the intervention, including processes of implementation, staff perceptions and economic evaluation. The team will conduct quantitative analyses to ascertain suitable measures of impact to inform stakeholders and future evaluations.

What are the study aims and objectives?

Using quantitative and qualitative research methods, to evaluate the implementation and local impact of the Redthread intervention at UCLH, including the cost-effectiveness analysis of the intervention, and identify wider lessons and insights for similar initiatives drawing on published literature and the analysis of secondary data. The main objectives are as follows:

1. To conduct a scoping review of peer-reviewed evidence and grey literature about hospital-based violence crime interventions that focus on young people and behaviour change, identifying lessons for researchers, health professionals and policy makers;
2. To review and summarise existing and current evaluation(s) of Redthread interventions/services, in particular evaluation methods and main findings to identify lessons for Redthread, evaluators and NHS trusts;
3. To evaluate processes of local implementation and capture perceptions of UCLH staff and relevant local stakeholders concerning the intervention and its impact;

¹ Redthread services launched at the Queen’s Medical Centre (QMC), Nottingham, in March 2018 and at the Queen Elizabeth Hospital and the Heartlands Hospital, Birmingham, in July 2018. These services are being evaluated with funding from the Health Foundation and are due to report findings in late 2020.

4. To assess the feasibility of using secondary care data (e.g. Hospital Episode Statistics [HES], UCLH EPIC system) to evaluate the Redthread intervention through the comparison of appropriate control and intervention groups.
5. To conduct a cost-effectiveness analysis of the Redthread intervention at UCLH from the perspective of the NHS and personal social services;
6. To draw conclusions about the types of evaluation approaches and methodological designs that appear well suited and feasible for evaluations of the Redthread service and similar youth-based interventions in the NHS.

What outputs and insights will this evaluation deliver?

The evaluation will help inform decisions UCLH may wish to take in further developing this service or extending its provision locally. Findings are also intended to inform decisions in the NHS, in particular similar London-based NHS Trusts, about the impact of the Redthread approach in terms of its effectiveness, implementation and cost effectiveness.

The NIHR REST will work closely with collaborators to capture lessons for other NHS organisations introducing similar services and evaluating them, mindful of how the shifting context of Covid-19 has impacted upon NHS service delivery and health system demands. Towards the end of the project, the NIHR RSET will produce an evaluation framework in collaboration with UCLH clinical partners, Redthread and the project's Evaluation Advisory Group to support Redthread's work in the NHS and similar charity initiatives focused on young people and violence prevention (for example, St. Giles - <https://www.stgilestrust.org.uk> and Oasis - <http://www.oasiswaterloo.org/oasis-youth-support/a-and-e/>).

MAIN CONTENT

Policy background and insights from the literature

There are rising levels of knife crime and other serious injuries among young people in London and elsewhere in the UK. The Office for National Statistics (ONS) showed that, excluding homicides (which after a period of stability rose by 34% between 2016 and 2017), figures for violence related crime offences involving a knife or sharp object rose by 24% to 40,184 offences between 2010 and 2018 in England and Wales. Assault with injury and assault with intent to cause serious harm rose by over a third (ONS, 2019). While the number of hospital episodes with a classification of assault by sharp object (including, but not limited to, knives) has fluctuated over the last twenty years, more recently the number of cases in England has been rising (by nearly 40% between 2014/15 and 2017/18) (House of Commons Library, 2018).

The causes of these recent trends are multiple and varied and include factors related to deprivation and childhood poverty (Vulliamy et al. 2018; WHO 2007) and suggest multiagency approaches to tackle the problem. In addition, assault-injured youth are at significant risk for repeat injury (Johnson et al. 2007). The rate of repeat visits to the emergency department (ED) for violence-related injuries may be as high as 44%, and the risk of recurrent injury may be 80-times that of 'unexposed' individuals (Ibid.; Dowd, 1998; Snider and Lee, 2009). When assessed

in the ED, the majority of injured youths and parents believe their injuries are preventable, and over a third also believe that a similar violence-related injury is likely to occur in the future (Johnson et al. 2007). Moreover, youth assault injuries are often related to repeated disagreements and retaliatory behaviour that fuels repeated violence (Cheng et al. 2006). Well over half of victims report knowing, or knowing of, the person who injured them and, over time, the victims and perpetrators become interchangeable (Ibid.). Interrupting this cycle of reactive decision making has the potential to significantly reduce the burden of injury to youths in the UK.

Research suggests that injuries serious enough to require medical intervention may make youths and their parents uniquely susceptible to behavioral intervention (Johnson et al. 2007). As Wortley and Hagell (2020, p.6) observe: “The incident bringing the young person to the ED may provide a hook for change”. Consequently, ED-based interventions that provide a ‘teachable moment’ offer a unique opportunity to identify and reach young victims of violence, inform individuals of the benefits of lifestyle changes and link them with supportive treatment programs and agencies that can function in their daily life beyond the hospital, such as in education. Unfortunately, there is a paucity of studies and economic evaluations of such interventions and limited knowledge about their implementation processes and mechanisms, leading to repeated recommendations for further research and evaluation. Prior attempts to demonstrate the efficacy of ED-based programs have also been underpowered and, though promising, results have been largely equivocal (Snider and Lee, 2009).

The service innovation: the Redthread Youth Intervention Programme

The Redthread service consists of youth specialists who meet every young person aged between 11 and 24 who attends the ED as a victim of violence, assault or exploitation, or where there are concerns around undisclosed vulnerabilities. The Redthread model centres on placing youth workers directly within EDs to bring about a ‘teachable moment’ with a young person. The intervention enables specialist youth workers to engage with clinicians to identify young people at risk and support them, hence Redthread youth workers can be viewed as embedded practitioners working alongside NHS staff. Clinicians within the hospital can make a direct referral to the Redthread service (including from outpatient services) if they have concerns about a young person being at risk of gang violence and harm, or if they have safeguarding concerns about patients under the age of 18 being at risk of abuse or assault. The Redthread youth workers receive a range of referral types about young people where clinical staff feel additional support is needed. For example, a young person may present to the ED due to a medical concern (e.g. seizure) although the underlying cause was in fact an assault which leads to a Redthread referral.

