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Identifying the Economic Value of the Keiro Service Pathway

Final Report

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Executive Summary

Keiro operates two centres in Middlesbrough and Gateshead providing specialist nursing care and neuro-rehabilitation. The service adopts an integrated and efficient care pathway, encompassing a public/private/third sector partnership approach to health and social care, rehabilitation, housing, leisure, information and educational services. Keiro enables people with neurological conditions, including post-stroke and other complex care needs to regain and retain independence.

There is good evidence on the cost-effectiveness of specialist rehabilitation services, but not for the Keiro pathway's community setting. This work was commissioned to address this evidence gap. It seeks to identify the financial and qualitative benefits to commissioners from investing in timely community rehabilitation, as part of an integrated pathway, for highly dependent patients with neurological conditions and their families.

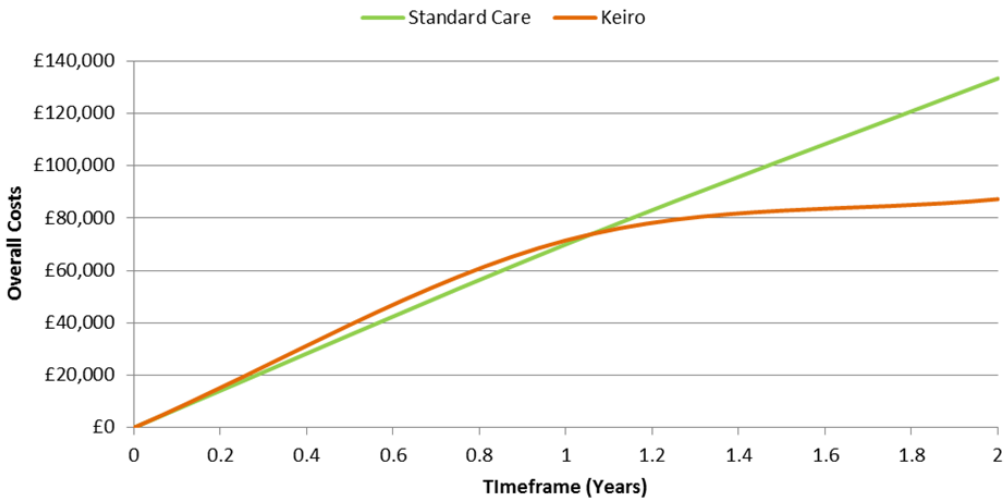
Despite the focus on neuro-rehabilitation within this analysis, the Keiro service is applicable to wider client groups, and therefore, Keiro are currently seeking to expand their services so they can benefit a wider range of patients.

The main benefit measure is the reduction in total life-long cost to health & social care commissioners and the NHS. The perspective adopted is that of integrated NHS and social care budgets in accordance with Government policy. A second benefit measure is the clear congruence between Keiro's approach and that required to meet Government policy and clinical and quality standards.

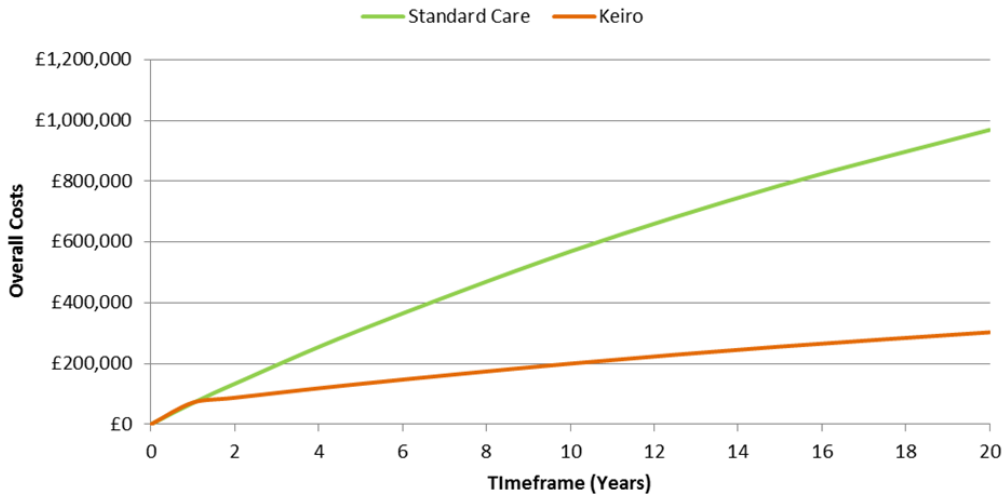
Economic modelling was used to estimate the financial benefits of Keiro, and a literature review conducted to identify relevant policies and guidelines. The economic model adopts a decision tree structure comparing resources required and costs of the Keiro pathway compared to standard care. The model focuses on The Gateway, a 40 bed neurological rehabilitation centre in Middlesbrough centre. Key parameters modelled are that the Keiro facilities are used at full occupancy (being 40 beds occupied 100% of the time), with an average length of stay per patient of six months. Thereafter 50% transfer to transitional housing prior to moving to their permanent residence, with the remainder returning straight to their permanent residence. Standard care is modelled as a patient residing in a high dependency nursing care home for the full time horizon assessed. Other parameters include hospital length of stay and readmission at 28 days. Assumptions were informed by freedom of information requests to existing service providers, costs from published literature and national datasets, and assumptions framed by data recorded for patients using the Gateshead facility.

