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NATIONAL JOINT COUNCIL FOR LOCAL AUTHORITY FIRE AND RESCUE SERVICES

**To: Chief Fire Officers
Chief Executives/Clerks to Fire Authorities
Chairs of Fire Authorities
Directors of HR (Fire Authorities)**

Members of the National Joint Council

14th November 2017

CIRCULAR NJC/12/17

Dear Sir/Madam

Broadening the role

1. Circular NJC/10/17 issued on 13th October advised you that in order to support joint political lobbying on funding the NJC had commissioned *New Economy* to build upon the work undertaken by the team led by the University of Hertfordshire in its independent evaluation of trials undertaken in a number of FRSs.
2. *New Economy* was asked to develop a detailed cost benefit analysis in respect of emergency medical response. It was provided with access to all the data gathered by the University of Hertfordshire team, and undertook analysis of further information provided by FRSs.
3. A copy of the report together with an Executive Summary is **attached**.
4. Based on the evidence, the report concludes:

'This research indicates that EMR, at scale, generates a positive financial return on investment and achieves economic outcomes. Benefits are deemed likely for clinical commissioners, social care commissioners, and the Department of Work and Pensions. By delivering EMR, national FRS are able to enhance the offer of cardiac arrest response, with life-altering outcomes in a small but vital minority of cases.'

5. Together with the NJC employer and employee side Chairs and colleagues from *New Economy*, the NJC's joint secretariat will be meeting with members of the All-Party Parliamentary Fire Safety Rescue Group in Westminster on the afternoon of 15th November to discuss the report and its impact. The group has also agreed to sponsor a wider Westminster event in January to which all MPs will be invited.

6. It is also intended that similar events will take place in respect of Scotland, Wales and Northern Ireland.
7. Should you have any queries in respect of the report please contact your respective NJC secretariat in accordance with normal protocol.

Yours faithfully

SIMON PANNELL
MATT WRACK
Joint Secretaries

Emergency Medical Response by Fire and Rescue Services

Financial and economic modelling of impact

November 2017
New Economy

**new
economy**

A cost benefit model of emergency medical response by fire and rescue services on a UK-wide footprint, with a specific focus on the impact of cardiac arrest response on long-term health and social care outcomes.

Cost Benefit Analysis & New Economy

New Economy research helps agencies to identify the costs and benefits of new ways of working. We have developed and continue to refine a Cost Benefit Analysis (CBA) model that can be used to estimate the fiscal, economic, and social value of project outcomes, and specify which public agency sees this benefit.

Agencies are using our model to rethink whether activities previously funded and delivered by one agency can be better funded and delivered by partnerships. Topics upon which the model has been applied include support for troubled families, health and social care provision and redesign of the criminal justice system.

[New Economy's CBA model](#) has been developed with national experts from HM Treasury and other government departments, and its methodology has been adopted as supplementary guidance within [HM Treasury Green Book](#) recommendations on appraisal and evaluation.

Executive Summary

Introduction

Fire and rescue services (FRS) have experienced considerable success in preventing emergency fire incidents over the last decade. Various factors have been recognised as driving this trend – for example societal change, technological improvements, and a concerted focus on risk reduction. There has been recognition by both sides of the NJC that FRS activity in relation to fires, other incidents and public safety needed to be reviewed. In light of the success of their prevention agenda, FRS have been presented with an opportunity to replicate their effective emergency response capability within other operational contexts where services face increasing demand pressures. This potential was also recently recognised in the Policing and Crime Act 2017, which introduced a duty for the police, fire and rescue, and emergency ambulance services to keep opportunities for collaboration under review ‘where doing so would improve their efficiency or effectiveness’¹.

Emergency Medical Response (EMR) involves the deployment of FRS operational staff into contexts where they can help protect the health and care of the public. The volume of services deploying staff in EMR conditions has increased greatly over the last few years, largely accelerated by a UK-wide trial instigated by the National Joint Council of Local Authority Fire and Rescue Services (NJC), starting in 2015. A range of EMR offers exist across the UK, and services have differed in their specific focus, but between 2015 and 2017, most FRS have delivered it in one form or another. One of the most common forms of EMR is co-responding. The NJC trials involved a dispatch in parallel with ambulance services, under blue-light conditions, making a particular impact when reducing risk in the event of time critical out-of-hospital cardiac arrests (OHCA). The patient was then transported to hospital by the ambulance service.

In areas where EMR co-responding has been practiced, when a person suffers a suspected cardiac arrest, firefighters are deployed in parallel to the ambulance service under blue-light conditions. Staff from whichever service arrives first immediately begin to provide potentially life-saving treatment before the other arrives. Not only does parallel dispatch therefore facilitate the probability of a timely response; the additional on-scene activity also supports ambulance crews to undertake advanced clinical work while FRS operate in a support capacity.

In early 2017, the University of Hertfordshire delivered ‘Broadening Responsibilities’, an independent evaluation report commissioned by the NJC which sought to collate the

¹ The National Archive, Policing and Crime Act 2017 (retrieved from www.legislation.gov.uk/uppga/2017/3/contents/enacted)

evidence around EMR activity within the NJC trial, and reflect on its positive impacts. The report identified a strong strategic fit between the rapid intervention capability of firefighters and the circumstances encountered during EMR, suggesting a wider opportunity to involve firefighters in an expanded range of medical response work. One of the report's key findings was that: "appropriately trained and equipped firefighters co-responding to targeted, specific time-critical medical events, such as cardiac arrest, can improve patient survival rates"². It used some of the conventions of health economics to express the 'value' of EMR in terms of its life-saving potential / quality-adjusted life years (QALY) gained by beneficiaries. The authors concluded, based on the available evidence, that the benefits demonstrated in the trial outweighed the costs.

This Executive Summary provides a high-level overview of work undertaken by New Economy between June and October 2017 to build on the work detailed in 'Broadening Responsibilities', with a specific focus on Cost Benefit Analysis (CBA). New Economy was approached to undertake this work because the NJC was keen to develop a financial appraisal of the EMR trials that could: (i) explore in more detail the evidence around benefits of co-responding in the event of OHCA; (ii) take a view on potential benefits of EMR if it were adopted in the standard firefighter role profile; and (iii) weigh up those potential benefits against the full cost implications of a scaled approach.

The remainder of this document will seek to elaborate on the findings of that financial and economic appraisal. As per established New Economy methodology, research involved a synthesis of the best available data, insights from experts, and evidence from academia to develop a clear logic model, based on the 'chain of survival' of a patient following out-of-hospital cardiac arrest

Four main points should be made with regard to the limitations of this analytical exercise:

- 1. The report hypothesises patient outcomes, in the absence of a longitudinal study of actual case records.**
- 2. The report makes a best - but ultimately estimated - judgement on how much co-responding would take place in a UK-scaled model of EMR, and takes a generalised view of implementation.**
- 3. The report's findings describe the costs and benefits of EMR at the level of the UK, and cannot be disaggregated to the level of individual services.**
- 4. The report's findings include the total costs and total benefits associated with EMR, without reference to the degree to which costs have already been borne by specific services.**

More detail is included with regards methodology in the "Research Aims, Methodology and Scope" section of this paper.

² University of Hertfordshire, "Broadening Responsibilities", March 2017

Key Findings

Analysis sets out a strong value-for money case for EMR. The indicative benefits to both health and social care partners far outstrip the initial investment required, with an overall financial return on investment of £4.41 per £1 invested, taking a conservative view of the population served. Taken as a very broad average, this equates to a net financial saving of approximately £214 per callout; even accounting for the 79% of co-responding attendances in which it is determined that cardiac arrest has not occurred.

At scale, the intervention is likely to see FRS attend to about 15,000 out-of-hospital cardiac arrests per year (about half of all those seen by ambulance services)³. While only 4.3% of cardiac arrest patients are likely to experience a life-altering impact, those that do will be independent and cognitively functional, where before they would have suffered severe, permanent neurological impairment – at sizeable cost to both health and social care partners.

For each individual with new, good cerebral performance, it is broadly estimated that a benefit is created in the order of:

- £24,000 for clinical commissioners as a result of reduced length of stay in intensive care and less costly treatment requirements; and
- £44,500 for social care commissioners as a result of reduced demand for post-cardiac arrest domiciliary care.

Financial Case

Definition of terms: *Financial benefits are the outcomes of an intervention which – depending on context and decisions by stakeholders – can be realised to some degree as a cashable fiscal saving to the public purse. All headline figures quoted in this Executive Summary in respect of financial benefits give an indication of what would be termed the potential fiscal benefits. This is not the actual visible budget impact likely to be experienced by services, but rather a more general expression of the financial savings generated by EMR.*

EMR, when modelled at UK scale, has the potential to create considerable financial benefits over a ten-year time period, and these benefits are estimated to outstrip the projected / estimated costs. The overall financial return on investment (ROI) for the wider public purse is 4.41. This means that for every £1 invested over a ten year period, approximately £4.41 of gross fiscal savings are generated, a proportion of which is likely to be cashable.

³ British Heart Foundation, March 2017, (retrieved from <https://www.bhf.org.uk/news-from-the-bhf/news-archive/2017/march/cardiac-arrest-report>)

The financial ROI is calculated based on a comparison of the cumulative costs of rolling out and delivering EMR at UK scale, and the cumulative savings made where outcomes are improved. Economic convention is to apply a ‘discount’ rate to future costs and benefits, but otherwise the mathematics of the calculation is simply the product of dividing all the benefits by all the costs. The full profile of anticipated costs and benefits over the 10-year modelling period is shown in Figure 1.

Figure 1 – Fiscal Costs and Benefits of EMR

Fiscal Benefit	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Costs	£10.9m	£4.8m	£4.4m	£4.1m	£4.0m	£3.9m	£3.7m	£3.6m	£3.5m	£3.3m	£46.1m
Benefits	£19.6m	£22.6m	£22.8m	£22.0m	£21.2m	£20.4m	£19.7m	£19.0m	£18.4m	£17.7m	£203.4m

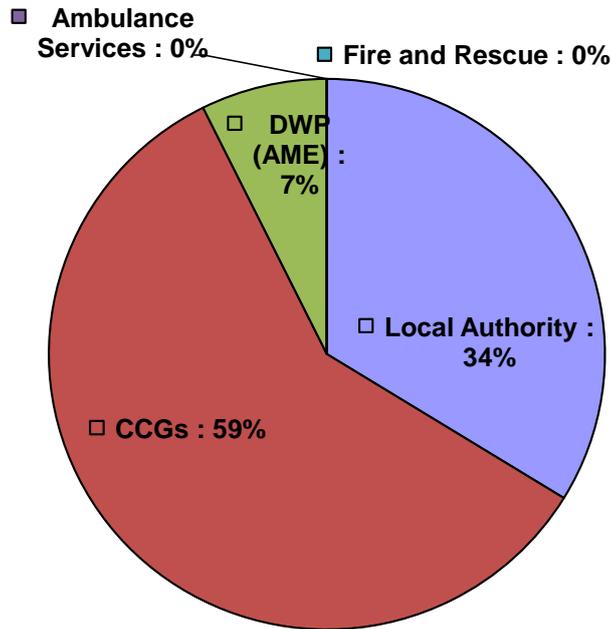
Net Present Budget Impact*	- £157.3m	<i>*the degree of additional fiscal benefit created, having accounted for costs.</i>
Overall Financial ROI**	4.41	<i>**the gain generated by an intervention, relative to the costs invested.</i>
Payback period***	1 Year	<i>***the estimated length of time required for an investment to become profitable.</i>

An alternative way of presenting the financial case is to subtract the cumulative costs from the cumulative benefits. With discounting applied, this provides a figure called the ‘Net Present Budget Impact’ (effectively an expression of total financial benefits, less total costs). Weighing costs and benefits against one another, EMR’s net impact is - £15.7m on public budgets, on average each year – based on an average cost draw of £4.6m and an average cost saving of £20.3m each year. After ten years, it is estimated that EMR will have had a Net Present Budget Impact of -£157.3m. Taken as a very broad average, this equates to a net financial saving of approximately £214 per callout; even accounting for the 79% of co-responding attendances in which it is determined that cardiac arrest has not occurred.

The payback period for return on investment is 1 year, meaning that in the first year, EMR is projected to generate benefits greater than the cost of implementation. This is a reflection of the intensive support cardiac arrest patients require on admission, as well as the immediacy of support required post-discharge; in averting these system costs, the benefits are modelled to accrue quickly once EMR begins.

Value is chiefly created for clinical commissioners and social care commissioners, with ambulance services and fire and rescue services only projected to be secondary beneficiaries. It has been assumed that Clinical Commissioning Groups (CCGs) are broadly responsible for most clinical commissioning, and that local authorities (LA) are broadly responsible for most social care commissioning throughout the UK. Where these groups are referenced, they serve as proxies for national health and social care commissioners. The split of gross fiscal savings by agency is represented in Figure 2.

Figure 2 – Gross Fiscal Benefits by Agency



Reference to Fig 1 shows that the costs of implementing EMR across the UK (some of which are already being borne by FRS who have undertaken co-responding) are estimated to amount to an average of approximately £4.6 million per year. Annual costs are projected to peak in the first year at £10.9 million and decline each subsequent year throughout the ten year model, reaching £3.3 million in the tenth year of implementation. Costs are chiefly borne by FRS and ambulance services (where they commission EMR), with some additional costs incurred by social care commissioners; more detail on the split of cost burden by sector is outlined later in this report. Please see Figure 5, at the end of this executive summary, for a visualisation of costs and benefits contained within this model.

Cashability

A natural next step for strategic leads is to give consideration to the degree to which savings are cashable. Cashability is the extent to which fiscal benefits can be realised in the budget of beneficiary agencies, which in turn influences their spending power. Figures presented in this document are pre-cashable fiscal savings. Factors influencing cashability are unique to the contractual and strategic landscape of individual services.

If taking a longer-term view of the cashability of EMR, assuming systemic transformation and large-scale engagement, the return on investment ratio of EMR is 2.90. Based on this analysis, for every £1 invested in EMR, £2.90 of benefit to the public purse is modelled and cashable.

Long-term cashability (sometimes called ‘large-scale’ cashability) is designed to simulate an achievable, realistic degree of benefits realisation following a more systemic change within local systems, following strategic decisions by commissioners taken over time. Whether through commissioning and procurement decisions, workforce reform or other forms of funding redistribution, most agencies have a general strategic context for cashing a saving. Savings associated with long-term cashability take a broad view of what ‘normal’ realisation looks like following such engagement. The timing of retrievability for long-term cashable savings is contingent on the timings of engagement.

Figure 3 – Long-term cashable savings of EMR

Long-term cashable benefit	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Costs	£10.9m	£4.8m	£4.4m	£4.1m	£4.0m	£3.9m	£3.7m	£3.6m	£3.5m	£3.3m	£46.1m
Benefits	£11.9m	£14.8m	£15.1m	£14.6m	£14.1m	£13.6m	£13.1m	£12.7m	£12.2m	£11.8m	£133.9m

Net Present Budget Impact*	- £87.7m	<i>*the degree of additional fiscal benefit created, having accounted for costs.</i>
Overall Financial ROI**	2.90	<i>**the gain generated by an intervention, relative to the costs invested.</i>
Payback period***	1 Year	<i>***the estimated length of time required for an investment to become profitable.</i>

Please refer to Figure 3, and the technical discussion paper attached to this summary, for New Economy’s indicative calculations on the broad cashability of EMR. Please also see Figure 7, at the end of this executive summary, for a visualisation of New Economy’s starting assumptions about the cashability of EMR.

Economic Case

Definition of terms: *Public value benefits refer to the value generated by an intervention as expressed in terms of changes in the wider economy or in wider societal effects. Public value includes:*

- (i) all fiscal benefits except transfer payments that just move money from one place to another;*
- (ii) net growth in the local economy; and*
- (iii) wider social benefits, including gains to society such as improvements to health; educational attainment; safety; etc.*

Public value benefits cannot be attributed to any one agency and do not amount to a pot of potential fiscal savings.

EMR is estimated to create an average public value benefit of approximately £158.9m p.a. over ten years. Almost all (more than 99%) of the public value created by EMR is the result of prevented loss of life. In *Broadening Responsibilities*, the University of Hertfordshire derive the value of a life saved through an analysis of Quality-Adjusted Life Years (QALY) gained. Anticipated survival gains were applied to a set of assumptions made about the average remaining life expectancy of the national trial cohort. A further weighting was applied to recognise the expectation of health-related quality of life (HRQoL) after a cardiac arrest episode where neurological deficits were incurred. This underlying approach has also been used by New Economy⁴.