A referral leads to an offer to a young person of help by Redthread. If accepted, Redthread use the ‘teachable moment’ to build a beneficial, trusting relationship with a young person on an individual basis. This case work involves regular review of both the risk indicators and avenues for personal and professional support available to each young person and forms the basis for:

- Creating a bespoke package of support for each young person according to their needs and goals, prioritising the building and scaffolding of robust professional

networks in order to support (re-)engagement with professional agencies – for young people who are known to statutory services and already engage;

- Advocating on behalf of young people, and coordinating networks of professionals across disciplines and locations;
- Supporting other agencies and scaffolding key professional relationships;
- Making ‘relational referrals’ for young people who do not have any current input from statutory agencies, and acting as a bridge to key workers, inviting professionals into the hospital or accompanying young people to initial meetings;
- Completing intensive case work with young people – including goal setting for the future or discussions around self-esteem, safety or healthy relationships.

In addition, an important feature of the Redthread intervention is supporting and training health care professionals in the hospital to increase knowledge and confidence of working with young people who may be at-risk of violence or trapped in a cycle of violence.

Therefore, compared to other interventions designed to mitigate violence largely through inter-agency coordination and data sharing, or the identification of violence ‘hotspots’, Redthread has a clearer focus on personal behaviour change and creating a network of support around an individual through forming connections with public agencies. The introduction of the Redthread service at UCLH at the beginning of 2020 provided an opportunity to carry out a prospective evaluation of the intervention and provide evidence about its local impact, implementation, cost effectiveness and how the UCLH context might shape delivery.

Covid-19 service-level impacts

The NIHR RSET evaluation was due to commence in March 2020 but has been delayed by Covid-19. The evaluation team remained in regular contact with Redthread to understand how the service was being impacted and adapted during the first wave of the pandemic. Redthread is currently entering a phased return to UCLH having provided a remote, virtual youth work service during the height of the pandemic (this may change depending on the future course of the pandemic and government and NHS policies). The charity continues to operate as usual in terms of receiving referrals from UCLH staff, including live referrals presenting within the ED. Redthread youth workers also continue to work with young people once they have been discharged from hospital.

At UCLH, paediatric patients have been temporarily moved to the Whittington Hospital (a provisional arrangement until March 2021) and referral processes are regularly reviewed within UCLH and the local health system. The pandemic has therefore impacted on the functioning of UCLH’s ED and has led to close collaboration with a neighbouring NHS Trust to manage paediatric patients.

We have modified the evaluation plans in light of these developments, factoring in recently available information from Redthread about changes they have made to the intervention at UCLH.

Other evaluations of Redthread interventions

The NIHR RSET have also been made aware by Redthread of previous and current evaluations of its service at different NHS Trusts in London and around the country, covering the period 2015-2020. For this reason, the NIHR RSET are not proposing a multi-site comparative evaluation and will instead review the protocols and reports of other evaluations (where available) to cross-check methodological approaches and findings in a rapid manner (see Phase 1 below). This will be supplemented by the analysis of available national data sets (e.g. HES) to provide knowledge about service trends and patient cohorts regionally. The NIHR RSET have already made contact with project leads and researchers working on other current Redthread evaluations around the country (e.g. the Queen's Medical Centre, Nottingham, and University of Birmingham Hospitals NHS Trust) with the purpose of sharing insights, particularly around the statistical approaches being applied in local evaluations using hospital data.

Study aims

Research Questions

RQ1: What measurable impacts on the use of NHS services and wider benefits does implementation of the Redthread youth violence intervention programme have at UCLH for both staff and patients?

RQ2: What evidence exists in the published research and grey literature about the effectiveness, benefits and impact of youth-based interventions in urgent care and hospital settings that focus on violent crime? What lessons can be learned from UK and international studies to help NHS Trusts implementing such interventions?

RQ3: How can a combination of routine secondary care and Redthread data inform an evaluation of the impact of the Redthread service on the use of NHS hospital services?

RQ4: What are the views of UCLH NHS staff (e.g. paediatric consultants, ED nurses, service managers) of the Redthread intervention, its feasibility, service-level impacts and overall effectiveness?

RQ5: What organisational factors, processes, resources and staff training are necessary for the successful implementation and delivery of the Redthread service?

RQ6: How cost-effective is the implementation of the Redthread service at UCLH?

RQ7: What evaluation approaches and methodological designs appear particularly well suited and feasible for evaluations of the Redthread service and similar services in the NHS?

Design and methods

The evaluation will have a mixed-methods, multi-phased design. The project will be undertaken in different stages, starting with Phase 1, which only allows for desk-based work and remote working on account of the Covid-19 pandemic.

PHASE 1 (NOVEMBER – MARCH 2021)

Phase 1 will incorporate the following work packages, which we provide more detail on below. This is the feasibility and scoping stage of the study, including a literature review of published evidence. The components are:

- Scoping of the literature and interim findings;
- Documentary analysis of other Redthread evaluations, including their methodological approaches and findings;
- Documentary analysis to understand Redthread programme theory;
- Qualitative scoping interviews (conducted remotely) with the Redthread team and youth workers to confirm the interpretation of Redthread's programme theory and the intervention at UCLH, including any recent adaptations due to Covid-19;
- Quantitative secondary data analysis using HES data to assess the scope and capability of any quantitative evaluation of the Redthread service, in particular to assess the feasibility of identifying control groups;
- Desk review of available Redthread and UCLH documents to inform the cost-effectiveness analysis.