Central case results, over a 10 year period, report estimated costs for the Keiro pathway, for the 40-bed facility, of £8.0 million, compared to £22.8 million with standard care, saving £14.8 million. This is equivalent to a 65% reduction in the standard care costs. On a per patient basis, the costs over the 10 year period are forecast to fall from £568,811 with standard care, to just under £200,000, giving per patient savings of £369,286. The main savings accrue from providing community rehabilitation to empower patients to live more independent lives and reside in lower cost community settings and hence avoid high dependency care. Initially, the Keiro service is more expensive than standard care, due to the cost of rehabilitation within The Gateway. After this period of rehabilitation, the break-even point occurs at around 12.5 months, with Keiro becoming more cost effective as time progresses. Sensitivity analyses indicate that the model results are robust to changes in individual input parameter values. The input parameter with the largest impact is the cost of high dependency care homes, but even at the lowest value assessed (£800 per week); the Keiro service remained cost saving over the 10 year time horizon, with per patient savings of £151,997.

Per patient costs over time: years 0-2



Per patient costs over time: years 0-20



The central case analysis follows one cohort of 40 patients through both pathways (i.e. standard care and the Keiro service) for the 10 year time horizon. However, once that cohort is discharged from The Gateway, a new cohort of patients will be admitted. Therefore, over the 10 year time horizon, multiple cohorts will use the Keiro service. To investigate the impact of these multiple cohorts, further analysis was undertaken, in which the costs of 800 patients (i.e. two 40 patient cohorts a year for 10 years) were estimated for both the standard care and Keiro services pathways. This assumes six month stays within each of the rehabilitation facility and transitional housing. Over the 10 year time horizon, with an occupancy rate of 80% (i.e. 20% of Keiro beds are left empty) it is estimated that Keiro produces savings of £125 million, with costs of £139 million compared to £264 million for patients managed in standard care. Savings increase to £474 million over 20 years. When the occupancy of Keiro is assumed to be 100%, it is estimated that Keiro produces savings of £156 million, with costs of £108 million compared to £264 million in standard care. Savings over 20 years are estimated at £593 million. However, with 20 year estimations it should be noted that these values assume that all standard care patients remain in high dependency care homes for the full time frame, when in reality, over this longer period it is expected that a large number would either die or move to a less resource intensive setting (e.g. own home with targeted support).

Findings from the literature review include that the Keiro service provides the integrated community rehabilitation required by the Care Act 2014. The core purpose of the Act is to require Local Authorities, as providers of adult care and support, to maximise the outcomes that matter to the individuals, particularly in relation to realising the potential to live independent lives. The Act focuses on promoting “wellbeing” which includes the following areas:

- Physical and mental health and emotional wellbeing;
- Control by the individual over day-to-day life including the provision of care and support;
- Participation in work, education, training or recreation;
- Social and economic wellbeing;
- Domestic, family and personal relationships.

The Act also recognises the importance of supporting families and carers, a value embedded in the Keiro approach.

Recently, Wessex Strategic Clinical Networks published Rehabilitation Quality Guidance that provides advice for commissioners to ensure high quality community rehabilitation and related services are provided equitably. This guidance is not disease specific, hence the Keiro service can be benchmarked against the quality principles and requirements defined therein. These standards are evidence based and support continuous improvement through measurement and audit. It is recommended that Keiro develops its evidence base to demonstrate compliance with these standards.

The NHS Five Year 'Forward View' sets out a clear direction for the NHS, showing why change is needed and what it will look like. Principles include delivery of services by new partnerships across the NHS, local communities, housing providers and the private sector. Goals include delivery of patient-centred care, with patients empowered to contribute to goals and care plans, with a key outcome being to realise an individual's potential for independent living, social participation, return to work, and other meaningful activities to restore quality of life. Many of these themes chime with the vision of community rehabilitation that drives the Keiro philosophy.

Keiro's strategic direction, operating practices and ethos are congruent with these high level principles and it can demonstrate leadership in adopting these innovative approaches. The services provided by Keiro are also consistent with the high-quality models of care envisioned by the NHS in its Five Year Forward View. This is a high level judgment and should be supported by detailed measurements against the quality standards recommended by Wessex.

One modelling limitation is the poor quality of evidence supporting some key assumptions. The paucity of data is largely because the Keiro service has only been operational for a short period of time, and as such has limited experience to draw data from. This means it has not been possible to incorporate important factors such as patient quality of life and mortality. In terms of quality of life, patients are likely to benefit from the rehabilitation provided by the Keiro service. As such, Keiro may wish to seek suitable data to quantify their impact on patient quality of life, in the future. Similarly, there is currently no clear evidence regarding Keiro's impact on patient length of stay in hospital and readmission rates. Therefore, assumptions have been used within the model. The values used within this analysis are believed to be conservative, and may in fact underestimate the beneficial impact of Keiro.

Primary research is recommended as the appropriate way to address such gaps, building on the indicators recommended for rehabilitation in the Wessex Guidance and NHS Forward View. Consideration also needs to be given to identifying information on comparator pathways from national datasets, the literature and expert opinion.