The additional element of public value benefit captured by New Economy is the economic output of an individual, and the resultant benefit to the wider economy. This is monetised through factors such as their participation in the labour market, the tax system and generic public service utilisation. New Economy calculations of economic benefit include an in-built allowance for factors influencing the extent of additional value, such as leakage displacement and substitution.

There are smaller - but in the scheme of this particular model less substantial - public value impacts associated with prevented admissions to residential care, the release of episodic NHS resource where cerebral performance is improved, and long-term relief to central government in terms of employment support.

⁴ University of Hertfordshire, 'Broadening Responsibilities: Consideration of the potential to broaden the role of uniformed fire service employees', January 2017

Impact on Services

Fire and Rescue Services

The costs accounted for in this model are based on the average experiences of fire and rescue services in delivering EMR. Due to tremendous variation in preferred local approach, it is unlikely that this model depicts an accurate representation of the experience of any specific service. It is estimated that costs incurred by FRS, if co-responding was delivered at scale, would equate to approximately £3.3m per annum over ten years (though, in fact, the truer representation is that the model predicts an initial investment of £7.8m in the first year, followed by an average recurrent expenditure of £2.8m for each year thereafter). This does not include any additional costs covered by ambulance services or other clinical partners.

This model includes both direct and indirect resourcing of the EMR programme, and accounts for three different elements of cost:

- (i) **The value of operational staff resource.** This recognises that, while there is no additional spend incurred while deploying existing whole-time firefighters (and the model accounts for this), there is an inherent value to that operational resource⁵. It also includes an element of expenditure with regards retained firefighters;
- (ii) **Additional direct expenditure that is required in order to co-respond.** This chiefly accounts for newly purchased uniforms and equipment, as well inoculations/vaccinations and training⁶; and
- (iii) **Associated costs to services that result indirectly as a consequence of co-responding.** Costs which are not an explicit component of the EMR service delivery model, but which are an inherent output of implementation⁷. Some of these are attributable to FRS, and some to social care commissioners.

All FRS in the UK which have delivered co-responding, regardless of involvement of the NJC trial, were given an opportunity to input into a survey of implementation leads and chief fire officers, undertaken throughout September 2017. Estimations of costs and (in-part) benefits were calculated with reference to detailed inputs provided by 42 FRS from across the UK who responded.

⁵ Because this involves no additional budgeted expenditure, this is included as an in-kind cost but not reflected in the return on investment or other figures described elsewhere in this document. This cost is described in more detail in the discussion paper attached to this report.

⁶ A small number of services have delivered co-responding work for several years, making it difficult to delineate organisational spend which is specifically in service of EMR.

⁷ Specifically, additional demand within the wider system is accounted for where it relates to 'new' referrals made for cardiac arrest sufferers into the adult social care system and 'new' members of the workforce referred into counselling as a result of undertaking EMR activity.

Ambulance Services

41% of FRS state that they have received financial support from a partner ambulance service to deliver EMR. Based on the nature of remuneration, which most often takes the form of a contractual arrangement similar to a Payment by Results (PbR) mechanism, it is estimated that there is a cost implication for ambulance services across the UK equating to approximately £1.3m p.a. on EMR (again, a truer reflection of the investment requirement would be £3.1m p.a. for start-up costs in the first year of activity, and recurrent annual costs of £1.1m p.a.).

In the context of a parallel dispatch, the impact of EMR on ambulance services is not to reduce demand. It is possible that in some cases, due to expedited on-scene activity, the duration of total on-scene time may be reduced. This might enable ambulance crews to more quickly attend to other time-critical medical incidents in a timelier fashion.

Clinical Commissioners

The financial benefits of EMR for clinical commissioners arise as a result of NHS savings accrued in the context of acute medical healthcare. The CBA considers those occasions where improved neurological performance in the period immediately following a cardiac arrest translates into different (and less costly) provision of inpatient hospital care. Specifically, an association of EMR response times with cerebral performance outcomes suggests that some out-of-hospital cardiac arrest sufferers achieve cerebral performance outcomes which are both 'new' and 'good'. In this instance, 'new' refers to outcomes which would not have been obtained without the presence of a co-responding FRS, and 'good' refers to 'good-to-moderate' cerebral performance (i.e. CPC1 or CPC2) such that severe neurological deficit is avoided. Where this is the case, duration of stay in hospital and the nature of support in an intensive care setting is partially mitigated. It should be noted that the volume of patients benefitting in this way is relatively small – just 4.3% of cardiac arrests attended. However, the gross saving created per 'new' and 'good' neurological outcome is significant for each individual who does benefit. The gross fiscal saving to clinical commissioners is approximately £12.6m p.a.

The core methodology which supports this is a modelled calculation of the relationship between EMR response times (where an additional responding resource leads to faster response), return of spontaneous circulation (ROSC) prior to arrival at hospital, and cerebral performance outcomes. Published literature in this area provides the basis for the modelling. The level of estimated savings to clinical commissioners have been presented in the model in appropriately conservative terms, in part to reflect this.

A consensus paper jointly published by NHS England, the UK Resuscitation Council and the British Heart Foundation acknowledges and affirms the commonly-referenced statistic that each minute without defibrillation and CPR is likely to reduce a patient's

chances of survival by between 7% and 10%⁸. A review was undertaken of trial data on FRS response and “Category A” response times for ambulance services⁹. This comparison indicatively suggested that better outcomes were likely to occur as a result of the additional responding resource created by EMR.

With respect to the impact of response times on neurological outcomes, research suggests that there is a significantly reduced burden on the health sector as a result of better performance. An 18-month study undertaken in London found that patients exhibiting good or moderate performance generated median costs per hospital provider spell which were £24,000 less than that of patients exhibiting severe impairment. This is the result of the number of bed days occupied within an ICU, bed days spent on a non-intensive ward, and the nature of care provided¹⁰.

Figure 4 – Estimated outcomes for clinical commissioners

Clinical Commissioners	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Benefits	£14.7m	£14.2m	£13.7m	£13.2m	£12.8m	£12.3m	£11.9m	£11.5m	£11.1m	£10.7m	£125.7m

Social Care Commissioners

It is assumed that some individuals who would have experienced severe neurological impairment as a result of cardiac arrest would have required care. The agency most likely to bear the cost of social care is the local authority (LA) in the locality of residence for the survivor¹¹. Through avoiding this need for care as a result of better neurological outcomes, the gross fiscal saving to LA is estimated to be approximately £6.7m p.a.

It should be noted that any modelling exercise must also account for the potential that EMR may in some instances create an additional, indirect cost, which needs to be ‘offset’ against any anticipated financial saving to social care commissioners. This will apply where sufferers may otherwise have died, but survive in a severely impaired state (as a result of the intervention). This additional cost is estimated to be £3.0m p. a.

The gross fiscal saving reflected in the CBA can be further categorised into two forms of benefit in relation to:

⁸ British Heart Foundation, NHS England & Resuscitation Council (UK), ‘Consensus Paper on Out-of-Hospital Cardiac Arrest in England’, October 2014.

⁹ NHS Digital, Ambulance Quality Indicators (retrieved <https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/>)

¹⁰ J Petrie et al, ‘Hospital costs of out-of-hospital cardiac arrest patients treated in intensive care; a single centre evaluation using the national tariff-based system’, BMJ Open, January 2015

¹¹ Where Local Authorities are referred to in graphics or images, this refers to the association of Local Authorities with social care commissioning costs.

- a) a larger cohort of individuals who would have received home care for a given period as a result of cognitive defects, motor functioning difficulties, or other impairments; and
- b) a much smaller cohort of individuals who would have entered into residential social care as a result of more severe neurological impairment.

Both categories are based on the overall volume of individuals for whom it is estimated that cerebral performance at hospital discharge is both ‘new’ and ‘good’. They also each take account of research on the average length of stay in care by PSSRU, which estimates the people remain in care for 832 days on average¹². This includes an account of mortality/recovery reflected throughout the cost benefit analysis. Then, looking at each category in turn:

- (a) For domiciliary care - An account has been taken of the proportion of patients discharged into rehabilitation¹³. A further weighting has been applied to account for the cost per hour of domiciliary care, based on unit cost research by PSSRU¹⁴.
- (b) For residential care – Research on the functional outcomes of cardiac arrest by the Department of Epidemiology and Preventive Medicine at Monash University in Australia suggests that 4% of adult survivors of out-of-hospital cardiac arrest moved into care homes¹⁵.

Modelling in this area is highly experimental, and findings are likely to provide only an indicative reflection of impact. In the case of residential care, research addresses a fundamentally younger cohort than that served by EMR. Failure to include the benefit associated with post-OHCA residential care would hinder the accuracy of the model more greatly than an account based on suboptimal evidence, and New Economy has adhered to HM Treasury conventions for optimism bias. As a source which addresses a population under the age of 40, it is assumed that evidence from this research is conservative with respect to savings for the EMR population, whose average age is 65. As elsewhere in the model, a confidence grade has been applied to reflect the nature of the evidence base. The smaller saving estimated for reduced residential care admissions is based on research on young adults from Australia – a very broad (and conservative) proxy for outcomes for the cohort served by EMR.

Figure 5 – Estimated outcomes for social care commissioners

Social Care Commissioners	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Benefits	£3.7m	£7.2m	£7.9m	£7.6m	£7.4m	£7.1m	£6.9m	£6.6m	£6.4m	£6.2m	£67.0m

¹² PSSRU, ‘Length of stay in care homes’, January 2011

¹³ *Op. cit.* J Petrie et al, January 2015

¹⁴ PSSRU, ‘Unit Costs of Health and Social Care 2016’, 2016

¹⁵ Conor Deasy et al, ‘Functional outcomes and quality of life of young adults who survive out-of-hospital cardiac arrest’, July 2012.

Department of Work and Pensions (DWP)

An estimation has been made of the benefit to DWP where survivors who receive 'new' and 'good' neurological outcomes are also of working age and likely to re-enter the workplace. A third of cardiac arrest sufferers supported by EMR during the NJC trial were under 65, and some were under 40. A saving is modelled where a proportion of individuals will not draw on benefits, such as Employment and Support Allowance (ESA) or the disability-related elements of universal credit, as a result of avoided neurological deficit. The gross fiscal saving to DWP of EMR is estimated to be approximately £1.1m p.a.

Research aim, methodology and scope

The overall **aim** of this research has been to support the NJC to understand the financial and economic impact of EMR on a UK-wide footprint. It describes the sum total of investment (past, present and prospective future) to establish a model of co-responding EMR nationally, and projects the likely outcomes of that investment for public sector partners. The time horizon used for this model is ten years.

As per established New Economy methodology, research included the following inputs:

A clear logic model – New Economy has rooted its modelling in an exploration of the effect of EMR on the 'chain of survival' of a patient - from the point of first response, through hospital admission and discharge, and where longer-term life-altering effects may occur.

The best available data – New Economy was given access to all relevant data from the NJC trials. In broad terms, this ensured that the same source material investigated by the authors of the *Broadening Responsibilities* report was re-considered and in some instances re-analysed for the new purposes required by CBA.

Insights from experts – Data from the EMR trials were combined with a range of valuable supplementary insights from survey of EMR implementation leads. Insight was provided by 42 senior FRS officers from across the UK. Among other things, this allowed New Economy to precisely account for the cost of delivering EMR. Expert advice was also sought from recognised subject matter experts involved in the *Broadening Responsibilities* report, from the Personal Social Services Research Unit (PSSRU), and from the research project steering group.

Evidence from academia – Like *Broadening Responsibilities*, this research necessarily draws conclusions based on evidence-based assumptions. It has not, therefore, monitored actual outcomes of the EMR trial. The CBA draws on the most recent and relevant academic literature to make projections about how patients suffering an out-of-hospital cardiac arrest are likely to access and depend on services in the future. In

most cases where FRS co-respond, they undertake work which is important but broadly supportive of ambulance services. In a crucial minority, they make a life-altering impact on cardiac arrest sufferers. The modelling considers both scenarios.

The model provides a number of different numerical outputs, all of which are documented and explained in the full technical report accompanying this Executive Summary. In headline terms, the model gives a set of estimates for the costs and benefits (fiscal savings, but also wider economic and social value) *were a co-responding model of EMR to be adopted at scale* across the United Kingdom. The model is also directly interested in articulating which public agency or agencies pay for the intervention vs which are most likely to accrue the benefits.

What this report does not do

It is often helpful to be explicit about what a piece of research has *not* involved, i.e. to be clear on inputs that were not available for this work, and what was agreed with the report commissioners as “out-of-scope”. Four main points should be made in this regard:

1. **The report hypothesises patient outcomes, in the absence of a longitudinal study of actual case records.** This report is not informed by case matching between FRS records and partners from either NHS ambulance trusts, NHS acute trusts, or Local Authorities. There are a number of barriers preventing record-level data matching, including: (i) difficulty in obtaining consent to share identifiable information; (ii) an absence of information governance arrangements between partner organisations sufficient for the purposes of research; and (iii) the sheer volume of organisations potentially participating in such an exercise.
2. **The report makes a best – but ultimately estimated – judgement on how much co-responding would take place in a UK-scaled model of EMR, and takes a generalised view of implementation.** The NJC has requested this research in support of a case for implementation on a UK-wide basis. This research assumes that the experience of most services participating in the NJC trial has been somewhat representative with regards co-responding and service design, whilst recognising that data has not always been representative of the type of scale proposed, and few FRS have operated at the fullest capacity. It therefore describes the potential costs and benefits of EMR based on an upscaling of the implementation experience of services.
3. **The report’s findings describe the costs and benefits of EMR at the level of the UK, and cannot be disaggregated to the level of individual services.** Given the nature of the exercise, all research outputs relate to this scaled UK-wide model based on the composite of all FRS, and findings do not reflect the specific experience of any one service.

- 4. The report's findings include the total costs and total benefits associated with EMR, without reference to the degree to which costs have already been borne by specific services.** Most FRS have previously delivered some form of EMR. The profile of gross costs associated with the programme includes a peak in expenditure in the first year of £11.8m, declining thereafter. Many FRS have already borne these initialisation costs as part of the trial, and should consider this in considering findings (i.e. a service who began co-responding in April 2015 would find itself, in April 2018, to be in Year 4 of the programme).

There is a need for additional research in this area. Locality-based commissioners seeking to understand the footprint of EMR within their own area may wish to pursue further data analysis. The existence of stable payment mechanisms between ambulance trusts, clinical commissioners and FRS in many areas suggests a strong existing sense of the shared benefits of EMR, but there remains a lack of evidence, particularly around the relationship between response interventions and patient outcomes.

Conclusion

This research indicates that EMR, at scale, generates a positive financial return on investment and achieves economic outcomes. Benefits are deemed likely for clinical commissioners, social care commissioners, and the Department of Work and Pensions. By delivering EMR, national FRS are able to enhance the offer of cardiac arrest response, with life-altering outcomes in a small but vital minority of cases.