Scoping review of the literature

Phase 1 will involve the design of a detailed scoping literature review which will be completed in the early part of Phase 2. The review will focus on youth focused interventions delivered in medical and hospital settings to reduce violent crime, such as those involving multi-disciplinary teams composed of emergency responders, trauma surgeons, paediatricians and youth specialists working in collaboration. This part of the project will have clinical and researcher input and aims to meet the following objectives:

- Summarise what is currently known about youth-orientated services delivered in hospital settings to reduce knife crime;
- Identify and appraise any existing evidence of the impact of such interventions on the behaviour of young people and/or their re-admission for serious injury from violence crime;
- Identify existing gaps in the knowledge base, such as the cost effectiveness of such interventions;
- Identify factors that support or hinder the implementation and impact of youth-focused behavioural and public health interventions delivered in hospital settings, particularly those that involve collaboration between secondary care professionals and youth workers / specialists;
- Identify any conceptual or theoretical lenses applied in this area, such as behavioural concepts applied to evaluate 'teachable moments' with young people.

Following recommendations on conducting systematic scoping reviews (Tricco et al. 2016, 2017), we aim to identify the types of evidence available on this topic (e.g. including other literature reviews, trials, pilot studies and evaluations) and the theories or conceptual frameworks that have been applied to this topic. We will use the review to determine if there

are research and evaluation gaps, such as whether any economic impact analyses have been conducted about similar service innovations in the UK and internationally.

Design

The review process will begin with the drafting of a scoping review protocol, to be agreed between members of the team and designed in consultation with an information specialist at UCL. It will be based on an initial review that has already been conducted by a member of the team to identify the types of hospital interventions found internationally to reduce youth violent crime and a recent review published by Wortell and Hagell (2020). RSET have concluded that a full scoping review is necessary because existing reviews contain a number of gaps and lack published review protocols. For example, the Wortell and Hagell paper used only four key terms - 'teachable moment', 'youth worker' and synonyms for 'young person' and 'emergency department' - leading to the identification of 13 papers for inclusion from PubMed, MEDLINE and Embase databases. There was no focus on the cost implications of interventions or multi-agency working across sectors, such as secondary care and youth agencies that could be important.

Following the design of the review protocol, structured searches will be carried out on more than three databases to go beyond the medical and life sciences repositories and include the social sciences which cover education and social work (e.g. PubMed, Embase, Medline *and* Web of Science, ASSIA – the Applied Social Sciences Index and Abstracts). The final databases to be included will be verified with an information specialist based at UCL.

The TRIP database will be used to identify grey literature and any gaps, and we will also check PROSPERO and the NIHR Journals Library for relevant studies or reviews published on this topic or recently commissioned. We will hand search the references of included studies for additional relevant papers.

We will use an appropriate appraisal tools, such as the Mixed Methods Appraisal Tool (MMAT) (Hong et al. 2018), the Critical Appraisals Skills Programme (CASP) Economic Evaluation Checklist (CASP 2018) and guides available via the Joanna Briggs Institute Manual for Evidence Synthesis to assess the quality of the articles, making adaptations as necessary. Two researchers (including one clinical fellow) will rate articles independently for quality and relevance. In cases of disagreement, the reviewers will discuss their responses until consensus is reached. In this way, data extraction and critical appraisal will be performed to increase reliability and reduce bias. The review will be reported following Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) recommendations (Tricco et al. 2018).

Initial findings of the search will be written up as an interim report to inform the design of research materials in Phase 2. A full review report will be completed in Phase 2 and inform the case study data analysis and final evaluation framework.

Output: scoping review protocol and interim summary report of findings

Qualitative data collection and analysis to understand programme theory

During Phase 1, available Redthread documents supplied to the evaluation team will be reviewed to map out referral pathways into the service and analyse the programme theory.

Programme theory refers to what an intervention aims to do and how, and its main component parts. This work will be supplemented by undertaking exploratory discussions with key stakeholders at UCLH and members of our evaluation advisory group (for further information, please see below), such as clinical collaborators working in emergency medicine and paediatrics, and those involved with NHS youth violence reduction programmes in London. We will also examine the findings of previous Redthread evaluations undertaken at other Trusts to see how they have interpreted the Redthread programme.

Due to the complex nature of the Redthread intervention, which has increased due to changes wrought by the Covid-19 pandemic, we do not anticipate that the Redthread intervention is associated with a linear logic model or theory of change. Rogers (2008: 34) suggests that logic models can risk representing a single theory of change rather than different stakeholders' views about the desirable outcomes of an intervention and how these might be achieved.

Particularly complicated aspects of the Redthread intervention that the NIHR RSET will attend to are:

- different causal strands and mechanisms at work at the same time, such as different referral pathways to access the service;
- crossovers with similar services in neighbouring NHS Trusts;
- varying “doses” of the intervention provided to young people depending on their circumstances and willingness to engage

We will conduct a small number of qualitative interviews (approximately 4-5) with key stakeholders such as paediatric clinicians at UCLH and Redthread youth workers. The main purpose of these interviews will be to understand what meaningful success looks like to those closely involved in delivering the intervention (e.g. reduction in admissions, onward referrals to other services, positive case work with an individual, etc.) and to explore any skills and training required to deliver the intervention. Finally, we will document any novel service components that are new to the UCLH setting or have arisen due to Covid-19 (e.g. virtual delivery) during this stage.

Output: programme theory document to be presented to stakeholders and inform Phase 2 process evaluation

Quantitative feasibility analysis

The ultimate goal of the quantitative analysis is to use the data for Redthread patients coming through UCLH to understand whether the service is improving outcomes. The main impact outcomes will be hospital attendances and admissions specifically relating to assaults or similar for which we will use data on inpatient admissions and (as much as possible) accident and emergency (A&E) attendances.

We will also compare any characteristics of eligible patients who engage with the service against those who do not.

An important issue is how we might identify comparisons in this evaluation. We have identified three options for analysing the impact on hospital attendances, and the most feasible approach will be determined as part of Phase 1:

- 1) A before and after comparison of changes in attendances between UCLH Redthread patients and a cohort of patients selected on eligibility and likely acceptance of Redthread services attending other hospitals (which either have no similar youth violence service or, if they do, have one that is unchanged over the comparison period).
- 2) Similar to option 1, but comparing Redthread eligible patients at UCLH to eligible patients at hospitals other than UCLH.
- 3) A dose-response analysis comparing attendances of relevant residents by Lower Super Output Area (LSOA) level areas, accounting for where UCLH Redthread patients live (the hypothesis being that more Redthread users in an area leads to a greater impact on attendances).