The analysis focuses on patients who are currently discharged from an acute setting, into high dependency care homes. This was done to avoid over-complication within the model. However, other patient groups are likely to benefit from the rehabilitation services provided by Keiro. This includes patients who do not reside within The Gateway and/or transitional housing, but rather make use of Keiro's auxiliary services such as the Wellbeing and Information Hub and vocational training at Middlesbrough College.

In conclusion, for commissioners, the economic model identifies considerable financial benefits from investing in timely and appropriate rehabilitation as part of an integrated pathway for highly dependent patients with neurological conditions. Adopting Keiro's community rehabilitation model is cost-effective compared to providing long-term nursing home accommodation for people with neurological conditions. This result is robust under a wide range of sensitivity analyses. Therefore, adopting the Keiro service has the potential to provide patients with the best possible opportunity to regain and retain their independence and deliver the best outcomes for them and their whole family. We note quality of evidence within the analysis is low-grade and that origin of several key assumptions is Keiro managers. Therefore, further research is needed to improve the quality of the evidence base, ideally primary, but the prospect of success with such an approach requires testing.

Acknowledgements

The authors would like to thank Ben Hope, Service Development Manager and Boda Gallon, Chief Executive Keiro, for comments on the draft model and parameter values. Their input provides a quality check that the approach presents a valid representation of the Keiro pathway and resource use. All decisions on values adopted were the authors' sole responsibility.

Content of Section 2, describing the Keiro philosophy and facilitates is taken largely from Keiro's website (http://www.keirogroup.co.uk/).

This project has been funded by the North East & Cumbria Academic Health Science Network, an independent body set up by the Department of Health to identify, adopt and disseminate innovative healthcare in the NHS.

Section 1: Introduction

1.1 BACKGROUND

Neurological rehabilitation seeks to help patients return to the highest level of function and independence possible, while improving overall quality of life - physically, emotionally and socially. This may be expected to reduce the long term cost of providing care for these patients in the community. However, for cost efficiency, the initial investment in rehabilitation must be offset by savings on care within a reasonably short timeframe. Given increasing constraints on health and social care funding, rehabilitation programme providers must be able to demonstrate value for money.

The National Service Framework (NSF) for Long-Term Neurological Conditions (LTNCs) [1] sets out quality requirements relating directly to provision of neurological rehabilitation services. These were informed by evidence that rehabilitation in specialised settings, for people with traumatic brain or spinal cord injury, is effective and provides value for money by reducing length of stay in hospital and the cost of long-term care.

Keiro provides an integrated care pathway, encompassing a public/private/third sector partnership approach to rehabilitation, housing, leisure, information and educational services to enable people with neurological conditions and other complex care needs to regain and retain their independence. This intervention, with a focus on the whole system including accommodation, is different from that informing the current evidence base. This report describes Keiro's approach and seeks to identify the costs and benefits to all stakeholders, from investing in such a community-based rehabilitation service.

1.2 AIM

The aim of this document is to identifying the benefit to commissioners from investing in timely neuro-rehabilitation as part of an integrated pathway for highly dependent patients with neurological conditions. The main measure of benefit adopted is the reduction in total cost to health & social care commissioners and to the NHS. The perspective adopted is that of integrated NHS and social care budgets in accordance with Government policy [2].

The central case economic model adopts the demographic profile for The Gateway, the regional catchment area served by the James Cook University Hospital Trauma Centre, part of South Tees Hospitals NHS Foundation Trust. It is, however, sufficiently flexible to produce valid results for each of the other 21 national trauma centres.

A second measure of benefit is congruence between the advanced Keiro delivery approach and that required to meet Government policy and clinical and quality standards.

1.3 METHODOLOGY

In order to quantify the impact of the Keiro service on the local health economy, an economic model has been constructed. The model compares the Keiro service, centred on the Gateway including its on-site transitional housing provided by public sector partner Erimus Housing, to current standard NHS care for a specific cohort of patients. The modelling approach adopted is described in detail within Section 3.

In order to establish whether patient quality of life scores could be formally included within the model, a systematic literature review was undertaken to search for relevant data that could be applied to this analysis. This review indicated that patient quality of life following neuro-rehabilitation is a poorly researched topic, and as such, no relevant data were identified. A more pragmatic search of the literature was also undertaken to evaluate data regarding patient outcomes in the acute setting (i.e. James Cook University Hospital). Again, the available evidence was limited. Therefore, in order to obtain data that could be used to inform model input parameter values, a freedom of information (FOI) request was made to South Tees NHS Foundation Trust.

The economic model has not captured some of the material benefits to patients, their families and carers. For example, it has not been possible to include the following aspects of the Keiro service:

- Promoting physical and mental wellbeing by providing therapy and leisure facilities, including a gym staffed by trainers knowledgeable in managing people with neurological conditions and a hydrotherapy pool to rehabilitate injured muscles;
- Encouraging patients to self-manage their condition, informing them of the expected trajectory of their condition and advise and support on how to manage changes in it;
- Encouraging peer support;
- Providing psychological and emotional support to patients, families and carers;
- Facilitating third sector organisations as they support the patient, family and carers in many aspect of daily living including benefit claims, returning to work, advocacy, adult education programmes and tools to improve daily activities (e.g. telecare and telehealth equipment).