Figure 6 – Costs and benefits per agency

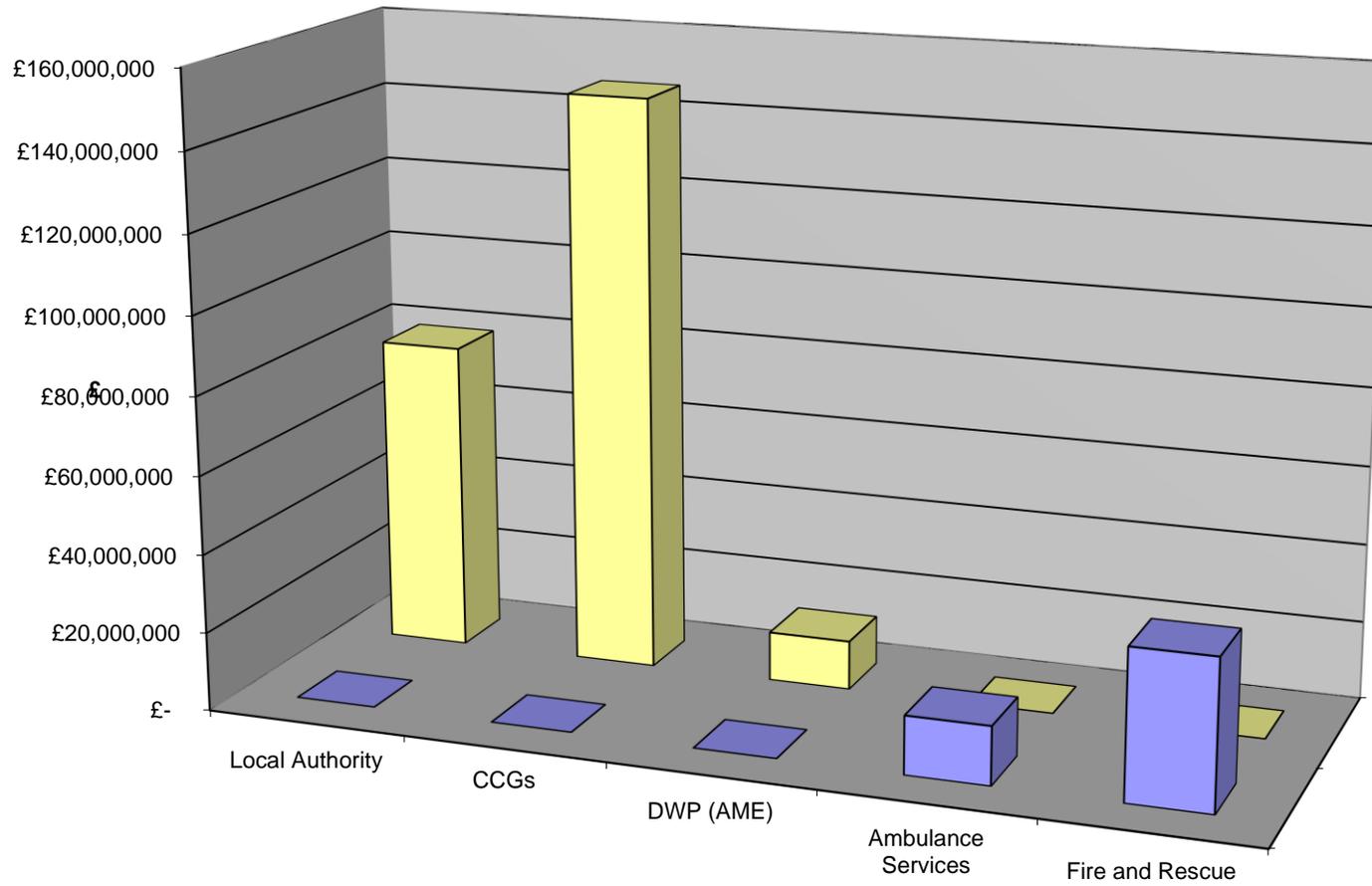
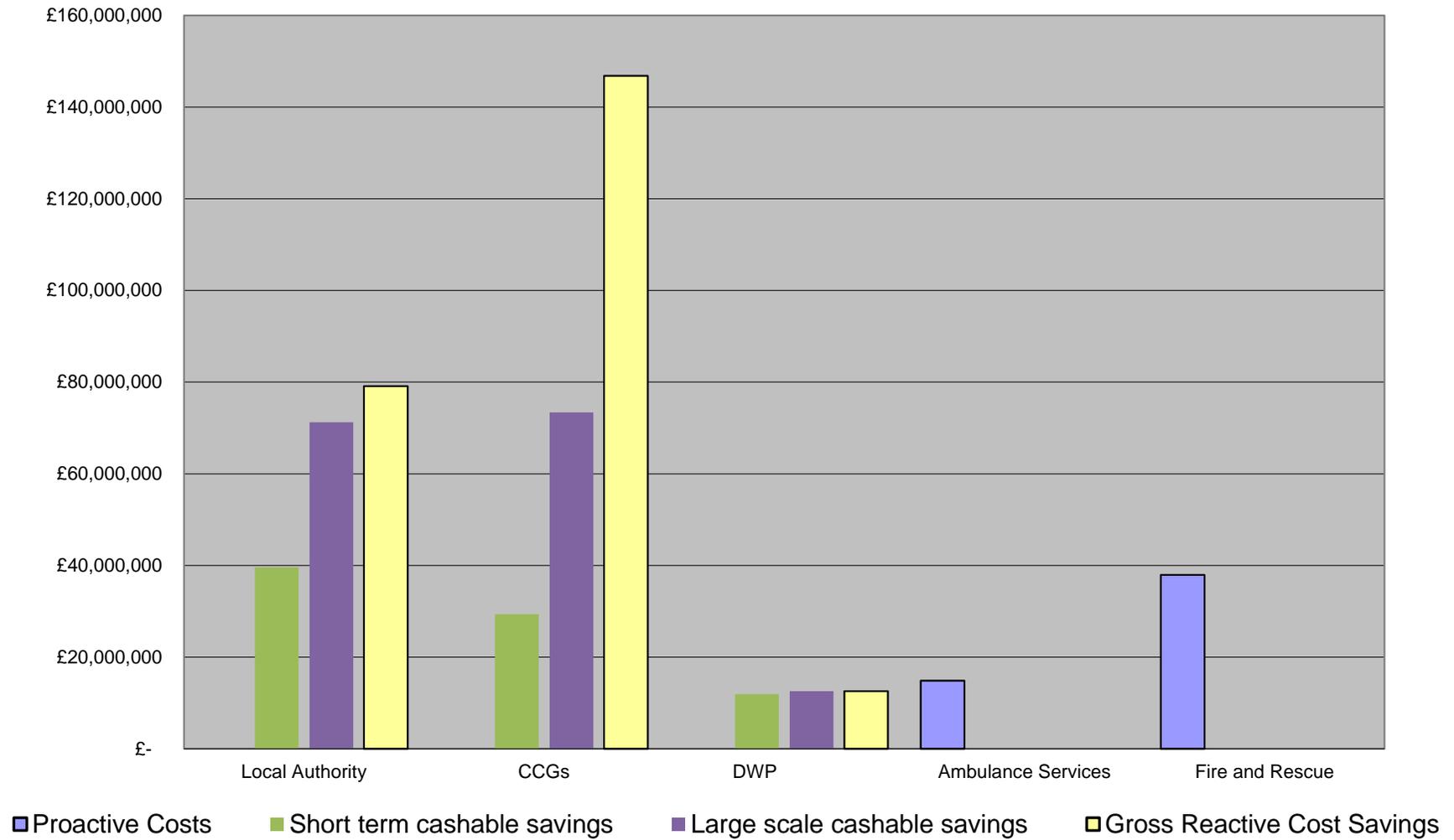


Figure 7 - EMR and cashability assumptions - chart





EMERGENCY MEDICAL RESPONSE BY FIRE AND RESCUE SERVICES

Financial and economic modelling of impact

Technical Report

A cost benefit model of emergency medical response by fire and rescue services on a UK-wide footprint, with a specific focus on the impact of cardiac arrest response on long-term health and social care outcomes.

Cost Benefit Analysis & New Economy

New Economy research helps agencies to identify the costs and benefits of new ways of working. We have developed and continue to refine a Cost Benefit Analysis (CBA) model that can be used to estimate the fiscal, economic, and social value of project outcomes, and specify which public agency sees this benefit.

Agencies are using our model to rethink whether activities previously funded and delivered by one agency can be better funded and delivered by partnerships. Topics upon which the model has been applied include support for troubled families, health and social care provision and redesign of the criminal justice system.

[New Economy's CBA model](#) has been developed with national experts from HM Treasury and other government departments, and its methodology has been adopted as supplementary guidance within [HM Treasury Green Book](#) recommendations on appraisal and evaluation.

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1. Introduction

This discussion paper is designed to outline the approach of New Economy to the cost benefit analysis of emergency medical response (EMR) by fire and rescue services (FRS)¹. It elaborates on key findings outlined in a separate summary paper, and explains the methodology underpinning those findings. In doing so, it highlights the strengths and weaknesses of the research and is intended to prompt discussion on the implications for partner agencies involved in service design, both at the level of central government and individual services. As such, it should be circulated and digested in tandem with the accompanying summary paper.

The National Joint Council of Local Authority Fire and Rescue Services (NJC) has approached New Economy to undertake a cost benefit analysis (CBA) of EMR. Since 2015, the NJC has supported a trial of EMR, involving 36 services from across the UK. A small number of FRS have delivered EMR or co-responding activity outside of (and predating) the NJC trial. While implementation leads in individual FRS have designed distinct services against a variety of strategic considerations, all but seven FRS have deployed co-responding EMR in one form or another.

This analysis attempts to capture the totality of investment required to support and sustain the UK-wide implementation of EMR and the totality of impact likely to accrue as a result, taking the programme as a whole². It hypothesises the costs and benefits of the adoption of emergency medical co-responding as part of a renewed role map for the operational staff of fire and rescue services³. This analysis also serves as an exercise complementary to *Broadening Responsibilities*⁴. That evaluation was undertaken by a range of partners, led by the University of Hertfordshire, and published in early 2017.

It is expected that both this document and its summary companion report can underpin a broader dialogue on the case for the adoption of EMR as part of the core business of fire fighters at the level of national policy. Analysis has therefore been undertaken with that purpose in mind – that is, the underlying methodology is geared towards supporting a more informed discussion around the financial impact of EMR on the public purse. That said, the research is not designed to measure outcomes or quantify impact with empirical precision; the evidence base required to undertake a high-fidelity analysis does not presently exist, as will be elaborated upon in this document. Rather, this research has been provided with a view to furnishing strategic leads with the best available understanding given the material to hand.

¹ New Economy are a research and strategy unit based in Greater Manchester and specialising in cost benefit analysis. It was founded in 2009 to promote economic growth and prosperity in Greater Manchester, working on behalf of the Greater Manchester Combined Authority (GMCA) and the Greater Manchester Local Enterprise Partnership. Since its inception, New Economy has continued to evolve and progress as an organisation, expanding the scope of work both in Greater Manchester and across the UK and internationally. In April 2017, New Economy's Greater Manchester functions formally merged into the GMCA.

² This means that the model includes the full range of costs and benefits – including those which have already been borne by services who co-respond at scale.

³ During the course of research, a number of important developments have occurred in relation to the ongoing discourse on fire fighters' roles and EMR. Findings from this research have, however, retained a focus on modelling a hypothesised version of activity at scale across the UK and the modelling therefore assumes that firefighters will continue to co-respond. The analysis does not make any upfront assumptions about potential future changes to staff pay or resource when itemising costs. Rather, it should serve to inform debate between representatives engaged in that discourse.

⁴ University of Hertfordshire, "Broadening Responsibilities", March 2017

1.1. What does ‘EMR’ mean in the context of this document?

The identification of both costs and benefits associated with EMR is complicated by variation of experience. While most FRS have adopted reform as a strategic priority, the format of reform is very different in neighbouring geographies. Even for FRS engaged in EMR, the nature of activity can vary. This research focuses on one of the most common and potentially significant types of EMR – co-responding.

Co-responding is the immediate dispatch of a fire and rescue appliance in parallel with ambulance services in the event of urgent medical emergencies. By design and due to complementary strategic fit, many FRS and partner ambulance services have elected to focus on out-of-hospital cardiac arrests. Out-of-hospital cardiac arrests are life-threatening, time-critical events in which members of the public suffer from the sudden and unexpected disruption of a regular heart rhythm.

The most common (but not only) cause of a cardiac arrest is ventricular fibrillation; the electrical activity of the heart becoming chaotic to the point that the heart stops pumping blood (and therefore oxygen) around the body. Cardiac arrest can therefore lead to the deoxygenation of the brain, and result in either life-altering neurological damage or death. There are a number of potential precursors to ventricular fibrillation, including medical causes such as pre-existing heart-related disease, and environmental triggers such as electrocution, choking or the use of recreational drugs in dangerous quantities.

Where the phrase ‘emergency medical responding’ or ‘EMR’ is used in this document, it refers to the co-responding of FRS in parallel to ambulance services. It also, therefore, refers to response in the case of out-of-hospital cardiac arrest. Because of the heightened risk carried by such events, it is in these cases that savings to the wider public purse (and in particular the health and social care sector) are most likely to be accrued. It should be noted that many FRS operate a wider suite of responses as part of their EMR offer. A small number did not operate a co-responding offer at all. Findings produced as the result of this analysis, which estimates impact on a UK-wide footprint, take full account of the extent to which cardiac arrest response would not be implemented as the result of local strategic decisions.

1.2. Broadening Responsibilities

In early 2017, the University of Hertfordshire and its partners published *Broadening Responsibilities*, a more exhaustive research exercise exploring the NJC’s EMR trial. Among a number of interrelated research topics, *Broadening Responsibilities* included a calculation of the economic impact of EMR, giving a broad economic return on investment among its findings. This was broadly founded on the increased survival and life expectancy of cardiac arrest sufferers, expressing benefit in the form of societal value. While those findings are broadly similar (and certainly relevant) to the economic case for implementation, the methodology utilised by New Economy is fundamentally different in its focus on service utilisation and savings to actual public expenditure. These savings may be cashable in some instances. Even when not, they reflect a tangible resource shift and create opportunities to reconfigure services and further improve outcomes for the public.

This research has been undertaken in light of findings from *Broadening Responsibilities*. Moreover, it has been possible to reflect on those findings with reference to the underlying source evidence from the national EMR trial in many instances. This means that, on occasion, data has been reprocessed to generate bespoke inputs needed within a financial appraisal of EMR (were it to be adopted at scale) across the UK. For this reason, some of the findings in this document may not appear to replicate those in *Broadening Responsibilities* with precision. This should not be seen as a problem, and it should be borne in mind that – differences aside - both exercises share consensus with respect to the benefits of EMR.

1.3. Research aim, methodology and scope

The overall aim of the research was to support the NJC to understand the financial and economic impact of EMR on a UK-wide footprint. It describes the sum total of investment (past, present and prospective future) to establish a model of co-responding EMR nationally, and projects the likely outcomes of that investment for public sector partners. The time horizon used for this model is ten years.

As per established New Economy methodology, research included the following inputs:

A clear logic model – New Economy has rooted its modelling in an exploration of the effect of EMR on the ‘chain of survival’ of a patient - from the point of first response, through hospital admission and discharge, and where longer-term life-altering effects may occur.

The best available data – New Economy was given access to all relevant data from the NJC trials. In broad terms, this ensured that the same source material investigated by the authors of the *Broadening Responsibilities* report was re-considered and in some instances re-analysed for the new purposes required by CBA.

Insights from experts – Data from the EMR trials were combined with a range of valuable supplementary insights from a survey of EMR implementation leads. Insight was provided by 42 senior FRS officers from across the UK. Among other things, this allowed New Economy to precisely account for the cost of delivering EMR. Expert advice was also sought from recognised subject matter experts involved in the *Broadening Responsibilities* report, from the Personal Social Services Research Unit (PSSRU), and from the research project steering group.

Evidence from academia – Like *Broadening Responsibilities*, this research necessarily draws conclusions based on evidence-based assumptions. It has not, therefore, monitored actual outcomes of the EMR trial. The CBA draws on the most recent and relevant academic literature to make projections about how patients suffering an out-of-hospital cardiac arrest are likely to access and depend on services in the future. In most cases where FRS co-respond, they undertake work which is important but broadly supportive of ambulance services. In a crucial minority, they make a life-altering impact on cardiac arrest sufferers. The modelling considers both scenarios.

In headline terms, the model gives a set of estimates for the costs and benefits (fiscal savings, but also wider economic and social value) were a co-responding model of EMR to be adopted at scale across the United Kingdom. The model is also directly interested in articulating which public agency or agencies pay for the intervention vs which are most likely to accrue the benefits.

1.4. What this report does not do

It is often helpful to be explicit about what a piece of research has not involved, i.e. to be clear on inputs that were not available for this work, and what was agreed with the report commissioners as “out-of-scope”. Three main points should be made in this regard:

1. **The report hypothesises patient outcomes, in the absence of a longitudinal study of actual case records.** This report is not informed by case matching between FRS records and partners from either NHS ambulance trusts, NHS acute trusts, or local authorities. There are a number of barriers preventing record-level data matching, including: (i) difficulty in obtaining consent to share identifiable information; (ii) an absence of information governance arrangements between partner organisations sufficient for the purposes of research; and (iii) the sheer volume of organisations potentially participating in such an exercise.
2. **The report makes a best – but ultimately estimated – judgement on how much co-responding would take place in a UK-scaled model of EMR, and takes a generalised view of implementation.** The NJC has requested this research in support of a case for implementation on a UK-wide basis. This research assumes that the experience of most services participating in the NJC trial has been somewhat representative with regards co-responding and service design, whilst recognising that data has not always been representative of implementation as proposed by the NJC, and a few FRS have operated at the fullest capacity. It therefore describes the potential costs and benefits of EMR based on an upscaling of the implementation experience of services.
3. **The report’s findings describe the costs and benefits of EMR at the level of the UK, and cannot be disaggregated to the level of individual services.** Given the nature of the exercise, all research outputs relate to this scaled UK-wide model based on the composite of all FRS, and findings do not reflect the specific experience of any one service.
4. **The report’s findings include the total costs and total benefits associated with EMR, without reference to the degree to which costs have already been borne by specific services.** Most FRS have previously delivered some form of EMR. Many FRS have already borne these initialisation costs as part of the trial, and should consider this in considering findings (i.e. a service who began co-responding in April 2015 would find itself, in April 2018, to be in Year 4 of the programme).