Table 1 below summarises these options. Note that all options rely on using HES data to build appropriate comparison groups (if used). We will not seek to access hospital data from any hospital other than UCLH.

Table 1: Options for quantitative comparisons during the evaluation

Option	Control	Intervention group	Comparison
1	Cohort of non-Redthread patients attending hospitals other than UCLH, selected on Redthread eligibility criteria and characteristics explaining likelihood to accept Redthread services	UCLH Redthread patients	Difference in change in attendances between control and intervention groups before and after introduction of Redthread at UCLH
2	Cohort of non-Redthread patients attending hospitals other than UCLH, selected on Redthread eligibility criteria	UCLH patients eligible for Redthread services	Difference in change in attendances between control and intervention groups before and after introduction of Redthread at UCLH
3	There are no control or intervention groups. Analysis carried out at small area (LSOA) level, with LSOA areas mapped to number of UCLH Redthread patients		Two potential comparisons: a) difference in rate of attendances (in the period in which Redthread has been operational at UCLH) as a function of number of Redthread patients, or

		<p>b) difference in the change in attendances before and after UCLH Redthread service started, as a function of number of Redthread patients</p> <p>Note – relevant attendances only will be included, e.g. those belonging to people of eligible age</p>
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The choice between option 1 and 2 will depend on the availability of data and the practicalities of record linkage, described next. While our primary impact outcomes will be attendances/admissions, we will investigate the extent to which we can account for further outcomes, e.g. type of attendance/severity of condition.

In Phase 1, we will determine the most feasible approach(es) to use. We will use HES data to determine the extent to which it is possible to identify cohorts of individuals who could be eligible for the Redthread service, are likely to use such a service if offered, or who might be affected by individuals using the service. This will involve mapping the Redthread service’s referral criteria to relevant information available within the datasets and analysing differences in characteristics of those who do and do not accept the Redthread intervention (based on data and experience from the UCLH and other Redthread services). Our primary dataset will be the inpatient HES record, but we will also explore the feasibility of using the A&E HES data (available to December 2019) and the Emergency Care Dataset (ECDS) (available from April 2019).

The stages of this analysis will include:

- (i) Identifying ICD10 or SNOMED codes that may be relevant either for identifying potential users of Redthread, or for measuring impact of the service (e.g. assault by sharp object – ICD 10 X99, assault by firearm discharge - X93-5). These will be agreed with the service and clinical collaborators.
- (ii) Assessing how frequently these codes are recorded in a hospital like UCLH.
- (iii) How many occasions single individuals are likely to attend with these codes.
- (iv) An assessment of frequencies of attendance with these diagnoses at LSOA level.
- (v) The size of the cohort using Redthread at UCLH.

We will document the frequency of eligible patient index admissions/attendances in UCLH, as well as in hospitals across England, and typical rates of admissions and attendances for these patient groups. We will carry out statistical power calculations to estimate how long studies would need to be to detect changes in rates of readmissions/reattendances assuming a range of magnitudes of impact.

Phase 1 will also include preparation for Phase 2 by assessing the feasibility of accessing data from UCLH’s electronic patient health record system (known as ‘Epic’). This system records

routine and emergency hospital care activity, and additionally includes information about patients referred to Redthread. Where there is a clear benefit toward answering questions about the impact of the Redthread service, we will look to agree appropriate data sharing and access arrangements.

We will explore the feasibility of linking local hospital records data (and linked administrative information directly from Redthread) to national HES datasets, for example. This would help us identify admissions of Redthread users to other hospitals, although the advantages will depend on which of the three evaluation approaches we adopt.

Feasible measures may include:

- Reducing hospital readmissions (or A&E re-attendance) for individuals who have engaged with the Redthread service.
- Reducing hospital admissions for individuals living in the same area as those who have engaged with the Redthread service.

Output: Quantitative data and information, and an analysis plan for phase 2

Set up of an Evaluation Advisory Group

During this phase we will also set up an Evaluation Advisory Group to meet up to three times during the course of the evaluation (virtually or in person) and involving representatives from the NHS, health care and relevant public agencies. Terms of reference will be drafted and the aim of each meeting will be to provide helpful challenge and advice to the evaluation team from stakeholders more external to the programme.

We have allocated funding to bring on board an external expert if deemed helpful for the evaluation (e.g. an expert in youth offending and knife injury). We have already approached - and received positive confirmation of willingness to be involved - from a member of NHS staff delivering NHS hospital-based violence reduction models in London and a senior policy manager for provider policy at NHS England and Improvement.

Outcomes of Phase 1:

- Interim report on literature review findings
- Summary of the Redthread service programme theory (i.e., how it intends to have a positive impact on young people and support the NHS)
- Quantitative data collection and analysis plan (including investigating the possibility of accessing anonymised data from UCLH's patient administration system (EPIC) in Phase 2 and an approach to identifying a control group or groups)
- Local ethical approvals / permissions obtained (e.g. from UCLH)
- Set up of Evaluation Advisory Group and first virtual meeting

PHASE 2 (MARCH 2021 – JANUARY 2022)

This phase will apply mixed methods and involve a single-site case study to understand local implementation processes, staff perceptions, impacts and overall costs of the Redthread service. This is the most substantive and in-depth phase of the evaluation.

Process evaluation – qualitative case study

The unit of analysis for the process evaluation will be a single organization, UCLH, which provides acute and specialist services to the population in central London and will function as the boundary for the case. A process evaluation is recommended given that the Redthread service is a complex intervention and randomisation is not feasible; what is required in this case are insights about delivery and overall impact to inform future implementation (Barratt et al. 2016). Process evaluations aim to understand how a programme or intervention is implemented, including any important decisions that influence how the intervention operates in practice.