A pragmatic literature search was undertaken to identify health policy, clinical and quality standards promoting such activities, in order to demonstrate the non-economic benefits of adopting a holistic approach. This report also considers whether evidence can be collected to quantify these benefits, rather than limiting it to a qualitative analysis, and recommends further research.

1.4 LAYOUT OF THIS DOCUMENT

Section 2 describes The Gateway facility and transitional housing provided by its public sector partner Erimus Housing. Section 3 describes the economic model, values, related assumptions populating it and sensitivity analyses informing the key factors influencing results. Section 4 presents results of the central case and sensitivity analyses. Section 5 identifies how the Gateway facilities and ethos are consistent with a number of Government policies, including integration of health and social care. It identifies further research which could strengthen the evidence base. Section 6 describes the economic model's strengths and limitations and provides some conclusions informed by the evidence.

Section 2: The Keiro Model

2.1 KEIRO

Keiro is Japanese for 'Pathway' or 'Journey'. The company seeks to provide an integrated 'pathway' of support and rehabilitation services from hospital to home to support clients on the 'journey' towards independence.

Following over 10 years of incremental developments, partnerships and innovation to deliver an integrated rehabilitation service pathway, Keiro opened 'The Gateway' in January 2014. The Gateway is a 40 bed neurological rehabilitation centre in Middlesbrough centre that provides:

- Specialist nursing care by medical consultants and nurses;
- Rehabilitation programmes for inpatients and outpatients, delivered by the medical team and augmented by physiotherapists, occupational therapists, personal assistants and gym trainers;
- A Wellbeing Hub offering a range of therapy, leisure, rehabilitation and fitness opportunities;
- A Knowledge Centre used by staff, community groups and statutory services offering counselling and support on issues such as employment, alternatives to work, legal advice, welfare benefits, self-management and adult learning courses for people with neurological conditions, their family and carers;
- Access to on-site transitional housing from a Public Sector partner.
- Access to an array of long term housing and support options from Public and third Sector partners (this aspect of Keiro is not formally incorporated in this analysis).

The Gateway is a Care Quality Commission registered care home with nursing. Staff are skilled in managing children and adults who have suffered strokes, brain or spinal injury, or have long term neurological conditions or other complex needs. A typical user requires a period of specialist community rehabilitation, usually following a period of in-patient NHS treatment. People can also 'step up' into the service for episodes of care and rehabilitation to help them remain independent, avoiding long term care placements. All patients remain in The Gateway for a defined period before moving home or to transitional or permanent supported housing.

The housing accommodation comprises new, fully-furnished houses, bungalows and apartments, designed for clients with mobility problems and managed by Erimus Housing. Lettings are short term. Clients can access social care support and services within The Gateway e.g. physiotherapy, gym and hydrotherapy pool; and self-management support all being on the same site.

Keiro has also partnered Middlesbrough College, and purposefully situated itself next door to the College to promote, and provide easy access to, adult learning courses on topics such as vocational rehabilitation and self-management programmes.

Nationally, rehabilitation services are commissioned under a three tier structure:

- Level 3 are local general services, with teams providing general multi-professional rehabilitation and therapy support for people with a range of conditions;
- Level 2 are local specialist rehabilitation services led, or supported, by a consultant trained and accredited in rehabilitation medicine;
- Level 1 are tertiary 'specialised' services and are high cost / low volume services, which provide for patients with highly complex rehabilitation needs.

The appropriate level for The Gateway is not finalised, although it has the capacity to admit patients with needs falling within the usual remit of Level 2 services. The economic model uses The Gateway as its exemplar, seeking as it does to demonstrate the financial consequences to commissioners of contracting for such facilities.

Keiro also operates a similar facility, Chase Park Neuro Centre in Gateshead. This has been open longer and operational data collected from patients using this site inform the economic model.

The current focus for the Keiro service is the rehabilitation of patients who have neurological issues, hence the focus of neuro-rehabilitation in this analysis. However, the services provided by The Gateway, and associated transitional housing, are applicable to other client groups (e.g. trauma and cardiovascular). Therefore, Keiro is currently seeking to expand the remit of indications and patient cohorts that can be dealt with as part of their service provision.

Section 3: Economic Model Methodology

Commissioners face difficult decisions when commissioning community neuro-rehabilitation services, as part of the clinical pathway to support people with long term neurological conditions. These services aim to improve the quality of life and enhance the opportunities for independent living for clients with neurological disorders. In many cases these services cost more per week than the cost of placing the person in a nursing home. However, in the longer term, if rehabilitation achieves its goals then subsequent health, social care and housing costs should reduce in comparison to those which would otherwise be incurred, in appropriate timelines. An economic model has been developed to examine the likelihood that the higher short-term costs from commissioning the community neuro-rehabilitation service are offset by savings in costs after discharge, enabling commissioners to realise net savings by purchasing such services.

The economic model also includes commissioning decisions related to the provision of transitional housing to accommodate clients requiring some additional support on leaving neuro-rehabilitation care before moving home. These higher housing costs are incurred as part of the pathway required to enable clients to achieve independent living.

As discussed previously, this analysis centres on The Gateway neuro-rehabilitation centre. However, at the time of writing, the centre has only been operational for a short period of time, limiting the current available evidence base. Therefore, data for key model input parameters has been sought from other sources, including Chase Park Neuro Centre, and alternative neuro-rehabilitation services that have been described in the published literature. In order to apply this data to the Keiro service it has been necessary to use simplifying assumptions, and these will be described throughout this section of the report.