1.5. Structure of this document

The remainder of this document is divided into five short sections. Sections 2 and 3 describe methodology and findings. Section 4 outlines the logic model used in analysis. Sections 5 and 6 provide a more specific elaboration of cost and benefit modelling respectively.

Section 2: Summary of Key Findings – outlining the key findings of research. Research has been designed principally to support the development of a case in line with HM Treasury’s green book guidance. Therefore findings are divided into two categories: (i) those supporting the financial case; and (ii) those supporting the economic case.

Section 3: Methodology – describing the procedures followed in obtaining analytical findings, and defining specific inputs gathered in the course of research. This section first describes the outputs sought; then briefly outlines the analytical method used by New Economy; and then discusses the mechanisms by which quality assurance has been undertaken.

Section 4: Logic Model – explaining the combination of evidence used to establish a theory of change. This logic model makes reference to the analytical steps required to define the cohort served by EMR, determine the proportion and kind likely to experience benefit as a result of intervention in the cardiac arrest ‘chain of survival’, and calculate the impact on health and social care partners.

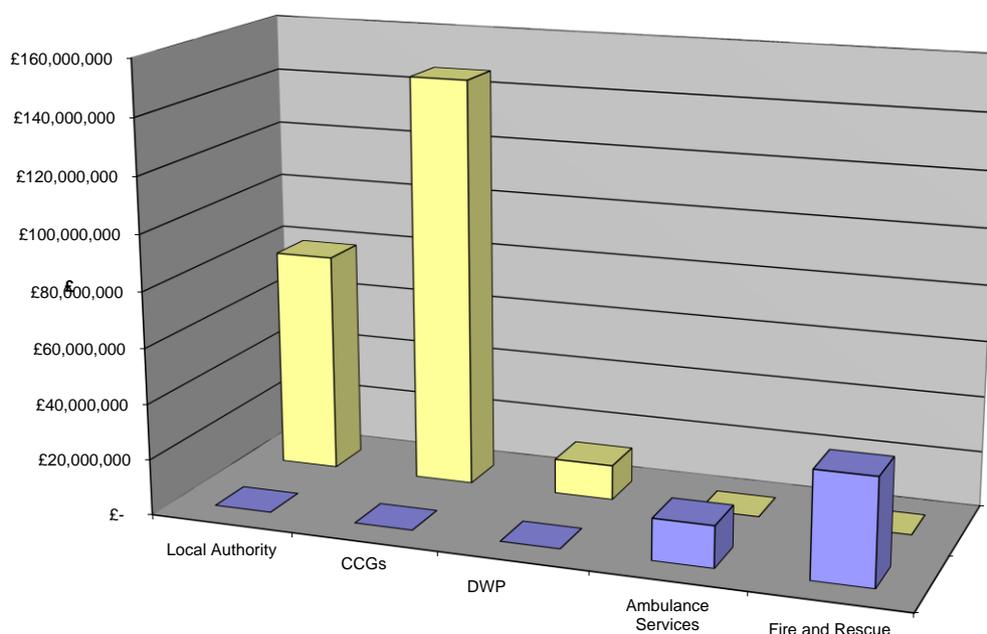
Section 5: Costs of Implementation – itemising the additional costs incurred in the course of implementing EMR. This includes both direct and indirect expenditure, and attempts to model the totality of cost incurred to the wider public purse (i.e. including the cost incurred to partners outside of fire and rescue services).

Section 6: Benefits of Implementation – estimating the value of projected savings suggested to accrue to a range of partner agencies over ten years of implementation. This section itemises savings thematically, based on scale and attribution. It makes reference to benefits both financial and economic, and also alludes to those benefits likely to accrue which carry value in terms of wider societal effects.

2. Summary of Key Findings

This short section outlines the summary of findings relating to the financial and economic case for EMR.

Figure 1 – Findings on costs and savings



2.1. Financial case

The main purpose of the financial case is to demonstrate that a spending proposal will result in a fundable and affordable arrangement. HM Treasury suggest that public financial cases require agencies to set out the capital and revenue requirement for a proposal over its expected life span, together with an assessment of how the intervention will impact upon the balance sheet, income and expenditure account and pricing (if applicable) of public sector organisations. Further, any requirement for additional or external funding must be included⁵. The overall return on investment as a result of EMR is 4.41. This means that for every £1 invested in EMR, a total of £4.41 in gross fiscal savings is generated, attributable to the wider public purse.

The costs built into this model are captured in section 5 of this report, including proactive spend by FRS, the proportion of costs covered by ambulance services, and the value of additional demand placed on social care partners as a result of the intervention. The benefits built into the model are captured in section 6 of this report, including: benefits attributable to clinical commissioners as a result of lesser utilisation of intensive care services; those attributable to social care commissioners as a result of reduced long-term neurological deficits; and those attributable to the Department of Work and Pensions

⁵ HM Treasury, *Using the Five Case Model – Green Book supplementary guidance on delivering public value from spending proposals*, (retrieved from <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>)

(DWP) as a result of a reduced draw on Employment and Support Allowance (ESA). EMR is expected to enter into a positive cost benefit ratio (its 'payback period') within the first year of the model. This model describes the costs and benefits of a national projection of EMR, taking into account approaches to service delivery undertaken to date and estimating the most likely activity given UK-wide implementation.

Figure 3 – Fiscal costs and benefits associated with EMR

Fiscal Benefit	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Costs	£10.9m	£4.8m	£4.4m	£4.1m	£4.0m	£3.9m	£3.7m	£3.6m	£3.5m	£3.3m	£46.1m
Benefits	£19.6m	£22.6m	£22.8m	£22.0m	£21.2m	£20.4m	£19.7m	£19.0m	£18.4m	£17.7m	£203.4m

Net Present Budget Impact*	- £157.3m	<i>*the degree of additional fiscal benefit created, having accounted for costs.</i>
Overall Financial ROI**	4.41	<i>**the gain generated by an intervention, relative to the costs invested.</i>
Payback period***	1 Year	<i>***the estimated length of time required for an investment to become profitable.</i>

2.2. Economic case

The main purpose of the economic case is to define that a spending proposal optimises public value to the UK as a whole. HM Treasury's Green Book suggests that an economic case identifies and appraises outcomes in terms of how well they meet the spending objectives and critical success factors of a programme. The public value return on investment as a result of EMR is 25.18. This means that for every £1 invested in EMR, the broad equivalent of £25.18 of value is generated, as determined through the methodical monetisation of economic and social worth. A key economic outcome relates to lives saved as a result of the intervention⁶. The benefits within the economic case mainly include the economic and social value of lives that would have been lost as a result of cardiac arrest, but are saved by a co-responding response. The specific methodology used in capturing this value is outlined in subsection 6.4.

The costs within the economic case include all costs within the financial case. The trials primarily have involved the deployment of personnel who work the retained duty system. However, it is envisaged that adoption of co-responding will also take place within a number of fire rescue services where deployment of wholetime staff will be greater. Whilst the deployment of retained staff results in readily identifiable costs (e.g. turnout fees and hourly payment) the deployment of wholetime staff does have a cash value. Accordingly, the calculations show the additional value of wholetime firefighter staff resource modelled to be expended by FRS in co-responding. This equates to approximately £1.9 million per annum of additional resource and is described in subsection 5.7.

Figure 4 – Public value outcomes of EMR

Public Value	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Costs	£12.8m	£6.7m	£6.2m	£5.9m	£5.7m	£5.5m	£5.3m	£5.1m	£4.9m	£4.8m	£62.8m
Benefits	£232.8m	£213.6m	£195.1m	£177.4m	£160.6m	£144.9m	£120.3m	£125.5m	£112.0m	£99.3m	£1,581.4m

Net Present Public Value*	£1,518.6m	<i>*the degree of additional public value created, having accounted for costs.</i>
Public Value Return on Investment**	25.18	<i>**the gain generated by an intervention, relative to the costs invested.</i>

⁶ *ibid.*

3. Methodology

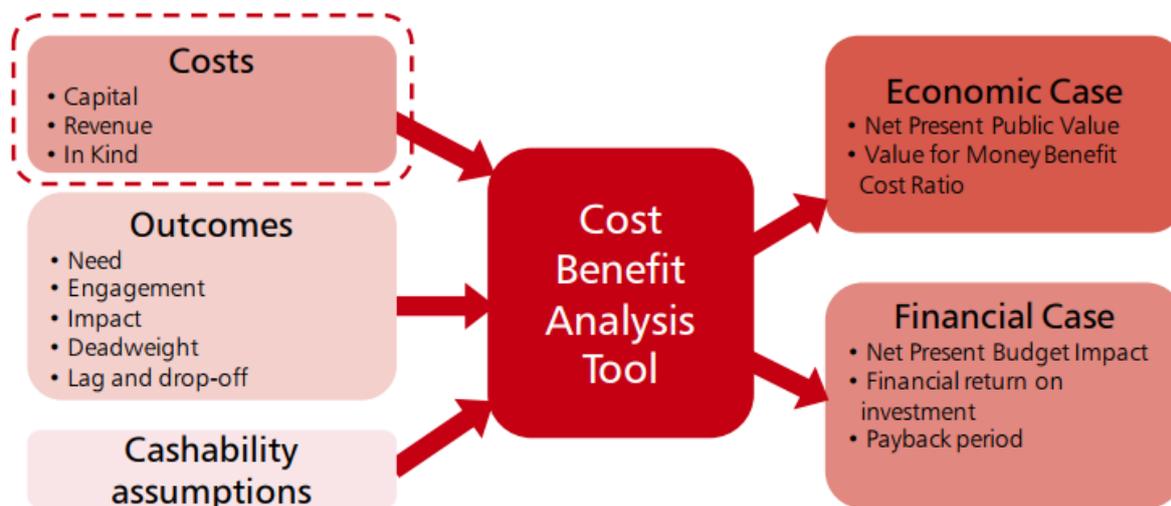
This section outlines the methodological underpinnings of the evaluation undertaken by New Economy. It outlines the general approach to CBA, the specific considerations of this project, and the quality assurance mechanisms put in place to ensure the most robust understanding has been achieved. For more information, including guidance documents on CBA, template versions of our CBA toolkit, and a discussion paper about our initial approach to ‘cashability’, please refer to the New Economy website⁷.

3.1. Cost benefit analysis

New Economy’s standard approach to CBA has been used as the framework for investigating both the financial and economic case for EMR. This has ensured that potential fiscal savings to the public purse have been examined, in combination with a broader appraisal of ‘public value’ benefits (which can include QALY benefits explored in *Broadening Responsibilities*). New Economy’s approach is aligned with HM Treasury’s Green Book guidance on the five case model for business case development of new policy, strategy, programmes or projects.

The outputs from New Economy’s CBA model are designed to support production of the financial case and economic case. Please see Figure 5 for a diagram of the methodological inputs and outputs of New Economy’s CBA model.

Figure 5 – CBA Model



⁷ New Economy, CBA Guidance and Model, 2015, (<http://www.neweconomymanchester.com/our-work/research-evaluation-cost-benefit-analysis/cost-benefit-analysis/cost-benefit-analysis-guidance-and-model>, retrieved 10/07/2017)

Outputs

The products of CBA support policy leads deciding whether to commission or decommission services. The emphasis placed on each output is likely to depend on the purpose of the analysis. Members of the NJC are invited to reflect on the specific outputs which are most relevant to their strategic needs. Broadly speaking, outputs of CBA include three elements which support the financial case for an intervention, and two elements which include the economic case for an intervention.

Elements which support the financial case include:

- **Net Present Budget Impact** –the net impact on the wider public purse created by the intervention. Net present budget impact is expressed in terms of a financial figure in pounds sterling. For a ‘successful’ intervention this figure will be negative i.e. it will represent a net reduction in public spending as a result of the intervention⁸.
- **Overall Financial Return on Investment (ROI)** – the ratio of net present budget impact versus the cost of the new delivery model. This is expressed as the denominator produced by the ratio of cost to benefit. ‘Successful’ interventions produce a ROI of greater than 1.0 i.e. they create more benefit than was spent.
- **Payback period** – the “payback period” is defined as the year in which the cumulative present value of the budgetary savings is greater than the cumulative present value of the budgetary costs, i.e. the length of time it will take for a project to achieve a positive ROI. CBA models are generally produced with five- or ten- year time horizons. It is recognised that lead-in time, staggered implementation and other start-up considerations can create a gradual ramp-up in the realisation of benefits.

Elements which support the economic case include:

- **Net Present Public Value** – the net impact on the wider economy created by the intervention. While net present public value is expressed in terms of a financial figure, this figure does not refer to recoverable money, nor is it relief which will be experienced by any one definable agency. It might include, for example, increased public value created by putting an individual into work (but *not* including direct financial benefit to HMRC etc.⁹)
- **Value for Money Benefit Cost Ratio** – the ratio of costs to benefits with respect to the wider public purse for a given intervention (i.e. public value, not financial benefit).

Inputs

Broadly, the inputs into a CBA can be arranged into three categories:

- **Costs** – Including a live model of all costs incurred by the intervention. This includes capital and revenue spend, as well as in kind support provided by other organisations. It also includes an

⁸ In order to provide a consistent measure of costs and benefits now and into the future, future costs and benefits are discounted to produce “Present Values” (PV). For the financial case, the NPV metric is the **net present budget impact**, which solely considers the fiscal costs of delivering the project and the resultant fiscal benefits.

⁹ Discounting is again applied, as per footnote 6. For the economic case, the NPV metric is the **net present public value**, which is the difference between the overall benefits to society (fiscal, economic and societal) and the overall costs to society.

account of additional costs incurred within the wider system of public services as the result of an intervention (e.g. new demand where additional referrals arise).

- **Outcomes** – describing the outcomes of activity undertaken, and their impact on a cohort. This includes an account of the scale of a target population; the extent to which a cohort is engaged and retained; the degree of impact made for the retained cohort; and an understanding of the extent to which positive change would have occurred anyway under ‘business as usual’. There is also an account of the ‘lag and drop off’ of an intervention where it is unlikely to maintain 100% capacity at all times.
- **‘Cashability’ Assumptions** – attempting to recognise the degree to which benefits simulated as part of the model are likely to be realised by partner agencies. The landscape of ‘cashability’ varies tremendously between given interventions and given partners. Issues involved in cashing a benefit include the strategic financial approaches of individual organisations; commissioning, procurement and workforce procedures, and the latent demand which may outstrip the potential to realise any saving. Because of variation in disposition towards ‘cashability’ in the national landscape, New Economy’s standard assumptions about the average experience of ‘cashability’ among beneficiary services have been applied. Further, two versions of ‘cashability’ have been offered – short-term (where a small proportion of benefits are likely to accrue simply because of the existence of the service) and large-scale (where a larger proportion of benefits are likely to accrue as a result of a commissioning dialogue). For more on ‘cashability’, please refer to the relevant discussion paper published on New Economy’s website¹⁰.

3.2. NJC Trial Data

During the course of the NJC trial, a dataset of some 34,000 records has been gathered by 25 services across the UK. This data describes attendances made by FRS under EMR conditions (using the wider definition of EMR, rather than just co-responding).

The data includes fields on:

- (i) Response activity – including the time and data of call, geographic information, the presenting nature of incidents, etc.
- (ii) On-scene activity – including on-scene activity, equipment used, the extent and severity of harm for the individual attended, etc.
- (iii) Outcomes – including some information on deaths, handover to or stand-down by ambulance services, and other additional information, etc.

The NJC Trial data was used by the University of Hertfordshire and partners in *Broadening Responsibilities*, but has been reprocessed by New Economy in order to produce metrics and data points which marry more effectively with CBA.

3.3. Survey of FRS Implementation Leads

A bespoke survey of FRS was conducted to supplement NJC Trial data and other public datasets with a set of questions specific to cost benefit analysis.