The case study will involve in-depth qualitative data collection (interviews and meeting observations) and focus on the mechanisms identified in Phase 1, including any linkages between them, as well as any features of the hospital setting and its environment that shape delivery of the Redthread programme. Examples of the factors that are likely to be explored in this phase include:

- *Internal context*: departmental leadership and cross-departmental working; professional buy-in (especially by emergency, trauma and paediatric staff); hospital data sharing and governance policies; senior/executive team support for the intervention; staff training; perceptions of need; communication of information about the intervention; Trust-level strategic priorities.
- *External context*: demands on hospital services; Trust collaboration with public agencies; lines of accountability across sectors within the area (e.g. responsibility for youth crime prevention and inter-agency cooperation across health, social services, education and criminal justice).

Observations

Due to the advantage of case studies for naturalistic enquiry (Tsang, 2014), the evaluation will aim to conduct non-participant observations of relevant operational meetings, Redthread training sessions and service oversight briefings to understand local processes of implementation at UCLH and staff feedback about the Redthread service in real time. These are likely to be virtual meetings on account of the Covid-19 pandemic and will be conducted in accordance with national guidelines (e.g. from the Health Research Authority, UCL) and with permission from staff at UCLH. Observational notes will be handwritten by the researcher present at the meeting and then typed for secure electronic storage and analysis.

Observational work in emergency departments will not be feasible during this evaluation for practical and ethical reasons. Such observations involving young people raise issues around content sensitivity, especially where personal cases are being discussed in depth by youth workers and clinicians, and risk interfering with both the Redthread intervention and patient care.

Interviews

The case study will involve interviews (approximately 15-20) with health care staff, safeguarding teams, in-house social workers and operational managers either directly involved in implementing the Redthread intervention or who provide services to young people at risk of harm at UCLH. Interviews will be confidential and conducted in person or by telephone / videocall. The emphasis will be on collecting rich data that explores the nature of the intervention delivered within the UCLH context. Respondents will be purposively sampled to include staff that are both central and peripheral to the Redthread intervention; this will help capture the views of potential service “champions” and clinicians with lower levels of awareness of the service but who might be receptive to using it (e.g. paediatricians who have not been involved in the early implementation of the intervention). This has the advantage of avoiding a potentially biased sample of supporters and hearing from members of staff who may not have had the opportunity to engage with Redthread youth workers as much as they would like to.

Aspects of the programme theory will be ‘tested’ during interviews to ascertain whether staff recognise the same processes, aims and causal mechanisms identified by core stakeholders during Phase 1 of the evaluation. Interviews will explore staff perceptions, including how the intervention compares to a more traditional biomedical model for supporting young people admitted for violent injury (i.e., interviews can explore hypothetical scenarios such as, “what would you do in this case if this service was not available?”). The respondents approached in Phase 1, including Redthread youth workers, will be invited for a ‘time 2’ follow-up interview at this stage to explore any adaptations made to the service and perceptions about Redthread’s effectiveness, plus any other observations they have about the implementation process. The final interview topic guide will be informed by both the literature review and Phase 1 exploratory work.

In addition, in-depth interviews will explore anonymised clinical case examples where respondents have the opportunity to discuss a patient referral pathway: how a young person presented at UCLH; why this case resulted in a referral to the Redthread service; the needs of the young person; the type of interventions youth workers delivered; any outcomes observed for the young person (e.g. over a 3-6-month time period). The Redthread team will be contacted to validate (anonymously) details of such clinical examples and share their perspective of the referral pathway. This will allow for the production of illustrative, clinical case vignettes that demonstrate how the Redthread service operates in practice and any connections between the Redthread service and other points of referral and care delivery within the hospital setting.

Should recruitment difficulties arise due to pressures on clinical staff, it might be decided to conduct a series of small focus groups on site or virtually, such as before / after shifts or at the

end of staff meetings. We will liaise with our UCLH collaborators to ensure that the most convenient and least disruptive option for the qualitative data collection is prioritised. All qualitative interview data will be collected following an informed consent process and permission sought to record discussions for transcription in a secure manner (e.g. using encrypted recorders). No participants will be identified or job titles used in the final report or outputs (unless explicit consent has been provided to attribute quotes). Qualitative data will be stored on a UCL server in a folder only accessible to the RSET evaluation team. Audio files and transcripts will be stored in password-protected subfolders.

If possible, we would like to conduct semi-structured interviews with up to 5 young people who have directly experienced the Redthread service at UCLH during this stage – to capture the perspectives of service users and the impact on their lives. This will entirely depend on access, recruitment and ethical permission to approach young people, all of which will be determined during the Phase 1 exploratory work.

Finally, all interview/focus group and observational insights will be triangulated with documentary analysis of Redthread and UCLH planning and implementation guidance gathered in Phase 1, and other relevant documents, such as those used for communicating information to staff locally about the intervention and training materials. Data will be entered into NVivo software (Version 10) for thematic coding and analysis. Emergent and summative findings will be discussed in team meetings and compared with the findings arising from the economic and quantitative aspects of the evaluation.

Output: Implementation timeline and in-depth process case study

Economic evaluation

Based on the outcomes identified from Phase 1 of the evaluation and documentary analysis, we propose to conduct a cost-effectiveness analysis of the Redthread service at UCLH. Cost-effectiveness is calculated as the mean cost difference between comparators divided by the mean difference in outcomes to produce an incremental cost-effectiveness ratio (ICER).

A cost-effectiveness analysis is possible once a control group that fulfils the eligibility criteria for the Redthread service, but have not been admitted or attended at UCLH, is identified in Phase 1. The outcomes and costs of care for the Redthread remote service provided at UCLH will then be compared with the costs and outcomes of the comparative alternative (i.e., non-Redthread patients attending hospitals other than UCLH, selected on Redthread eligibility criteria or UCLH pre- Redthread patients). We will estimate the difference in the costs between comparator groups divided by the difference in outcomes (such as hospital inpatient admissions and A&E attendances relating to assaults) to give the ICER. Other outcomes such as readmission to the hospital, A&E reattendance and the severity of condition will also be considered.