The model has been developed to ensure flexibility in input parameters. This means the values used for input parameters can be updated should relevant data be identified and/or be transferred and applied to other potential patient cohorts that would benefit for an integrated service pathway. In particular, once The Gateway has been operational for a few years a larger evidence base will be available to inform the model. Furthermore, whilst the central case model focuses specifically on The Gateway and the South Tees NHS Foundation Trust, it will be possible to adapt the model to other NHS trusts, and therefore use the model to inform decisions relating to community neuro-rehabilitation and/or other patient cohorts requiring an integrated rehabilitation model in other sections of the UK.

3.1 TARGET POPULATION

People with complex neurological conditions who are discharged from acute inpatient care often have on-going physical and psycho-social disabilities. Evidence shows that community based neuro-rehabilitation services can be effective in improving outcomes for such patients (1). Where available, community neuro-rehabilitation facilities integrated with medical care, similar to that offered by The Gateway, can enable such patients to be discharged earlier from acute hospitals. The additional capacity provided by these facilities can also improve overall system efficiencies by providing bed capacity, enabling patients to move from high cost to lower cost settings. The alternative location for many patients with severe disabilities is high dependence nursing care homes, but these lack the medical care and facilities to accommodate the more severely affected patients. Therefore, patients often have to remain in the acute setting for longer before being suitable for discharge. Further, as these care homes do not focus on the rehabilitative aspects of care, patients who are discharged to that setting may not reach their full potential in terms of physical and cognitive function, which in turn will prohibit a return to their usual place of residence. As the patient is not able to make a functional return to society, they are likely to stay in the high dependency care home for many years, often the remainder of their lives. This subset of patients is the focus of the economic model.

The relevant patient group for the model is thus those with neurological conditions who will benefit from neuro-rehabilitation services at discharge from the acute setting. Within this group of patients, four conditions are modelled: stroke, trauma, spinal injuries and long-term neurological conditions (LTNC). LTNC predominately comprise of people with Parkinson's disease and Multiple Sclerosis. These were the four conditions deemed most relevant by Keiro (Personal communication with Ben Hope, Service Development Manager Keiro; January 2015). It was necessary to incorporate the proportion of patients with each of these conditions, and this was determined using data from Jackson *et al.* 2014 [3]. This paper reported a study of patients admitted in 2011/2012 to all nine London specialised in-patient neuro-rehabilitation settings. The patient mix used is summarised in Table 3.1.

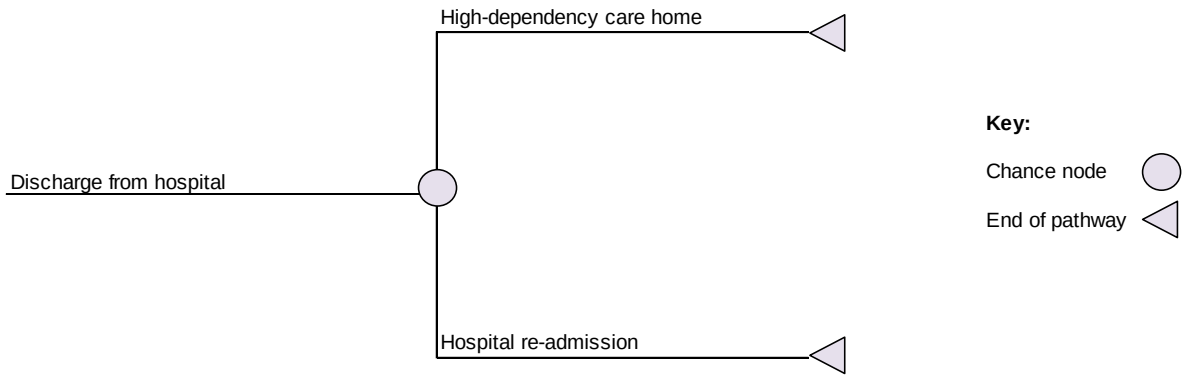
Table 3.1: Patient mix adopted for economic analysis

Condition	Proportion
Stroke	64%
Trauma	19%
Spinal injury	11%
Long term neurological conditions	6%

3.2 MODEL STRUCTURE

For this analysis, two decision trees have been constructed; one for standard care, being discharge from acute setting to a high dependency care home; and one for post neuro-rehabilitation service ('Keiro service' herein). Figures 3.1 and 3.2 outline each decision tree.