¹⁰ New Economy, Cashability Discussion Paper, 2015 (retrieved from <http://www.neweconomymanchester.com/media/1445/3314-150327-cashability-discussion-paper.pdf>)

The survey was divided into three sections:

- (i) Implementation costs – asking FRS to provide information about the additional equipment, training, inoculations and counselling required to support the delivery of EMR. Answers from this section have been the main input used to model the costs of implementation;
- (ii) Call types and on-scene response – asking FRS to relate their operational experience of co-responding, discussing the scale at which they had delivered EMR previously, and how they envisaged future roll-out, were co-responding adopted to be at scale. Answers from this section have been used as a control for understanding the projection of CBA findings across the UK;
- (iii) Benefits realisation – asking FRS to describe their local commissioning landscape, including the extent to which co-responding activity has been financially supported by ambulance services. Answers from this section have been used to consider the attribution of costs.

The survey was designed to ensure that the national model developed includes representation from all services, and that variation in experience is captured. 42 services from across the UK responded to the survey, spending an average of 63 minutes each to do so. Most surveys were completed by Chief Fire Officers or their nominees – usually at the level of Group/Area/District Manager. Seven services confirmed that they do not operate a co-responding model, and therefore did not complete the survey. This has been reflected in all CBA calculations. Please see attached paper Annex A for a transcript of the survey questions.

3.4. EMR-specific considerations

A number of considerations had to be taken to ensure that the best possible CBA of EMR was undertaken, and to satisfy the needs of the strategic leads from the NJC.

Four key considerations particular to an analysis of EMR include:

- **The availability of data.** CBA modelling on EMR is limited by the inaccessibility of several datasets required to be able to statistically prove impact. Ideally, work would seek to marry record-level data from a given FRS with record-level data from neighbouring ambulance service(s), patient records from relevant hospital sites, and social care records from the local authority of residence for service users in question. This has not been possible logistically or legally. With regards logistics, the exercise of mapping the flow of data on cardiac arrest sufferers' experiences would alone be extensive and complex, requiring a UK-wide understanding of the footprint of FRS, Local Authorities and NHS hospitals. Even given such an understanding, there is no standing information governance gateway to facilitate the kind of data transaction required to support a more robust exercise in record matching. In lieu of this, New Economy has adopted an approach which marries record-level data made available in the course of the NJC EMR trial with leading academic literature, most of which is statistically significant, to build a CBA which projects a model of EMR at scale.
- **The scope of modelling.** Beyond the questions of logistics and information governance, there also needs to be a consideration of what 'real world' implementation at scale may look like. Most FRS have delivered some form of EMR, particularly during the course of the national NJC trial. In order to capture the most accurate benefit of implementation, this model does not describe the value of current activity, but rather projects the impact, based on present experience, were EMR to be adopted as part of the fire fighter role map. It has been assumed that services who have

explicitly adopted an approach to EMR which does not include co-responding will not start co-responding during the course of the CBA model, and both costs and benefits reflect this.

- **Representativeness of trial data.** Data from the NJC trial shows fluctuations in levels of activity even where services are engaged in co-responding EMR. In order to support an accurate interpretation of this data, services have been asked to clarify the extent to which their experience of EMR during the period in question is representative of what full-scale, business-as-usual implementation would look like. Some suggested that fluctuations in demand were representative. But other FRS suggested that only a portion of the workforce had engaged in co-responding activity to date, whereas fuller adoption (and therefore the CBA simulation) would see rollout to 100% of the operational workforce.
- **Staff resource and opportunity cost.** EMR involves the deployment of an existing fire fighter workforce into a new context. It is a truism that successful prevention work in the last ten years has led to reduced demand volumes, and that FRS have been able to re-direct resources which would previously have been absorbed into a range of new endeavours, including safe and well checks, liaison with police forces on 'concern for welfare', and other health and social care-related activities. Only an element of staff resource applied to EMR represents proactive spend on the part of FRS. Only spend on retained firefighters is a fundamental part of the cost benefit model (fiscally speaking). While there is an inherent value to wholetime staff resource, the opportunity cost of undertaking EMR as opposed to other activity must be (separately) recognised as an economic cost.

3.5. Quality assurance

A number of steps have been taken to provide quality assurance of the model developed by New Economy. A chief elements of external quality assurance was an analytical review of social care modelling with experts from the Personal Social Services Research Unit (PSSRU)¹¹. This entailed a one-to-one methodological review, with recommendations on how best to approach the capture of benefits related to social care provision in the case of neurological deficits. A key example of an amendment made as the result of this process was the refinement of unit costs on domiciliary care from the perspective of social care commissioners.

¹¹ PSSRU are an internationally-leading social care research group, with branches in the University of Kent, London School of Economics, and Manchester University. All three branches have been assessed as 'outstanding by international criteria' by the Higher Education Funding Council. Their mission is to conduct high quality research on social and health care to inform and influence policy, practice and theory.

4. Logic Model

The logic model for comparing cost and benefit of EMR assumes that incremental improvements in the early stages of the cardiac arrest 'chain of survival' will lead to incremental improvements in later stages of the chain and, ultimately, in patient outcomes. The four links in the chain are:

- early recognition and call for help – to prevent cardiac arrest (where possible);
- early cardiopulmonary resuscitation (CPR) – to 'buy time';
- early defibrillation – to restart the heart; and
- post-resuscitation care – to restore quality of life¹².

Figure 6 – Cardiac Arrest 'Chain of Survival'



(Source – Resuscitation Council (UK)¹³)

Sufficient data exists within nationally available datasets such as Ambulance Quality Indicators (AQI) to be able to model the most likely incremental improvements in early recognition, CPR and defibrillation. This is then compared against recent, relevant learning from UK-based studies on out-of-hospital cardiac arrest in order to model how changes upstream of the chain are likely to affect outcomes at the point that a patient enters hospital, at the point that they are discharged, and on overall survival.

Where there are assumptions about the data and how it should be interpreted or applied, the most conservative choice has been made with respect to cost benefit analysis, and the decision-making process has (hopefully) been made transparent in this regard.

¹² Resuscitation Council, *Resuscitation to Recovery*, March 2017

¹³ *Ibid.*

4.1. Early recognition and call for help

One of the first key numbers needed within the CBA is a good estimate of how many cardiac arrest attendances would be made by FRS across a UK footprint in a scaled implementation.

Defining the Cohort

The experience of FRS who contributed to the NJC trial dataset varied considerably – a problem identified by partners from the University of Hertfordshire in *Broadening Responsibilities*. During the period in which data on co-responding was supplied (and accounting for the fact that each service began and concluded data submission at different points), the average number of monthly attendances to EMR by FRS varied, with some services undertaking targeted testing of the model, while others effectively deployed EMR across the workforce. This suggests that engagement in the trial was not representative of what would actually be reflected in a fully scaled approach, and that the cohort served by EMR is not described in simple terms through an analysis of the trial data.

Tests were conducted to determine any correlations between the volume of trial incidents and either workforce size, population served, the epidemiological landscape of heart health¹⁴. These tests found no discernible link between these comparable operational factors and callout volumes. The presence of such a link would have granted a statistical basis for inclusion or rejection of trial data in developing a UK-wide estimate of the cohort served. Its lack suggests that other, service-level factors were likely to have motivated activity volumes during the trial, and promoted a cautious approach to the use of the data.

In the absence of a definitive method for applying trial data, data for any services shown to have co-responded to fewer than 100 EMR attendances per annum have been discounted from the CBA model's UK-wide projection.

National Scaling

Data from the trial in respect of the remaining services was used to derive a projected volume of activity across all co-responding FRS. Differences in resident population were used to model the likely variation in demand between them. The projection was then compared against the experience of trial sites, and adjustments were then made to arrive at a realistic figure¹⁵.

The estimate of total activity in a UK-scaled approach was further finessed by giving due regard to the extent to which the full workforce would be likely to engage with EMR. This was based on the testimony of implementation leads from the 42 FRS who participated in the survey. Most services who answered this question identified that their intention was to implement EMR across their entire operational

¹⁴ Several options were pursued as a potential comparator to represent epidemiological variation. An indicator linked to the rate of heart failure-related admissions was selected as having the best strategic fit, because published figures were made readily available by Public Health England, and other possible factors were ruled as either too specific or too broad with relation to EMR. Nonetheless, no correlation was identified between the experience of trial sites and epidemiological variation in heart health.

¹⁵ While the projection largely flattened the degree of variation between services, it also inflated the average number of attendances made by those services. A deflator was therefore applied to the overall volume of projected attendances to bring the number closer into line with the experience of included trial sites.

workforce. Some defined scaled rollout as a proportion of stations or appliances within their footprint. The overall average (89%) was applied across all services.

Finally, a calculation was made based on the trial data to suggest the proportion of attendances made which were cardiac in nature. While the principal focus of this CBA is on cardiac arrests, it must be remembered that they represent only a fraction of co-responding activity, and that only a fraction of co-responding attendances in response to chest pain or other presenting need turn out to involve cardiac arrest. An automated search programme found that 21% of attendances made during the course of the NJC trial made reference to cardiac arrest. This broadly corroborates a similar process undertaken as part of the research process for *Broadening Responsibilities*.

The end product of all this modelling was a key finding that, if implemented nationally, EMR would result in approximately 73,500 co-responding attendances per annum across the UK, of which approximately 15,500 would be made in response to cardiac arrests. To put this figure into context, in the 12 months to May 2017, UK ambulance services attended to approximately 31,000 cardiac arrest incidents.

4.2. Early CPR/defibrillation

The second exercise to define the cohort served by EMR involves an exercise to determine the proportion of cardiac arrest sufferers for whom change is likely to be experienced in terms of neurological deficit and survival. This exercise involves an assessment of the impact of improved response times (which will sometimes be the result of two emergency services attending to a time-critical medical event).

Response Times

The comparison of response times between FRS and ambulance services can only be undertaken at a high level¹⁶. For the purposes of this exercise, response times as based on the NJC trial data have been compared against ambulance quality indicators. A challenge exists in achieving geographic parity between these two datasets: NJC data includes inputs from 25 FRS – covering approximately half of the UK. AQI are published by NHS England at the level of the ten Ambulance Service Trusts active in the UK¹⁷. In order to support equivalence, data on response times was clustered such that Ambulance Trusts were compared with those FRS which a) were active within their footprint; and b) had supplied data to the NJC trial¹⁸. Based on this method, it is estimated that 61% of the UK population may live within a footprint where FRS are able to respond as quickly as or more quickly than emergency ambulance services. Based on a comparison with the Category A response times of regional Ambulance Trusts, it was estimated that, where FRS do respond more quickly, they do so by approximately one minute and forty-seven seconds on average based on an average comparison of FRS with relevant ambulance services¹⁹.

¹⁶ Further, service-specific engagement on response times requires strategic research engagement between agencies, in order to prove the efficacy of counting rules and to ensure sufficient randomisation control for record comparison.

¹⁷ NHS Digital, Ambulance Quality Indicators (retrieved from <https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/>)

¹⁸ Ambulance services from Scotland, Wales and Northern Ireland are not included in AQI. In these cases, additional datasets have been sought which describe similar statistics.

¹⁹ *Broadening Responsibilities* identified a difference of two minutes and twenty-three seconds between median FRS response times and median ambulance response times in such a situation. New Economy's CBA methodology has produced a similar finding, and has utilised the more conservative figure in analysis.

During the course of analysis, comparison was undertaken to determine whether any variation has been experienced as a result of FRS responding in metropolitan versus non-metropolitan areas, and whether any variation was visible as a result of the type of firefighter responding (i.e. whole-time versus retained staff). Implementation leads have identified strong expectations that such distinctions should be visible. However, based on data from the NJC trial and the methodology outlined here, there is no evidence that response times are consistently different as a result of these distinctions. This corroborates a finding made in *Broadening Responsibilities*, which similarly failed to find such variation, despite it having been expected.

The significance of response times in determining the benefits of EMR lies in their relationship with patient neurological outcomes and survival. A consensus paper developed by the British Heart Foundation, Resuscitation Council (UK) and NHS England suggests that for each extra minute of response time saved, chances of survival are improved by between 7.5% and 10%²⁰. Based on the finding that, where FRS respond first, they respond first by one minute and forty-seven seconds, this suggests that the impact on survival in these cases is, on average, approximately 15%.

4.3. Post-resuscitation care

The third exercise to define the cohort served by EMR requires an exploration of how incremental improvements made as a result of co-responding in the earlier sections in the chain of survival generate incremental improvements in later sections. The version of this exercise with greatest efficacy would involve record-level data matching between EMR data held by FRS and their neighbouring ambulance services and acute hospital trusts. Without this data match, determinations about ROSC, neurological impairment as the result of oxygen starvation, and ultimate survival can only be made on the strength of an academic evidence base.

Cerebral Performance Categories

A 2015 study conducted by the Centre for Perioperative Medicine and Critical Care Research, in conjunction with Imperial College NHS Healthcare Trust, analysed the relationship between response times, survival, and neurological outcomes²¹. This study used cerebral performance categories (CPC) to examine an 18-month cohort within a London-based hospital, and identified that 48% of individuals who achieve ROSC are likely to experience good or moderate cerebral performance outcomes. For a typology of cerebral performance, please see Figure 7.

Unfortunately, there is a lack of authoritative evidence about the scale of the link between response times and the achievement of ROSC. However, even using survival rates as a conservative proxy for the achievement of ROSC and the impact of EMR on cerebral performance, it is estimated that over six hundred individuals would achieve good or moderate neurological outcomes each year in the UK specifically as a result of EMR. These individuals would otherwise have experienced more severe impairment, been rendered into a vegetative state, or died.

²⁰ British Heart Foundation et al, 'Consensus paper on out-of-hospital cardiac arrest in England', October 2015. For the purposes of this exercise, the middle point of 8.5% has been taken from this calculation.

²¹ J Petrie et al, 'Hospital costs of out-of-hospital cardiac arrest patients treated in intensive care; a single centre evaluation using the national tariff-based system', *BMJ Open*, January 2015

Figure 7 – Cerebral Performance Category Scale

<i>Category</i>	<i>Clinical Findings</i>
<i>CPC1</i>	Good cerebral performance: conscious, alert, able to work, might have mild neurological or psychological deficit.
<i>CPC2</i>	Moderate cerebral disability: conscious, sufficient cerebral function for independent activities of daily life. Able to work in sheltered environment.
<i>CPC3</i>	Severe cerebral disability: conscious, dependent on others for daily support because of impaired brain function. Ranges from ambulatory state to severe dementia or paralysis.
<i>CPC4</i>	Coma or vegetative state: any degree of coma without the presence of all brain death criteria. Unawareness, even if appears awake (vegetative state) without interaction with environment; may have spontaneous eye opening and sleep/awake cycles. Cerebral unresponsiveness.
<i>CPC5</i>	Brain death: apnoea, areflexia, EEG silence, etc.

(Source – Petrie et al, 2015²²)

Savings to clinical commissioners, social care commissioners, and other partners, as well as the wider economic benefits of EMR, are determined based on an estimation of the improved outcomes resulting from this analysis.

²² *Ibid.*

5. Costs of Implementation

This section describes the costs associated with delivering an EMR service across a UK-wide footprint. These costs have been broken down into three areas of proactive spend (describing the additional revenue required to support EMR), two areas of indirect spend (where increases in demand are expected to occur as the result of implementing EMR), and one source of in-kind resource (where the application of a 'cost-able' resource is required in order to enable EMR). Direct and indirect spend are financial and economic costs, whereas in-kind resource has economic value only.

For each specific item of spend (i.e. for each item being purchased, not just every category of expenditure), a base unit cost has been derived which expresses the average likely value of the item. These unit costs are based on the testimony of FRS, either through the survey of implementation leads or targeted discussions with those within their ranks. They do not include a separate assessment of the market value of each item of equipment. In deriving unit costs in this way, it is hoped that any contextual conditions influencing prices (e.g. alteration to expenditure in order to reflect the purchase of equipment in bulk) have been captured. Unit costs have been captured as a national average; therefore area cost adjustments have not been included in simulating these costs. The experience of individual services is likely to vary based on differences between regional markets.

As with benefits, all costs have been calculated as part of a ten-year implementation simulation. In most cases, the experience of implementation involves an initial spike in set-up costs followed by tapering replenishment expense. Most costs are expressed as average annual cost over a ten year model. Most categories of spend described in this section include an estimation of the change of cost over ten years.

A grade has been applied to these costs to account for the degree of optimism which New Economy has in their accuracy. These optimism grades range from a 10% upgrade (accounting for the possibility of an under-estimation of cost by up to 10%) to a 40% upgrade.