This approach will also permit observation and analysis of the changes to the programme that took place as a result of alterations to the service (remote vs onsite delivery) as a result of Covid-19.

Costs will be assessed from the perspective of the NHS and personal social services (PSS). The cost components will include the Redthread programme implementation, the costs of the health care staff, other medical and non-medical costs while on treatment, as well as costs associated with community follow-up. The information on costs and benefits of the Redthread programme from the PSS perspective will be retrieved through the qualitative interviews with the Redthread staff and from the literature review in Phase 1.

Reducing violence may have significant health and societal benefits extending beyond the current health care and social service settings - for example, cost-saving related to reduced impact on the criminal justice system. A separate analysis extending our base case to include a wider social perspective will try to take this wider social perspective into account. However, it should be noted that such analysis cannot be informed from the data collected in this study and would therefore be based exclusively on parametric data and assumptions from the existing literature.

Output: cost-effectiveness analysis of the Redthread's intervention at UCLH

Quantitative Methods

Phase 2 will collect patient-level data and analyse it to assess the value of the Redthread service using the analytical option(s) we have chosen in Phase 1.

Evaluating the effectiveness of the service

This analysis will proceed using one or more of the options specified in Phase 1. Phase 2 will also include an analysis of the differences in characteristics and service use between those who do and do not take up the offer of Redthread services.

Option 1 is the only one that would need a link between the UCLH or Redthread data and HES so that individuals using the Redthread service in UCLH can be identified through attendances at other hospitals. Dependent on the size of the cohort group and the outcome of Phase 1, we will analyse reattendance and readmission rates for eligible patients in the periods before and after the start of the Redthread service at UCLH, and carry out a pre-post analysis to identify whether there is evidence of a change that might be associated with the start of the Redthread service. Note that we will include reattendances and readmissions for relevant reasons to any hospital, following an index attendance/admission at UCLH. We will apply cohort selection criteria developed with reference to the analysis of characteristics of Redthread users, to a hospital (or to several hospitals) most comparable with UCLH, but without a Redthread (or similar) service, and compare changes in reattendance and readmission rates in the same periods. This analysis will be undertaken both as an evaluation of the effectiveness of the service for an individual and of the effectiveness on the eligible population attending UCLH on an intention-to-treat basis.

Option 2 is similar to the intention-to-treat analysis under option 1 except that it only analyses attendances of likely eligible users at UCLH and focuses on changes for all eligible attendances before and after the service is introduced with changes in selected control hospitals.

For Option 3 we will count how many Redthread users there are living in each geographic area using the local UCLH or Redthread data and then use HES to find hospital attendances for eligible people coming from each area, regardless of which hospital they attend. We will build multivariate models that relate numbers of admissions in each area to numbers of previous admissions (before the service is introduced) and the number of Redthread users from the area.

There are pros and cons with the options we have identified which are set out in the table below.

Option	Pros	Cons
1	<ul style="list-style-type: none"> Allows both an intention-to-treat evaluation and evaluation of the impact on Redthread users alone. 	<ul style="list-style-type: none"> Vulnerable to small numbers. Takes no account of knock-on effects of Redthread on potential victims who are not using the service (i.e., could underestimate or misrepresent impact). To account for reattendances elsewhere relies on an ability to link data between UCLH and HES.
2	<ul style="list-style-type: none"> Less vulnerable to small numbers. No data linkage required. 	<ul style="list-style-type: none"> Biases could be introduced by differences in user characteristics and few individuals using the service multiple times. Causes a problem if a Redthread service attracts emergency attendances to the hospital because of its presence. Won't account for reattendances elsewhere.
3	<ul style="list-style-type: none"> No need for a control group. Measures knock-on impact of the service on wider populations. 	<ul style="list-style-type: none"> There may be too much unexplained noise to cause problems in the analysis if the numbers are small.

To compare the characteristics of individuals using Redthread against those that decline the service, we will use data collected by Redthread and UCLH and compare characteristics using univariate and multivariate approaches. Throughout the course of the evaluation this will also

be fed back to Redthread formatively in order to highlight whether changes are required in how they reach individuals.

Output: Quantitative evaluation of the effectiveness of the service in terms of readmissions or reattendances

Outcomes of Phase 2:

- A provisional, descriptive case study focusing on implementation processes and staff perceptions of the intervention, in particular how the local context may shape outcomes
- If feasible, a cost-effectiveness analysis of the Redthread intervention at UCLH from the NHS and personal social services perspective
- If feasible, a quantitative evaluation of the effectiveness of the service in terms of readmissions or reattendances

Phase 3: integrated data analysis, final report and validation of findings leading to an evaluation framework (JULY 2021 – JANUARY/FEBRUARY 2022)

In the final phase we will integrate all our findings – including the most recently available economic and quantitative information – for a final report for the NIHR. We will present and discuss the findings with local stakeholders and our Evaluation Advisory Group, working together to develop an evaluation framework to help UCLH, Redthread and other NHS services evaluate Redthread and similar interventions in future. Due to the relatively short period of this particular evaluation (1 year), we foresee that the team may need to discuss recommendations for the commissioning of additional research studies, in particular longitudinal, comparative and cohort studies, as well as the type of impact and outcome measures that stakeholders find most meaningful.

A final evaluation workshop will be organised where we will present our findings, evaluation framework and recommendations to stakeholders, including researchers involved in other Redthread evaluations, UCLH staff, Redthread and NHS stakeholders involved in youth violence reduction programmes (e.g. in NHS London). We also plan to invite staff from other relevant local health and crime agencies in London and academic experts in the field of youth crime prevention. The workshop will be facilitated by the NIHR RSET with the objective of co-producing insights with UCLH and Redthread that are of particular value to the NHS, commissioners, public sector bodies and charities working in this area.