Figure 3.1: Standard care decision tree



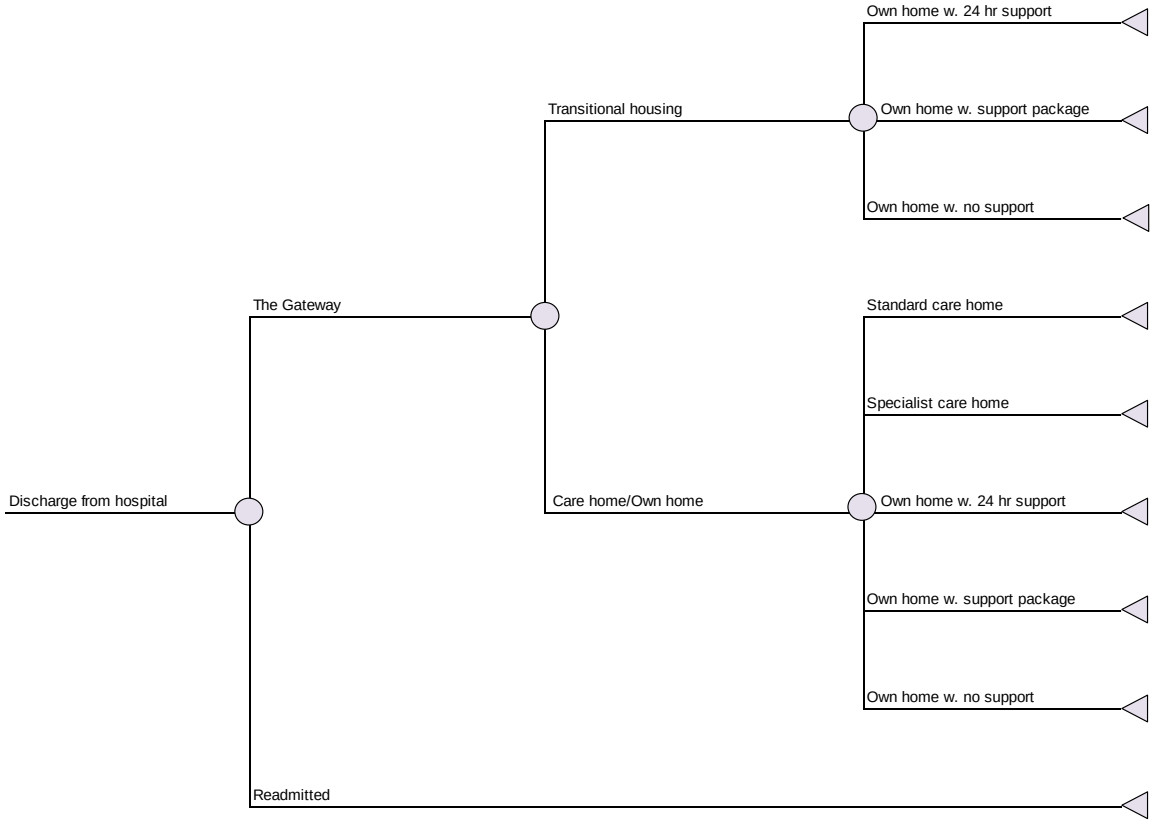
Within the standard care pathway, all patients start in an acute hospital setting, which in the central case analysis refers specifically to a stay in the James Cook University hospital. The length of stay for this acute admission has been determined using Hospital Episode Statistics (HES), a national dataset reporting frequency and duration of hospital admissions [4]. The length of stay for the four main conditions were taken from HES, and weighted against the patient mix (Table 3.1) in order to generate the weighted mean length of stay. Following the episode in hospital, it is assumed all patients move into a high dependency care home, where they remain for the full model time horizon. Within the first 28 days post-discharge there is also a risk that patients will be readmitted to hospital. The rate of readmission for each condition was obtained following a freedom-of-information (FOI) request to the South Tees NHS Foundation Trust. The readmission rates for the four conditions were weighted against the patient mix (Table 3.1) in order to generate the weighted mean readmission rate. Each readmission episode is assumed have the same length of stay as the original inpatient episode, and following the readmission episode all patients return to the high dependency care home.

The length of stay in hospital and readmission rate for each condition is summarised in Table 3.2.

Table 3.2: Length of stay and readmission rate to hospital, standard care

Condition	Length of stay in hospital (days)	Readmission rate at 28 days
Stroke	11.78	10.30%
Trauma	11.53	7.60%
Spinal injury	37.49	0%
Long term neurological condition	9.45	19.25%
Weighted mean	**14.51**	**9.18%**

Figure 3.2: Keiro service decision tree



The Keiro service is more complicated, with a wider range of possible destinations post-discharge. It is expected that the introduction of neuro-rehabilitation services such as The Gateway will enable patients to move from hospitals to the community at an earlier stage in their recovery. It has therefore been assumed that the length of stay in hospital will be 10% lower with the Keiro service pathway, compared to standard care.

As with the standard care decision tree, all patients begin with an inpatient episode, and following discharge there is a risk of readmission. Under the central case, at discharge, all patients enter a neuro-rehabilitation facility (i.e. The Gateway) for six months, but other periods (from 3 to 18 months) can be modelled. As these facilities have medical staff and equipment to treat the majority of adverse events that may require readmission, it is assumed readmissions are limited to patients with life-threatening conditions. A rate of 1% has therefore been adopted for all patients residing in community neuro-rehabilitation, with each readmission having the same length of stay as the original inpatient episode. Following the readmission it is assumed patients will return to The Gateway for the remainder of the rehabilitation period. To ensure the model is not overcomplicated, it is assumed that patients who have had a readmission episode will be discharged to a standard care home following the period in The Gateway, and they will remain there for the full time horizon.