Because benefits included in this CBA express the totality of savings accrued as a result of implementing EMR, included costs must also express the totality of expenditure. Therefore it is important to remember that this section does not describe the additional spend which would be required in order to achieve implementation at scale, given activity to date – rather it describes the total costs of initialising and maintaining EMR across the UK. Practically speaking, many of the costs describes in this section have already been borne by FRS. Inclusion in the financial appraisal is therefore to support the fullest understanding of the financial case for implementation.

5.1. Attribution of Costs

Most of the proactive costs associated with EMR are attributable to FRS, while the remainder are likely to be attributable to UK ambulance services. 41% of surveyed FRS stated that they had a financial agreement with a coterminous ambulance service to deliver EMR. Most suggested that they operated a flexible payment system, similar in principle to payment by results (PbR). Based on the details of the payments system defined by surveyed FRS, and the proportion of services who stated they did not have a commissioning arrangement with a local NHS body, the modelling assumes that 30% of the proactive costs of EMR²³ at the time of the survey was met by ambulance services, with the remainder defaulting to FRS. Based on the testimony of FRS implementation leads, it may be that prospective adoption of EMR as

²³ NB. Not including simulated reactive spend by Local Authorities. No FRS presented testimony of agreements or payment mechanisms with Local Authorities or other social care commissioners.

a national standard in FRS response requires recognition of a greater 'unit cost' for responding than has previously been used by most national services²⁴.

All reactive costs relating to increased social care utilisation are assumed to be attributable to the relevant public sector commissioners of social care within a given footprint. These costs have been associated with local authorities for the purpose of this exercise, and are modelled as a dis-benefit rather than a cost. They are included here for completeness, but are already included within gross social care benefits, ROI figures, and elsewhere within this document.

For a distribution of costs per sector over a ten year model, please see figures 8 and 9.

Figure 8 – Distribution of costs by sector (ten year model)

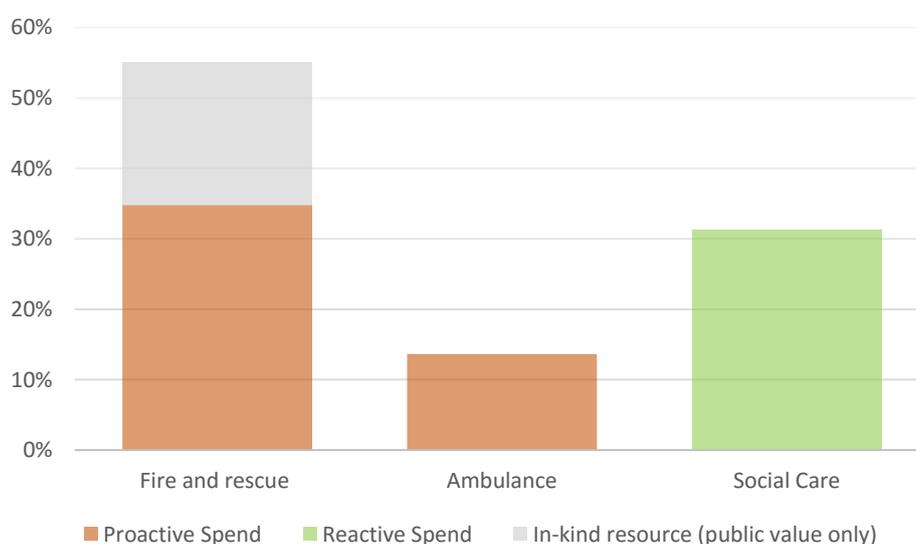


Figure 9 – Spend by agency annually (ten year model)

Costs	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Fire and rescue (fiscal)	£7.8m	£3.5m	£3.1m	£3.0m	£2.9m	£2.8m	£2.7m	£2.6m	£2.5m	£2.4m	£33.2m
Fire and rescue (further value)	£1.9m	£1.9m	£1.9m	£1.9m	£1.9m	£1.9m	£1.9m	£1.9m	£1.9m	£1.9m	£19.4m
Ambulance	£3.1m	£1.4m	£1.2m	£1.2m	£1.1m	£1.1m	£1.0m	£1.0m	£1.0m	£0.9m	£13.0m
Social Care (disbenefit)	£1.7m	£3.2m	£3.5m	£3.4m	£3.3m	£3.2m	£3.1m	£2.9m	£2.8m	£2.7m	£29.8m

²⁴ When they use a PbR approach, ambulance services currently pay FRS approximately £40 per attendance. New Economy calculates the actual value per attendance of FRS time as £161, while the University of Hertfordshire (whose methodology assumes a greater provision of vehicle and equipment costs) suggest it is between £284 and £350.

5.2. Direct spend: equipment

Direct spend on equipment includes any expenditure on equipment which is required to undertake EMR, and which would not have been incurred had FRS not adopted EMR. As part of the survey of implementation leads, services were asked to itemise spending on a number of different pieces of equipment before and after implementation, and to specify any additional areas of spend not included in the initial list itemised within the survey.

Methodologically, equipment costs were divided into two categories – core spend and additional spend. Items in the ‘core spend’ category were those which were anticipated to be a requisite for implementation by any FRS – though this definition was a starting point rather than a definitive typology. FRS were asked to describe their additional expenditure on each of these items of equipment. In addition to this, FRS were asked to provide details about any additional equipment or sundries which they purchased. Estimations were made about which of these pieces of equipment were likely to be universal; broadly, most sundries suggested by more than one FRS were assumed to be a requirement for most. Items of equipment spend derived in this manner are categorised in the ‘additional spend’ category – though again, this is an imperfect itemisation.

The sum total of UK-wide equipment costs in order to undertake the first year of EMR activity is £6 million. However, in years following implementation, it is anticipated that only 26% of costs will be required to sustain the programme, where equipment must be replaced or stocks replenished.

Please note that a confidence grade has been applied to these costs. For a full list of items included in this analysis, please see Annex B.

5.3. Direct spend: training

As with equipment costs, it is recognised that a number of specific forms of training are either required or will otherwise be made available to co-responding firefighters. This training includes response training for differing forms of immediate emergency care and service familiarisation in relation to ambulance services and clinical governance more broadly, among a range of others.

FRS were asked to identify each of the types of training their staff undertake to support EMR. They were also asked to identify the extent to which any of these types of training would be undertaken under business as usual. They were also asked to identify the price of each form of training, and how frequently training would need to be refreshed in order to maintain a co-responding workforce.

Using this methodology, the proportion of the workforce projected to undertake each form of training has been calculated, and an average unit cost applied to account for each individual. It is recognised that some training provided to FRS by ambulance services is provided without charge, and unit costs are weighted to account for this. It is assumed that the national sum cost of training is approximately £3.0 million in the first year. Based on the rate at which training will be refreshed, it is assumed that annual costs thereafter will be approximately 54% of the first year of costs.

Please note that a confidence grade has been applied to these costs. The full schedule of training options itemised for the purposes of CBA is included in Annex B.

5.4. Direct spend: inoculations

Direct spend on inoculations includes any of the costs incurred in the course of ensuring that the workforce is protected against new diseases (most prominently Hepatitis B) which they might encounter in the course of undertaking EMR. Services have been asked to describe the extent to which their workforce is already inoculated, the length of time it would take to inoculate all operational staff, and their policy towards inoculations. With regards this last query, they were asked specifically to identify whether they were more likely to inoculate a workforce undertaking EMR proactively, or to do so in response to need (i.e. if there was evidence of exposure to a disease). They were also asked to identify whether inoculations are targeted.

33% of the operational workforce is estimated to be inoculated against Hepatitis B already. Nine services suggested they could complete total inoculation of the operational workforce against Hepatitis B in less than a year; whereas one suggested that it would take longer than five years. 65% of co-responding FRS stated that they would proactively inoculate their entire workforce at the inception of EMR work. Of these, the majority stated that they would seek to target specific teams likely to be undertaking co-responding activity, while a minority stated that they would seek to inoculate the entire workforce in advance of any co-responding activity. The remaining 35% of co-responding FRS stated that they currently carry out inoculations responsively, once individuals encounter risk of exposure.

On average, FRS suggested that it would take 2.3 years to inoculate their entire workforce²⁵. While the unit cost of inoculation does not vary between these services (except in line with inflation), the point at which costs are incurred is influenced by these policies. Therefore, while the national sum total cost of inoculating the workforce in order to support EMR is estimated to be approximately £978,000, this cost is incurred over the course of 2.3 years. Given that the immunologic memory of the hepatitis B vaccine is greater than 20 years, the ongoing maintenance costs of inoculation remain minimal²⁶. It is assumed that, due to turnover in the workforce, it is unlikely that vaccination rates will ever exceed 3% of the total workforce. Please note that a confidence grade has been applied to these costs.

5.5. Indirect cost: counselling

No evidence was available to suggest that additional revenue has been made available among FRS specifically in support of EMR-related occupational health. Furthermore, given the confidential nature of the service, only a limited numerical understanding is available of the degree to which EMR has increased demand on counselling services. The confidential basis of the service prohibits the isolation of reasons for contact. Even so, there is broad consensus among implementation leads that the conditions of EMR are fundamentally different to the core business of fire response, and that additional pressure on counselling services is likely to accrue. Due to the lack of specific evidence, modelling in this area is indicative. However, due to the relative scale of outputs on counselling by comparison to other costs associated with EMR, the generalised sense of outputs does not disrupt the overall findings of the report²⁷.

²⁵ Hepatitis B is used as a proxy. This research has not determined an authoritative list of the inoculations likely to be required in order to protect a workforce undertaking EMR; nor is one required in order to simulate assumptions about the costs likely to be incurred in vaccinating a workforce. The experience of a single FRS undertaking workforce vaccinations has been referred to in determining the use of Hepatitis B as a helpful proxy. Reference to Hepatitis B is a useful proxy but not definitive.

²⁶ Centers for Disease Control and Prevention, Hepatitis B FAQs for professionals, Aug 2016, (retrieved from <https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm>)

²⁷ Please note that these costs do not make up a major part of overall costs of implementation.

Based on the shared experience of 21 FRS who offered an account of the interaction between EMR and counselling for their operational staff, it is possible that up to 8% of staff engaged in co-responding have, in the course of delivering co-responding, required some contact with counselling services. The experience of a single FRS was used to establish a baseline understanding of the degree to which the workforce already draw on counselling services as a result of discharging core duties – around 2%. A high-level estimation therefore suggests that the increase in operational staff likely to draw on counselling services is a little over 6% - or over 2,000 staff nationally.

The nature of support required is likely to vary from service to service, and from case to case. As a benchmark, evidence has been drawn from PSSRU's work on the Unit Costs on Health and Social Care. That research draws from evidence on workplace screening for depression and anxiety disorders to suggest that those at risk are offered a course of cognitive behaviour therapy (CBT) delivered in six sessions over twelve weeks. It is estimated that the cost of this intervention is approximately £259²⁸. Nationally, it is therefore anticipated that the indirect costs generated as a result of EMR-associated counselling are £661,000 per annum. At present, the model associates these costs with FRS, since data made available by the 21 services relates to formal referrals and it is assumed that payment will ultimately be sought from FRS. However, the chargeability of these costs is likely to vary between services. Please note that a confidence grade has been applied to these costs.

5.6. Indirect cost: social care commissioners

A key benefit of EMR itemised in the next section relates to savings to social care commissioners. These savings are accrued where individuals who would have required sustained social care instead achieve lesser neurological deficits as a result of co-responding. Built into the methodology utilised to derive this cost (and detailed in the next section) is the parallel implication that some individuals who may have died as a result of cardiac arrest may then survive as a result of co-responding – subsequently requiring social care in instances where their cerebral performance is severely impaired. To reflect the extent of these outcomes, a cost is included in the model, attributed to social care commissioners.

There is a dearth of evidence on the long-term social care of out-of-hospital cardiac arrest survivors, and less still on how the relationship between social care utilisation and neurological damage is influenced by response times and the chain of survival. Nevertheless, for the sake of parity and fairness, a cost should be calculated and so it is assumed that the methodology for calculating savings experienced by social care commissioners should also be used in calculating costs incurred. The proportion of service users modelled to receive good, new neurological outcomes represents a 12% increase on the rate under business as usual. Therefore, it is assumed that, having accounted for the greater volume experiencing good or moderate outcomes, a similarly proportioned increase is anticipated to occur in the case of poor, new neurological outcomes.

It is estimated that the cost social care commissioners across the UK of implementing EMR will be approximately £1.7 million per annum cohort served (for the duration of the expected stay in care). As an indirect referral cost, this item of revenue increase has been modelled as a disbenefit, weighed against gross impact on social care commissioners in the following section.

²⁸ PSSRU, Unit Costs of Health and Social Care 2016, January 2017, (retrieved from <http://www.pssru.ac.uk/pub/uc/uc2016/full.pdf>)

5.7. In-kind resourcing: staff

The FRS staffing resource required to support the model of co-responding analysed by this CBA model is estimated to be worth £3.1m. Approximately a third of this £3.1m is comprised of retained firefighters, expenditure on which is attributable to FRS (sometimes financially supported by ambulance services). The remaining element of staff resource represents the value of deploying wholetime firefighters in an EMR context. While this is a significant cost, it represents the value of resource, rather than proactive expenditure by FRS²⁹. It is only included in the economic case, and is not represented in the financial return on investment figure for EMR, or other financial findings³⁰.

Methodologically, the value of staff resource utilised in undertaking EMR is based on a projection of the number of incidents likely to be attended by each co-responding FRS. This has been combined with an understanding of the average (estimate) unit cost of co-responding, which itself is based on the number of operational staff available to FRS, the hourly value of individual members of the workforce, and the average duration of time-critical incidents likely to be attended. It is assumed that FRS which have confirmed that they do *not* deliver co-responding activity will continue not to co-respond.

This has been tempered by an input from the FRS survey which asked implementation leads to discuss the extent to which they were likely to achieve total scale in delivering EMR. Many services which have co-responded confirmed that there was no ceiling on the extent to which they were likely to deploy EMR were it implemented at scale. Even in these cases, an aggregate assumption has been made that 100% rollout is unlikely, and that 'full scale' probably refers to around an 89% roll-out (as reflected in subsection 4.1 of this report). A minority of services clarified that they were unlikely to reach total roll-out, and defined their definition of implementation 'at scale' as a stated proportion of stations or appliances. Any commentary of this nature on the ceiling of implementing EMR has been included within modelling of both costs and benefits. Please note that a confidence grade has been applied to these costs.

The strategic case for the inclusion of EMR in the role map of firefighters sets out the argument for redirecting staff capacity towards co-responding. Without the need to employ or procure additional staff (i.e. for proactive expenditure), existing staff resource can be utilised to co-respond which otherwise would have been expended on activity which is strategically significant but not time-critical. Because of their success in attending to time critical emergencies within highly effective response times, operational fire service employees represent a significant asset under blue light conditions.

²⁹ Equipped with a detailed understanding of the role profile of their own operational workforce, and the financial case for undertaking each component of activity included within that role profile, fire services might be able to make an estimation about the opportunity cost of undertaking EMR as opposed to other activity. Having discussed this point directly with the commissioners of this analysis, the approach taken for the purposes of this research is to recognise that reality, but not factor it into the financial appraisal, given how complex that would be in practice. Suffice it to say that, it is anticipated that the opportunity cost probably includes a review of work related to other duties. It is also worth highlighting that the model accepts the important premise that EMR has not been implemented (and is therefore not simulated to be implemented) in such a way that it impinges on the core business of training for and responding to fires.

³⁰ Please note that, were this resource included in cost benefit calculations, the financial ROI for EMR would still be positive (3.22) and the financial implications of the intervention still beneficial to the public purse.

6. Benefits of Implementation

The benefits of including EMR within the role profile of firefighters across a UK-wide footprint are based on the experience of the sites which participated in the EMR trial conducted by the NJC. This CBA has therefore attempted to interpret approximately 34,000 records gathered as part of the trial through the lens of the most likely average experience. This data is rich with respect to the co-responding activity of participant FRS, but does not elaborate on the impact of that activity. Impacts calculated in this section otherwise adhere to the methodology and logic model set out in sections 3 and 4 of this report.

6.1. Impact on clinical commissioners³¹

It is estimated that EMR is likely to create gross benefits for clinical commissioners in the order of £12.6m p.a. over a ten year model. The potential for benefits realisation is discussed in subsection 6.5 of this report. There is no agency-specific ROI figure attributable specifically to clinical commissioners, since no investment is anticipated³². Rather, all benefits are 'net' from the perspective of these partners. For a breakdown of costs and benefits over a ten year model, please refer to Figure 10.