Outcomes of Phase 3:

- A draft evaluation report for the NIHR
- A presentation of the main findings to UCLH and Redthread
- An evaluation framework, including advice on what should be in place, more generally, to enable quantitative, economic and qualitative evaluation of Redthread and similar services in future
- Presentations of the evaluation at suitable conferences
- Promotion of the evaluation findings via the Nuffield Trust's website and other networks
- Academic, peer-reviewed publication(s)

Ethical and local R&D permissions

On the basis of the NHS Health Research Authority's online decision tools, the study has been classified as a service evaluation for Phase 1. Phase 2 ethical review will depend on decisions reached during Phase 1 regarding feasibility of interviewing Redthread service users and available data for quantitative analysis. UCL Research Ethics Committee (REC) or HRA/NHS REC review and approval will be sought as indicated.

We are aware of the sensitive nature of this evaluation and the research team has experience in conducting research on similar sensitive topics. The qualitative researcher will have up-to-date Disclosure and Barring Service clearance before embarking on any data collection at UCLH.

Collaboration and stakeholder engagement

We will work closely with our named UCLH and Redthread collaborators throughout the evaluation to ensure we are kept abreast of developments at UCLH and to ensure the evaluation is relevant and conducted in a way that involves expert clinical and youth worker input as required. We have designated contacts for handling regular communications about the evaluation and sharing of information between Redthread and the NIHR RSET (Tiffany Brown - Redthread, and Dr Jean Ledger – NIHR RSET).

The Evaluation Advisory Group will meet up to three times during the course of the evaluation (virtually or in person) and include representatives from the NHS, health care and public agencies to provide challenge and input that is more external to the programme. Working in collaboration with Redthread, we will invite Redthread Youth Ambassadors to attend one meeting to share their perspectives and experiences of the intervention and help increase understanding amongst the team of the potential impacts of the service for young people.

Proposed members:

- NIHR RSET members working on the Redthread service evaluation
- UCLH Clinical Collaborators (Dr Joanna Begent and Dr Yasmin Baki)
- NHS stakeholders with a special interest in young people's health and reducing youth crime (two persons have already confirmed their willingness to be involved, both with secondary care provider experience)
- An academic or experienced professional expert in youth crime (TBC)

Dissemination and outputs

The evaluation will generate findings to inform the impact of the Redthread approach in terms of its effectiveness, implementation and cost effectiveness. The evaluation team will produce an evaluation framework in collaboration with clinical partners and the advisory group to support Redthread's work in the NHS and similar hospital-based initiatives focused on young people.

The evaluation team will also produce a final report to the NIHR Health Services and Delivery Research (HS&DR) programme. Findings will also be shared through articles published in peer-reviewed journals and papers presented at academic and professional conferences. In addition, the team will produce a number of more accessible outputs via the Nuffield Trust website summarising the findings and targeted at a range of audiences, including Trusts, regulators, policy makers, and patient groups.

Data management

Quantitative data

HES data are held and analysed on a secure server based at the Nuffield Trust, which acts as the data processor for these data, with UCL and the Nuffield Trust acting as joint data controllers. The access and use of HES data for this project is governed by a data sharing agreement with NHS Digital covering NIHR RSET work DARS-NIC-194629-S4F9X. Appropriate data sharing agreements will be established during Phase 1 to cover the use of additional quantitative data (for example, UCLH Epic, or Redthread data).

Qualitative data

Interview data will be collected from participants in accordance with the participant information sheets. Interviews will be recorded on an encrypted, password-protected digital audio recorder. The recording data will be cleared from the digital audio recording device promptly when it has been successfully transferred to the UCL IT network.

Information sheets will be provided to interviewees with information about the study (purpose, design, expectations, risks, benefits) before they are asked if they would like to take part. The information sheet will indicate that the researchers carrying out the evaluation act independently and are interested in the implementation and local impact of the Redthread service at UCLH and that participation is entirely voluntary. It will make clear that participants may withdraw from the study at any time, including their data, up until the end of the evaluation. We will maintain the anonymity of the participating individuals and process data in accordance with General Data Protection Regulation and data protection guidelines.

The digital audio recordings of interviews will be sent to a Cyber Essentials certified transcription service for transcription. Returned transcripts will be reviewed by a qualitative researcher for accuracy and password protected. Participant identifier codes will be stored in a password-protected Excel file and stored separately from the transcripts.

The original interview audio recordings, transcripts, and UCLH materials for documentary analysis will be stored on the secure UCL drive accessible only via the UCL password-protected IT network. Access to data is granted after login with valid accounts and according to UCL access permissions.

Data Archiving

The collaborators recognise that there is an obligation to archive evaluation-related documents at the end of the evaluation (as such end is defined within this protocol). The evaluation team will store personal identifiable data up to one year after the evaluation has ended. Participants will be informed of this storing requirement through the participant information sheet. The Chief Investigator (John Appleby) confirms that he will archive the evaluation master file for 10 years from the evaluation end.

Risk and risk management

The timeline proposed below is based on the following assumptions: 1) the study will be considered a service evaluation in Phase 1 and not require NHS ethical review in Phase 1 or 2; 2) that the UCLH R&D office and clinical collaborators will provide the necessary support and local approvals necessary for the evaluation team to collect data locally; 3) that Redthread will continue to share information with the evaluation team about its service, including adaptations made on account of the Covid-19 pandemic; 4) the evaluation team will have access to staff at UCLH for the conduct of interviews and observations; 5) the team will be able to arrange access to the data required for the quantitative and economic analyses in a timely fashion; 6) that work on the study may need to change in light of national Covid-19 guidelines and regulations that impact on research and NHS services.

Quality control

The evaluation protocol will be reviewed by the full RSET and clinical collaborators at UCLH. Once approved by the NIHR, the final protocol will be made available on the NIHR website and considered for publication. Quality control of other outputs (e.g. academic papers and project summaries) will be shared with the wider NIHR RSET programme and Evaluation Advisory Group over the course of their development to ensure analytical rigour and to maintain independence of the work.