Following the period within The Gateway, 50% of patients are assumed to move into transitional housing, with the remaining 50% moving straight into their own home or a care home. (Personal communication with Ben Hope, Service Development Manager Keiro; January 2015). For care home/own home patients there are five potential options, which can be seen in Figure 3.2. The proportion of patients moving to each of these options was determined using discharge data from Chase Park Neuro Centre. These data are summarised in Table 3.3. It should be noted that patients being discharged from this centre do not have the option of moving into transitional housing. As such, a higher proportion of patients discharged from Chase Park will end up in specialist care homes, compared to The Gateway. Therefore, the values used in the model are likely to overestimate the number of patients discharge from The Gateway to specialist housing.

In the central case it is assumed that patients remain in the transitional housing for six months, before returning to their own home. There are three possible levels of care packages required for people leaving transitional housing to their own home, varying from 24 hour support to no support (see Table 3.3). For all of the discharge destinations outlined in Table 3.3, it is assumed that patients stay there for the remaining time horizon.

Table 3.3: Location at discharge from the Gateway and Transitional Housing

Discharge Destination	Proportion at destination following the Gateway	Proportion at destination following Transitional Housing
Standard care home	6%	
Specialist care home	11%	
Own home with 24hr support	17%	20%
Own home with targeted support	44%	53%
Own home with no support	22%	27%

3.3 COSTS AND RESOURCE USE

3.3.1 Hospital Costs

The model has been designed to measure the impact of providing the neuro-rehabilitation services akin to those offered at The Gateway from both a commissioner and a provider perspective. Therefore, both the tariff payments received by the hospital for treating patients, and the actual cost of providing care to patients, are considered within the model. Tariff payments, for each of the four conditions, are based on the 2013/14 Payment by Results tariff published by the Department of Health [5]. For the 2013/14 tariffs, the payment a hospital receives was determined by the condition, the severity of the condition (i.e. whether patients suffer from complications and comorbidities) and the length of time spent in hospital. The length of time spent in hospital is particularly important to both commissioners and providers. This is because the hospital receives a set payment, regardless of the length of stay, up to a trim point. Once a patient has reached this trim point, the hospital receives a long stay payment for every extra day a patient spent in hospital. This concept can be explained using an example. Take a stroke patient with a standard tariff of £3,918, a trim point of 46 days and a long stay payment of £207 per day. If a patient remains in hospital for

5 days the hospital receives £3,918, and equally, if s/he remains in hospital for 46 days the hospital also receives £3,918. It is, therefore, in the hospital's interest to discharge the patient as quickly as possible, provided that s/he does not require to be re-admitted within 28 days. (Such readmissions are not paid for by commissioners). Alternatively, if the patient is discharged at 50 days, the hospital will receive the £3,918 tariff plus 4 days of £207 long stay payments, equating to a total payment of £4,746. The tariff values used in the model for all conditions are summarised in Table 3.4.

It should be noted that if patients are readmitted within 28 days of discharge, the hospital will only be reimbursed via tariff payments if the readmission is deemed to be unavoidable. Therefore, commissioners are not required to reimburse avoidable readmissions, and instead are expected to reinvest this money in programmes and services that aim to reduce avoidable admissions (including rehabilitation). Within this analysis it is assumed that all readmission episodes are unavoidable, and therefore, hospitals are fully reimbursed for all patients.

When using tariff values, the Market Forces Factor (MFF) must also be considered. The MFF determines payment values for individual NHS trusts, based on costs in the local area. MFF values are always one or greater, with the value higher in areas where the cost of healthcare provision is more expensive (e.g. central London). Within this analysis the MMF value for South Tees NHS Foundation Trust is used (1.029) and this can be updated for local adaptations.

Table 3.4: Summary of tariff values used in the model (2013/14)

	Stroke	Trauma	Spinal cord injury	Progressive LTNC
Healthcare Resource Group (HRG) codes[1]	AA22C, AA22D, AA22E, AA22F	AA02C, AA02D, AA02E	HC21D	AA25C, AA25D, AA25E, AA25F
Non-elective tariff	£3,918	£6,231	£12,477	£2,752
Trim point (days)	46	43	192	24
Long stay payment (per day)	£207	£207	£239	£207
Total payment (based on patient mix) – standard care			£5,408	
Total payment (based on patient mix) – Keiro service			£5,408	

[1] HRG codes are groupings used to classify patients based on their condition, and the severity of their condition.

Tariff payments are relevant to both commissioners and care providers, as they determine how commissioners spend their budget and determine the amount providers receive for their services. However, for providers the cost of delivering care will not necessarily match the tariff payment they receive. It is therefore important to consider the cost of actually providing care to the patients in this analysis. These costs were estimated by extracting costing information from the NHS Reference Cost database, using the same HRG codes used to establish tariff payments [6]. Table 3.5 sets out the cost per inlier bed day, cost per excess bed day and mean cost per stay. Inlier bed days are those that occur before the trim point, whilst excess bed days are those that occur after the trim point (the same trim point applies to both tariff payments and NHS Reference Costs).