Figure 10 – Estimated cost benefit outcomes for clinical commissioners

Clinical Commissioners	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Benefits	£14.7m	£14.2m	£13.7m	£13.2m	£12.8m	£12.3m	£11.9m	£11.5m	£11.1m	£10.7m	£125.7m

The total cost per day of patient admission to hospital is estimated at £1,700 within intensive care and £557 otherwise. Given durations in stay, and relative care requirements, the average overall admission cost of a CPC1-CPC2 patient in hospital is £24,000 lesser than the overall admission cost of a CPC3-4 patient in hospital. Therefore, where FRS facilitate the probability of a timely response, and increase the likelihood of improve pew-hospital neurological state, they also potentially create a saving to CCGs³³.

Clinical commissioners seeking to understand the specific benefits of EMR are advised to explore the extent to which the cohort attended by FRS are likely to experience improved neurological outcomes, and whether those outcomes corroborate the Centre for Perioperative Medicine and Critical Care Research's findings on bed usage. Such an exercise is likely to require input from information governance professionals.

³¹ Clinical commissioners are referred to in this document, inclusive of public sector health organisations only. It is assumed that the commissioner of health services will, in most cases, be the relevant CCG of residence for the service user or potentially an adjacent NHS Foundation Trust. CBA modelling assumptions have reflected this where appropriate.

³² One FRS specified a significant contractual arrangement with an NHS Systems Resilience Group, a partnership forum of multiple partners, including clinical commissioners. In this instance, it should be possible to develop an ROI from the perspective of this body.

³³ *Ibid.*

6.2. Impact on social care commissioners³⁴

It is estimated that EMR is likely to create benefits for social care commissioners in the order of £6.7m across the UK per annum over a ten year model. The potential for benefits realisation is discussed in subsection 6.5 of this report. This includes the additional costs projected to occur as a result of additional demand on the social care system, as detailed in subsection 5.6. For a breakdown of costs and benefits over a ten year model, please refer to Figure 11.

Figure 11 – Estimated cost benefit outcomes for social care commissioners

Social Care Commissioners	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Benefits	£3.7m	£7.2m	£7.9m	£7.6m	£7.4m	£7.1m	£6.9m	£6.6m	£6.4m	£6.2m	£67.0m

Savings to social care commissioners are predicted largely as the result of patients experiencing good or moderate cerebral performance who would otherwise have experienced severe disability or even death. Based on the most likely lifestyle and impact of patients who suffer neurological damage after cardiac arrest, the average unit cost per patient incurred is £19,508 – based on the duration of a patient’s average length of stay in care, and the intensity of support those in care are likely to receive on a weekly basis³⁵.

Social care commissioners seeking to understand the impact of EMR within their footprint should consider prevention strategies and engage with health partners – specifically ambulance services – to understand the relationship between up-stream service utilisation and long-term dependency.

6.3. Impact on the Department of Work and Pensions

It is estimated that EMR is likely to create benefits for DWP in the order of £1.1m p.a. across the UK over a ten year model³⁶. The potential for benefits realisation is discussed in subsection 6.5 of this report. For a breakdown of costs and benefits over a ten year model, please refer to Figure 12.

NJC trial data suggests that the median age of the cohort served by EMR is 65, while the most common ten-year age banded cohort served by EMR is those aged 70-79. Nonetheless, approximately a third of the cohort served by EMR during the trial were under the age of 60, and as such a proportion of those with new, good-to-moderate neurological outcomes are likely to be able to continue to work to some degree. This reduces the burden on DWP in the form of long-term dependency on Employment and Support Allowance (ESA) or the commensurate element of universal credit. Since a defining attribute of

³⁴ Social care commissioners are referred to throughout this document, inclusive of public sector social care organisations only. It is assumed that the commissioner of social care services will, in most cases, be the relevant local authority of residence for the service user. CBA modelling assumptions have reflected this where appropriate.

³⁵ UK Home Care Association, ‘An Overview of the Domiciliary Care Market in the United Kingdom’, May 2016

³⁶ Social care commissioners are referred to throughout this document, inclusive of public sector social care organisations only. It is assumed that the commissioner of social care services will, in most cases, be the relevant local authority of residence for the service user. CBA modelling assumptions have reflected this where appropriate.

moderate and especially good cerebral performance is the ability to work, it is probable these outcomes would also create a benefit for the DWP.

The focus of this analysis has been on the operational impact of EMR on other public services. As such, the estimation of impact on DWP is particularly impressionistic. Figures are included here, nonetheless, to indicate the broad scale of benefits likely to be accrued across the national footprint, in comparison with other benefits estimated through this analysis.

6.4. Wider economic benefits

It is estimated that wider public value will be created as a result of UK-wide implementation of EMR in the order of approximately £158.1 million per annum. As outlined in subsection 2.2, public value refers to the broader, non-attributable benefit generated by an intervention. The public value ROI of EMR is 25.18 – though it must be remembered that this represents the translation of extra-financial value into monetary terms for the sake of expressing the economic element of cost benefit analysis.

In the case of EMR, which involves the delivery of potentially life-saving interventions, public value is principally created through a small minority of cases in which co-responding is predicted to save lives as a result of FRS facilitating the probability of a timely response. The analytical approach outlined in this document does not robustly or authoritatively identify a number of lives likely to be saved by adopting co-responding on a national footprint, and further research would need to take consideration of a number of other significant factors not within scope for this analysis. However, this document suggests the most likely value created as a result of those lives saved.

With regards economic unit costs associated with EMR, New Economy refers to information provided by the Department of Transport (DfT) in addressing the public value dis-benefit created by road traffic fatalities³⁷. The public value element expressed here also includes economic productivity lost as a result of fatality. More information on the wider economic benefits of co-responding can be found in *Broadening Responsibilities*.

6.5. Cashability and the commissioning landscape

All figures previously presented in this analysis represent gross fiscal benefits³⁸. As such, they represent the overall fiscal saving (with the exception of wider economic benefits and in-kind resourcing) to a particular agency as the result of the intervention. This subsection will explain New Economy's working assumptions about the extent to which these savings can be realised, and provide further modelling about the fiscal impact of these realisation or 'cashability' assumptions. This methodology, and standard assumptions included in the model, have been developed in conjunction with partners from HM Treasury.

'Cashability' refers to the extent to which a change in an outcome or output, or an improvement in the way these outcomes are achieved (e.g. process efficiencies), will result in a reduction in fiscal expenditure such that the expenditure released from that change can be reallocated elsewhere. In lay terms, the

³⁷ Department for Transport, 'Average value of prevention per reported casualty and per reported road accident: Great Britain, latest available year', *Accident and Casualty Costs*, September 2017 (retrieved from <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>)

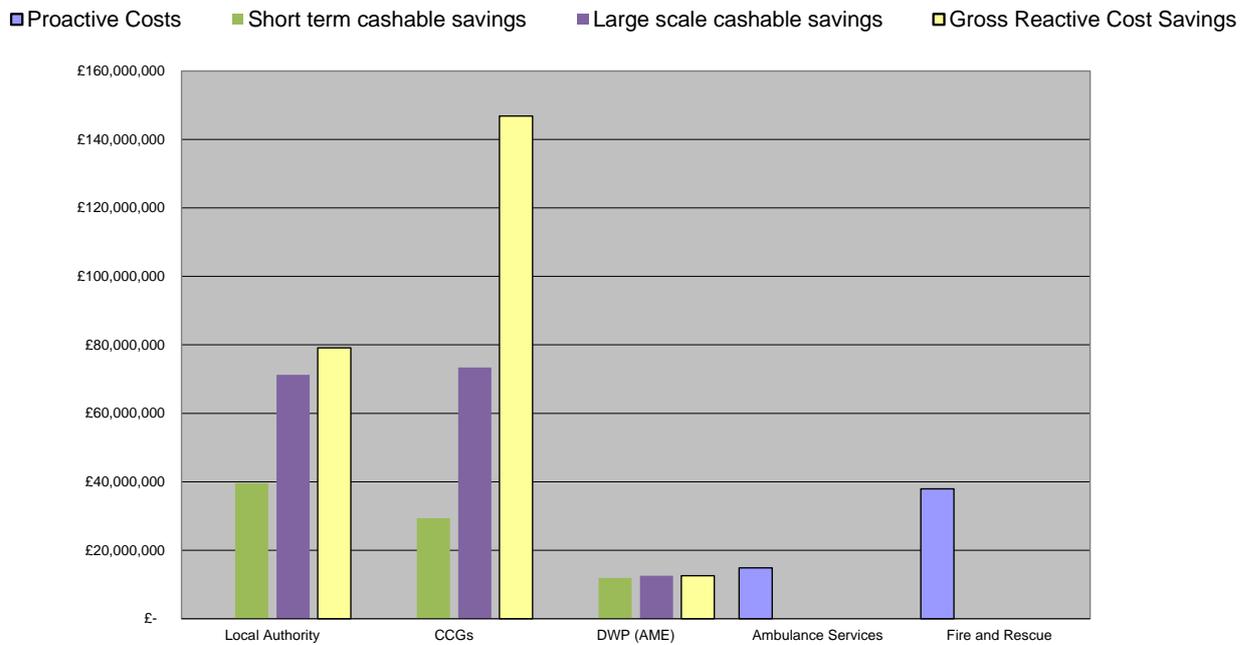
³⁸ Though expressed as 'gross fiscal benefits', they do reflect benefits after costs have been considered per agency. All benefits described in this subsection are, in the broader use of the terms, 'net' rather than 'gross'.

question of whether fiscal benefits are cashable involves an examination of whether reductions in activity and demand on services can practically translate into reductions in total expenditure by those services in the real world. Theoretically, all benefits are cashable, and 100% of gross fiscal benefits can be realised – but this seldom applies in a real-world context. This section very broadly attempts to estimate the most likely extent of short- and long-term cashability. For a full tabulation and visualisation of gross fiscal benefits, short-term and long-term cashability, please see figures 13 and 14.

Figure 13 – EMR and cashability assumptions - table

Benefits	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Gross fiscal benefits	£19.6m	£22.6m	£22.8m	£22.0m	£21.2m	£20.4m	£19.7m	£19.0m	£18.4m	£17.7m	£203.4m
(i) ...of which cashable (short-term)	£6.7m	£8.4m	£8.6m	£8.3m	£8.0m	£7.7m	£7.4m	£7.2m	£6.9m	£6.7m	£75.8m
(ii) ...of which cashable (long-term)	£12.8m	£15.8m	£16.2m	£15.6m	£15.0m	£14.5m	£14.0m	£13.5m	£13.0m	£12.6m	£143.0m

Figure 14 – EMR and cashability assumptions – chart



Short-term cashability

The short-term cashable return on investment of EMR is 1.49. Based on this analysis, for every £1 invested in EMR, £1.49 of benefit to the public purse should be cashable. Taking a view of cashability which assumes shorter-term and smaller-scale savings only, it is estimated that it will take approximately three years for EMR to begin to provide a positive return on investment.

Figure 15 - Short-term cashable savings of EMR

Short-term cashable benefit	Financial Year										Net Present Value (NPV)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Costs	£10.9m	£4.8m	£4.4m	£4.1m	£4.0m	£3.9m	£3.7m	£3.6m	£3.5m	£3.3m	£46.1m
Benefits	£6.0m	£7.6m	£7.8m	£7.5m	£7.3m	£7.0m	£6.8m	£6.5m	£6.3m	£6.1m	£68.8m

Net Present Budget Impact*	- £29.7m	<i>*the degree of additional fiscal benefit created, having accounted for costs.</i>
Overall Financial ROI**	1.49	<i>**the gain generated by an intervention, relative to the costs invested.</i>
Payback period***	3 Years	<i>***the estimated length of time required for an investment to become profitable.</i>

For clinical commissioners, marginal revenue is likely to be retrieved as a result of less need for treatment. This includes much of the activity which occurs in an intensive care setting, including administering drugs and delivering treatment such as therapeutic hypothermia.

In the case of social care commissioners, New Economy has assumed that local authorities will be the most relevant agencies nationally. Because many of the costs incurred are spot purchases from the perspective of local authorities, they ought to have a higher level of potential cashability.

New Economy's standing assumption with regards DWP is that savings are highly cashable, and that the majority of costs incurred reflect ongoing administrative tasks associated with delivering ESA and/or universal credit. It is worth noting that DWP expenditure is managed annually; over a ten year model this reflects a relatively responsive resource allocation.

Long-term cashability

If taking a longer-term view of cashability, assuming systemic transformation and large-scale engagement, the return on investment ratio of EMR is 2.90. Based on this analysis, for every £1 invested in EMR, £2.90 of benefit to the public purse is modelled and cashable.

Long-term cashability (sometimes called ‘large-scale’ cashability) is designed to simulate an achievable, realistic degree of benefits realisation following a more systemic change within local systems, following strategic decisions by commissioners taken over time. Whether through commissioning and procurement decisions, workforce reform or other forms of funding redistribution, most agencies have a general strategic context for cashing a saving. Savings associated with long-term cashability take a broad view of what ‘normal’ realisation looks like following such engagement. The timing of retrievability for long-term cashable savings is contingent on the timings of engagement.

Figure 16 – Long-term cashable savings of EMR

Long-term cashable benefit	Financial Year										Net Present Value (NPV)	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10		
Costs	£10.9m	£4.8m	£4.4m	£4.1m	£4.0m	£3.9m	£3.7m	£3.6m	£3.5m	£3.3m	£46.1m	
Benefits	£11.9m	£14.8m	£15.1m	£14.6m	£14.1m	£13.6m	£13.1m	£12.7m	£12.2m	£11.8m	£133.9m	
Net Present Budget Impact*											- £87.7m	<i>*the degree of additional fiscal benefit created, having accounted for costs.</i>
Overall Financial ROI**											2.90	<i>**the gain generated by an intervention, relative to the costs invested.</i>
Payback period***											1 Year	<i>***the estimated length of time required for an investment to become profitable.</i>

Clinical commissioners are likely to cash greater benefits in the long-term where demand reductions enable the reallocation of resource. However, it is anticipated in the case of EMR that the majority of costs remain fixed, particularly in the context of intensive care units, where the decommissioning of facilities is unlikely to be feasible or desirable.

Social care commissioners are likely to retrieve a much greater proportion of their gross fiscal benefits in the long-term, subject mainly to the influence of contract renewal processes and the responsiveness of commissioners to demand volumes.

While the majority of benefits attributable to DWP were cashable in the short-term, the long-term cashability features an incremental increase in benefits realisation.

7. Annex A – Survey Manuscript

Please see attached PDF document to review a manuscript of the survey undertaken of EMR implementation leads across the UK.

8. Annex B – Itemisation of costs included

This annex includes a full list of spend items included in the modelling described by this document. It tabulates these items of spend by category, matching the categories included in section 3.

Direct Spend – Equipment

Core Costs	Additional Costs
<i>Uniforms (Personal Protective Equipment)</i>	<i>Vehicles³⁹</i>
<i>Defibrillators (inc. AED etc.)</i>	<i>Airwave radios</i>
<i>Handling equipment (inc. lifting equipment)</i>	<i>Mobile Phones</i>
<i>Pulse Oximeters</i>	<i>Stethoscopes</i>
<i>Oxygen Cylinders</i>	<i>Aneroid Sphygmomanometers</i>
<i>Trauma Technician Goggles</i>	<i>Fob watches</i>
<i>Oxygen Masks (inc. adult and paediatric)</i>	<i>Disposable pen light torches</i>
<i>Clinical Bags</i>	<i>Non-contact thermometer</i>
<i>iGels</i>	<i>Suction pumps</i>
<i>First Aid Kits</i>	<i>Tourniquets</i>
	<i>Chest seals</i>
	<i>Disposal Gloves</i>
	<i>Smart pads</i>
	<i>Satellite Navigation Systems</i>
	<i>Surgical Tape</i>
	<i>Pelvic Slings</i>
	<i>Report forms</i>
	<i>Lubricating jelly for iGels</i>
	<i>Kneeling mats</i>
	<i>Laptops</i>
	<i>Touch cut scissors</i>
	<i>Hand wipes</i>
	<i>Bio-guard hand gel</i>
	<i>Clinical waste bags</i>
	<i>Shaving razors</i>

Direct Spend – Training

Categories of Training
<i>Immediate emergency care/medical life-threatening response training</i>
<i>Ambulance service familiarisation training (inc. additional medical response training)</i>
<i>First aid course</i>
<i>Clinical governance training</i>
<i>CPR and Defibrillator training (inc. high-quality)</i>
<i>Safeguarding training</i>
<i>Other</i>

³⁹ Please note that, while a significant item of spend, vehicles are included as an additional rather than core cost because only a minority of services are simulated to purchase new vehicles in order to undertake EMR. This reflects the national experience. The extent to which vehicle costs are captured within the model has been scaled to match the expectation that vehicles other than fire appliances will be used in co-responding.