Project management

This study will be led by Professor John Appleby (Nuffield Trust) and team members will comprise Jean Ledger (UCL), Chris Sherlaw-Johnson (Nuffield Trust), Theo Georghiou (Nuffield Trust), Sonila M. Tomini (UCL), and Jason Freirich (Nuffield Trust, Visiting Fellow).

The team will work closely with collaborators (Redthread and UCLH) throughout the evaluation, to ensure optimal approaches to data collection, analysis, interpretation, and sharing of lessons.

The team will meet weekly during the early phases of the project and at least monthly thereafter throughout the duration of the project. The evaluation will be discussed as a standing item at monthly NIHR RSET meetings, in terms of progress against project milestones and to address any practical or methodological issues, and to help maintain the independence of the evaluation.

Funding and insurance

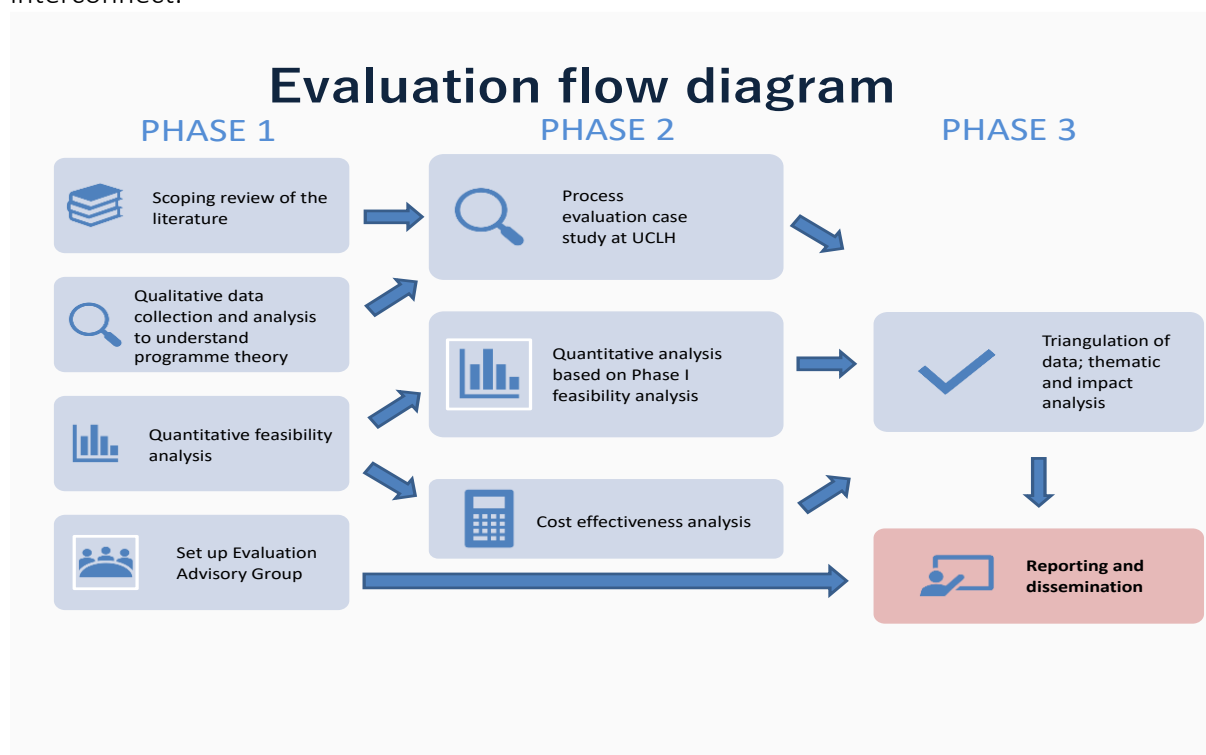
RSET is funded by the NIHR HS&DR programme (HSDR 16/138/17).

UCL holds insurance against claims from participants for harm caused by their participation in this study. Participants may be able to claim compensation if they can prove that UCL has been negligent. However, if this study is being carried out in a hospital, the hospital continues to have a duty of care to the participant of the study. UCL 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 a NHS Trust or otherwise.

Project timeline

The project will last fifteen months, starting November 2020 (or whenever NIHR-approval is confirmed) until the end of January/February 2022.

A Gantt chart for the evaluation is provided below and flow diagram showing how the phases interconnect.



Gantt Chart.

	2019	2020			2021												2022
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	
	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Study set-up																	
<i>Study scoping</i>	Done																
<i>Protocol development</i>				Done													
Phase I (desk-based remote working)																	
<i>Scoping review of the literature – protocol development, initial searches, interim report</i>																	
<i>Design qualitative study materials (e.g. topic guide(s))</i>																	
<i>Qualitative data collection (scoping interviews) and analysis of documents to understand programme theory</i>																	
<i>Quantitative feasibility analysis</i>																	
<i>Set up Evaluation Advisory Group</i>																	
Phase 2 (mixed methods analysis)																	
<i>Ethical / R&D approvals*</i>																	
<i>Scoping review – full search and final report</i>																	
<i>Process evaluation – qualitative case study</i>																	
Data collection (observations, interviews)																	
Data analysis																	
<i>Quantitative methods</i>																	
Gain access to datasets																	
Data collection and analysis																	
<i>Economic evaluation/cost-effectiveness</i>																	
Data collection and analysis																	

Phase 3 (evaluation framework, dissemination, final report)																	
<i>Integrated data analysis</i>																	
<i>Dissemination</i>																	
Local stakeholders																	
Evaluation Advisory Group																	
Stakeholder workshop																	
Wider dissemination/presentations																	
Academic publications																	
<i>Final report to NIHR</i>																	

*Phase I work is a service evaluation not requiring ethical review; Phase II ethical reviews and timings will be determined based on Phase I work and local NHS IG

Please note: darker shades are extensions to the original timeline.

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