9. Annex C – References

Where possible, this discussion paper has referenced literature used in deriving assumptions behind this financial simulation. This annex includes references for these and other significant sources used in undertaking cost benefit analysis. This list is not exhaustive, as a number of minor sources have been used in undertaking final analysis, but includes the list of sources required in order to replicate most of this analysis.

British Heart Foundation et al, 'Consensus paper on out-of-hospital cardiac arrest in England', October 2015.

Centers for Disease Control and Prevention, Hepatitis B FAQs for professionals, Aug 2016, (retrieved from <https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm>)

Deasy et al, 'Functional Outcomes and quality-of-life of young adults who survive out-of-hospital cardiac arrest', *Emergency Medical Journal*, Vol. 30, 2013

Department for Transport, 'Average value of prevention per reported casualty and per reported road accident: Great Britain, latest available year', *Accident and Casualty Costs*, September 2017 (retrieved from <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>)

HM Treasury, *Using the Five Case Model – Green Book supplementary guidance on delivering public value from spending proposals*, (retrieved from <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>)

Lund University, 'Long-term neurological outcome after cardiac arrest and therapeutic hypothermia', *Resuscitation*, 80, (2009), pp. 1119-1123

New Economy, CBA Guidance and Model, 2015, (<http://www.neweconomymanchester.com/our-work/research-evaluation-cost-benefit-analysis/cost-benefit-analysis/cost-benefit-analysis-guidance-and-model>), retrieved 10/07/2017)

New Economy, Cashability Discussion Paper, 2015 (retrieved from <http://www.neweconomymanchester.com/media/1445/3314-150327-cashability-discussion-paper.pdf>)

NHS Digital, Ambulance Quality Indicators (retrieved <https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/>)

Petrie et al, 'Hospital costs of out-of-hospital cardiac arrest patients treated in intensive care; a single centre evaluation using the national tariff-based system', *BMJ Open*, January 2015

PSSRU, Length of Stay in Care Homes, January 2011

PSSRU, Unit Costs of Health and Social Care 2016, January 2017, (retrieved from <http://www.pssru.ac.uk/pub/uc/uc2016/full.pdf>)

Resuscitation Council, *Resuscitation to Recovery*, March 2017

UK Home Care Association, 'An Overview of the Domiciliary Care Market in the United Kingdom', May 2016

Survey of FRS-Based Implementation Leads

This questionnaire has been developed by New Economy to support the development of an independent cost benefit analysis (CBA) of medical related response – and principally of cardiac arrest response – by Fire and Rescue Services (FRS). It has been commissioned by the National Joint Council for Local Authority Fire and Rescue Services (NJC). This survey has been streamlined to capture only new and necessary information which is a) relevant to cost benefit modelling and b) additional to that already captured through 'Broadening Responsibilities', the evaluation of co-responding by the University of Hertfordshire which was published earlier this year.

It has been determined that co-responding to cardiac arrests, while only one element of medical related response work undertaken by FRS, is most subject to credible and authoritative CBA. This is supported by the findings and methodology of Broadening Responsibilities. Where 'EMR' is referred to in this survey, it therefore refers to the form of EMR which involves "FRS co-responding, in parallel to ambulance services, to out of hospital cardiac arrests".

This research will focus on the broad fiscal impact of EMR across the UK. It will not include findings about any particular service. It will not make comments about the pros and cons of differing service designs. However, in order to build up the most accurate model of the total UK-wide impact of EMR implementation, it is necessary to capture an understanding of variation in implementation and service configuration.

For ease of use and accessibility, this survey has been designed using Survey Monkey. You will require an internet connection to complete this survey. You can save your progress at any time before submission and return to complete the survey at a later point. It is estimated that approximately 45 minutes will be required to complete this survey. However, you may need to complete the survey in multiple sessions in order to gather all relevant inputs.

If you are unable to supply answers to any specific questions, please reply "DK".

Please respond by no later than Friday 29th September 2017.

All information will be treated confidentially and no identifiable information about any individual Fire and Rescue Service will be published without prior permission. If you have any queries regarding the questionnaire, please contact rachel.stevens@local.gov.uk.

New Economy are a policy, strategy and research unit based in Manchester, specialising in CBA, with a methodology approved by HM Treasury and in line with its [Green Book](#) specifications for business case development. For more information, please refer to www.neweconomymanchester.com.

Note that all questions are included for the purposes of modelling only and that your answers do not constitute any formal or informal implementation commitments. This research is being undertaken by New Economy and only headline CBA findings (rather than specific answers) will be shared with members of the National Joint Council.

Reference information

1. Please enter your name (for reference only)

2. Please enter the name of your Fire and Rescue Service (for reference only)

3. Please enter your job title (for reference only)

SECTION 1: IMPLEMENTATION COSTS

Questions in this part of the survey refer to the cost of implementation. In order to undertake cost benefit analysis (CBA), it is necessary to develop a detailed understanding of the direct and indirect spending needed to support EMR.

New Economy's methodology is designed to include modelling on:

- Impact which is additional as the result of EMR to existing 'core' services; and
- Impact which is incurred on the wider public purse as the result of EMR – including indirect draws on resource (e.g. counselling) and costs/benefits incurred to wider partners (e.g. where improved long-term neurological outcomes alter the needs of a survivor)).

Questions in this section cover the following topic areas:

- Equipment
- Training
- Counselling
- Inoculations

Equipment and Clothing (Existing Units)

Question in this section ask about equipment and clothing which were EXISTING prior to EMR . Please provide complete answers where possible.

4. How many EXISTING UNITS of each of the following items did your service own PRIOR to the implementation of EMR?

Uniforms (Personal Protective Equipment)

Defibrillators (inc. AED etc.)

Handling equipment (inc. lifting equipment)

Pulse Oximeters

Oxygen Cylinders

Trauma Technician Goggles

Oxygen Masks (inc. adult and paediatric)

Clinical Bags

iGels

First Aid Kits

5. Which organisation was paying for the EXISTING UNITS of each of the following items, PRIOR to the implementation of EMR?

	Organisation paying
Uniforms (Personal Protective Equipment)	<input type="text"/>
Defibrillators (inc. AED etc.)	<input type="text"/>
Handling equipment (inc. lifting equipment)	<input type="text"/>
Pulse Oximeters	<input type="text"/>
Oxygen Cylinders	<input type="text"/>
Trauma Technician Goggles	<input type="text"/>
Oxygen Masks (inc. adult and paediatric)	<input type="text"/>
Clinical Bags	<input type="text"/>
iGels	<input type="text"/>
First Aid Kits	<input type="text"/>

6. What was the COST PER UNIT (if available) for each of the following items PRIOR to the implementation of EMR? *Please write numbers in full using only numeric characters (ie enter 1000 rather than 1,000, £1000, or 1k, etc.)*

Uniforms (Personal Protective Equipment)	<input type="text"/>
Defibrillators (inc. AED etc.)	<input type="text"/>
Handling equipment (inc. lifting equipment)	<input type="text"/>
Pulse Oximeters	<input type="text"/>
Oxygen Cylinders	<input type="text"/>
Trauma Technician Goggles	<input type="text"/>
Oxygen Masks (inc. adult and paediatric)	<input type="text"/>
Clinical Bags	<input type="text"/>
iGels	<input type="text"/>
First Aid Kits	<input type="text"/>

7. Did your service hold any EXISTING equipment or clothing, other than that included in questions 4 - 6, which is now used for co-responding (please specify **type**, **cost per unit**, and **approximate volume**)? *100 words*

--

Equipment and Clothing (Additional Units)

Question in this section ask about equipment and clothing which were purchased ADDITIONALLY in order to support EMR.

8. How many ADDITIONAL UNITS of each of the following items have been purchased (either by your service or a partner organisation such as an ambulance service) to support EMR (and in particular co-responding)?

Uniforms (Personal Protective Equipment)

Defibrillators (inc. AED etc.)

Handling equipment (inc. lifting equipment)

Pulse Oximeters

Oxygen Cylinders

Trauma Technician Goggles

Oxygen Masks (inc. adult and paediatric)

Clinical Bags

iGels

First Aid Kits

9. Which organisation pays for the ADDITIONAL UNITS of each of the following items (and in particular co-responding)?

	Organisation paying
Uniforms (Personal Protective Equipment)	<input type="text"/>
Defibrillators (inc. AED etc.)	<input type="text"/>
Handling equipment (inc. lifting equipment)	<input type="text"/>
Pulse Oximeters	<input type="text"/>
Oxygen Cylinders	<input type="text"/>
Trauma Technician Goggles	<input type="text"/>
Oxygen Masks (inc. adult and paediatric)	<input type="text"/>
Clinical Bags	<input type="text"/>
iGels	<input type="text"/>
First Aid Kits	<input type="text"/>

10. What is the COST PER UNIT (if available) for each of the ADDITIONAL UNITS of the following items (and in particular co-responding)? *Please write numbers in full using only numeric characters (ie enter 1000 rather than 1,000, £1000, or 1k, etc.)*

Uniforms (Personal Protective Equipment)	<input type="text"/>
Defibrillators (inc. AED etc.)	<input type="text"/>
Handling equipment (inc. lifting equipment)	<input type="text"/>
Pulse Oximeters	<input type="text"/>
Oxygen Cylinders	<input type="text"/>
Trauma Technician Goggles	<input type="text"/>
Oxygen Masks (inc. adult and paediatric)	<input type="text"/>
Clinical Bags	<input type="text"/>
iGels	<input type="text"/>
First Aid Kits	<input type="text"/>

11. Did your service (or a partner organisation) purchase any ADDITIONAL equipment and clothing, other than that included in questions 8-10, for the purpose of co-responding (please specify **type, cost per unit** and **approximate volume**)? *100 words*

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Training

Questions on this page relate to training which was undertaken by FRS staff for the purposes of delivering EMR. During the course of Broadening Responsibilities, several services highlighted that some vital training would have been undertaken by services anyway. Please indicate how many staff have received training.

12. Which of the following forms of training have your staff undertaken in support of co-responding

	Is this a requirement in order to undertake EMR?	Did colleagues receive this training anyway (i.e. aside from EMR)?
Immediate emergency care/medical life-threatening response training	<input type="checkbox"/>	<input type="checkbox"/>
Ambulance service familiarisation training (inc. additional medical response training)	<input type="checkbox"/>	<input type="checkbox"/>
First aid course	<input type="checkbox"/>	<input type="checkbox"/>
Clinical governance training	<input type="checkbox"/>	<input type="checkbox"/>
CPR and Defibrillator training (inc. high-quality)	<input type="checkbox"/>	<input type="checkbox"/>
Safeguarding training	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

13. What was the average duration of each training course (days)

Immediate emergency care/medical life-threatening response training

Ambulance service familiarisation training (inc. additional medical response training)

First aid course

Clinical governance training

CPR and Defibrillator training (inc. high-quality)

Safeguarding training

Other

14. Enter the number of staff who have received/will receive training

Immediate emergency care/medical life-threatening response training

Ambulance service familiarisation training (inc. additional medical response training)

First aid course

Clinical governance training

CPR and Defibrillator training (inc. high-quality)

Safeguarding training

Other

15. What is the price of training per day (*if available - not including staff costs*)

Immediate emergency care/medical life-threatening response training

Ambulance service familiarisation training (inc. additional medical response training)

First aid course

Clinical governance training

CPR and Defibrillator training (inc. high-quality)

Safeguarding training

Other

16. How often should this training be undertaken? (e.g. annually)

Immediate emergency care/medical life-threatening response training

Ambulance service familiarisation training (inc. additional medical response training)

First aid course

Clinical governance training

CPR and Defibrillator training (inc. high-quality)

Safeguarding training

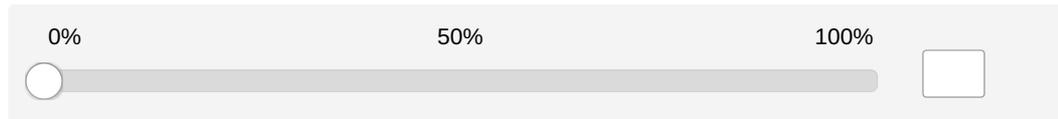
17. Which other forms of training have your staff undertaken (not already captured)? Please include **days allocated across the workforce** where possible. 200 words

Inoculations

18. What is the policy of your service towards workforce inoculations?

- Carried out proactively, across the entire workforce
- Carried out proactively, and targeted to those in key roles (i.e. EMR)
- Carried out in response to need (i.e. evidence of exposure to Hepatitis B)

19. What proportion of your operational workforce is inoculated against Hepatitis (as an estimate)?



20. In a scenario where you intended to inoculate your entire workforce to support implementation of EMR across your service, how long do you estimate it would likely take?

- 1 year (or less)
- 2 years
- 3 years
- 4 years
- 5 years
- More than 5 years

21. Please provide additional description of your organisational approach to inoculations and immunisation, other than that which is identified in this section (optional). 100 words

Counselling and Support

This page builds on evidence already gathered on mental wellbeing arrangements by the National Joint Council's Technical Working Group. This work established the volume of counsellors readily available to fire and rescue service personnel, as well as some information on the degree of direct referrals which occur. It seeks to build on that understanding by establishing the hidden additional demand created by EMR.

22. What is the caseload of the average workplace counsellor supporting your service?

23. How many referrals are made to workplace counsellors per annum (total)?

24. How many referrals are made to workplace counsellors per annum (EMR)?

Section 2 - Call Types & On-Scene Response

Questions in this part of the survey relate to operational experience of co-responding, be that as part of the NJC trial or otherwise. They build on findings from Broadening Responsibilities, as well as advice and guidance provided by a number of from implementation leads.

New Economy seeks to build a model of co-responding across the UK. Therefore questions in this section are designed to understand the potential of co-responding at scale, as well as factors which would influence or inhibit the extent and nature of co-responding. Chiefly, we anticipate that the other factors competing for fire service capacity will be (i) core fire response under blue-light conditions; and (ii) other non-urgent prevention work (such as safe and well checks).

Questions in this part of the survey are focused on building up a common national experience of co-responding, and no findings specific to any particular service will be expressed or referred to in reporting on cost benefit analysis.

25. Across your service, if EMR were agreed nationally, what proportion of your operational workforce would you plan to undertake co-responding? 100 words

26. (If your service took part in an EMR trial) Is the volume of co-responding activity during the EMR Trial representative of the intended scale of EMR for your area post agreement on permanence? 250 words

Response and On-Scene Activity

Data exists and is available on response times for EMR. Questions in this section look to supplement intelligence gathered in the course of Broadening Responsibilities with a broader understanding of response time variation (or lack thereof) between whole-time and retained firefighters when undertaking the core duty of fire response under blue light conditions. We recognise that not all services will be able to submit data on this section.

27. When discharging current core emergency response duties (i.e. not related to EMR), what is the average response time of your firefighters? (optional)

Wholetime	<input type="text"/>
Retained	<input type="text"/>
General	<input type="text"/>

28. When discharging current core emergency response duties, what is the average total on-scene time for your firefighters? (optional)

Wholetime

Retained

General

Section 3 - Benefits Realisation

Questions in this part of the survey are about existing service level agreements and the nature of strategic engagement between your service and clinical commissioners operating within your footprint. The purpose of this section is to help New Economy to develop a high-level understanding of the commissioning landscape within which you are operating, and therefore the potential realisation of any gross benefits created by your service as cashable financial savings.

29. Do clinical commissioner(s) AND/OR ambulance trusts operating within the footprint of your services commission any services you deliver?

- CCGs
- Ambulance trusts

30. If yes, is the commission based on a contractual award or payment-by-results (e.g. per attendance)?

- Payment By Results
- Contract
- None
- Other (please specify)

31. If yes, please provide details of the nature of the commission(s), including service-level agreements and other financial agreements (as you feel appropriate).

Thank you for completing this survey. Your answers will be utilised by New Economy to develop a national cost-benefit analysis for the National Joint Council in respect of EMR.

If you have any further questions, please get in touch with rachel.stevens@local.gov.uk.