Table 3.5: Summary of NHS Reference Cost values used in the model (2013/14)

	Stroke	Trauma	Spinal cord injury	Progressive LTNC
Cost per inlier bed day	£336	£692	£476	£297
Cost per excess bed day	£265	£268	£122	£262
Mean cost per stay	£4,441	£8,243	£18,448	£3395
Total cost (based on patient mix) – standard care			£6,686	
Total cost (based on patient mix) – Keiro service			£6,362	

3.3.2 Keiro Costs

3.3.2.1 Costs of neuro-rehabilitation

The weekly charges levied by The Gateway are assumed to be typical of the cost for community neuro-rehabilitation stays faced by commissioners. The charges are determined by the level of care required, varying from basic to very high, and are weighted by the bed distribution in each category. The average weekly cost is then multiplied by the average length of stay (i.e. six months in the central case) to determine the average cost per stay. These costs are summarised in Table 3.6. As a conservative assumption, it is assumed that readmitted patients incur the cost of staying in The Gateway whilst in hospital.

Table 3.6: Average cost per stay in the Gateway

Level of care required	Number of beds for each level of care	Weekly Cost
Basic	0	£1,000
Intermediate	10	£1,375
High	20	£1,800
Very high	10	£2,500
Average weekly cost		**£1,869**
Average cost per stay		**£48,588**

3.3.2.2 Transitional housing

For transitional housing stays two separate costs are incurred by patients or other funders. Firstly, there is the cost of the accommodation itself of £235 per week (Personal communication with Ben Hope, Service Development Manager Keiro; March 2015). This includes: rent, service charge, bills (gas, electricity and water) and council tax. Secondly, there is the cost of living support, with a central estimate of £643 used in this analysis, equating to six hours of support per day at a cost of £15.30 per hour (based on care being supported by an independent provider) [7]. The average weekly cost of transitional housing adopted in the model is therefore £878, and this weekly cost is multiplied by the length of stay (central case = six months) in order to generate the average cost per stay of £22,818 (see Table 3.7.)

Table 3.7: Average cost per stay in transitional housing

Elements of Care	Weekly Cost
Accommodation costs	£235
Living support	£643
Average weekly cost	**£878**
Cost per stay	**£22,818**

3.3.3 Community Care Costs

As discussed previously there are five possible locations for clients, once they are living in the community. Clients are assumed to stay in the same location for the remaining time horizon of the model. The weekly cost assigned to each of the five locations, and the source for the data adopted, are summarised in Table 3.8. Within the standard care arm, the cost of high dependency care homes (£1,305 per week) is important, given that patients remain there after discharge from hospital, for the full time horizon of the model (central case = 10 years). The value of £1,305 is taken from Personal Social Services Research Unit (PSSRU), which reports a wide range of costs relating to community care. Within PSSRU, the weekly cost of nursing/residential homes for patients with brain injury rehabilitation is reported, and this was deemed equivalent to the cohort assessed in the model. A wide range of values is reported (£1,305 - £2,899), but in order to remain conservative the lowest value in this range was adopted for the model. The impact of altering the value of this input parameter was also investigated within the sensitivity analysis undertaken.

High dependency care homes and specialist nursing homes are assumed to have equivalent costs within the analysis. This is because, whilst they belong to different categories of nursing/care homes, it is expected that will have very similar costs for the particular group of patients assessed within this analysis. The weekly costs used in the model can be updated for local adaptations, should area-specific data become available.

Table 3.8: Community costs

Destination	Weekly cost	Source
High dependency care home	£1,305	PSSRU 2013/14 (Table 18.2) [7]
Standard care home	£750	Laing & Bussion 2013/14 [8]
Specialist nursing home	£1,305	Same as high dependency care home
Own home with 24 hour support	£655	Average cost of 24hr support from 3 independent providers: Agincare, Safe Hands and Christies Care
Own home with targeted support	£241	2 x 1hr visits per day at £17.20 per hour [9]
Own home with no support	£0	Assumption

3.4 OTHER MODELLING CONSIDERATIONS

Within the model, a 10 year time horizon was adopted for the central case analysis. Results for the following time points can also be reported from the model: 1 year, 2 years, 5 years, 15 years and 20 years. A 10 year time horizon was adopted for the central case, as data from the Information Services Division, part of NHS Scotland, state that the mean length of stay for patients with a physical disability residing in a care home (equivalent to the patients in this model) is 9.7 years [9].

As costs and savings are estimated for future time periods it is necessary to apply a discount rate to reflect the opportunity cost of capital. A rate of 3.5% per year was applied, as required by Treasury Department guidelines [10].

Within economic evaluations it is common to formally assess the health outcomes of patients. This is generally achieved using cost utility analysis (CUA), in which the quality of life that patients achieve with each pathway is quantified, and compared with the cost of delivering care. It was not possible to formally quantify quality of life within this analysis as primary evidence from patients using The Gateway and transitional housing was not available. Further, a literature review failed to identify suitable data from secondary sources. Hence it has been necessary to evaluate the Keiro service using cost consequence analysis (CCA). During CCA, health outcomes are not formally considered, but rather all outcomes are considered in terms of cost. Therefore, the cost effectiveness of the Keiro service has been assessed by quantifying the overall cost difference against standard care.

The majority of economic evaluations that are undertaken adopt the perspective of the NHS and social care only. If that perspective was adopted for this analysis then housing costs would not be incorporated, as the majority of these costs are borne by local authorities, and often individual patients and their families. The NSF notes that the provision of suitable accommodation at each stage in a pathway is integral to maximising patient independence. Therefore, the analysis has been expanded to incorporate housing costs, alongside NHS and social services expenditure.

As part of the analysis it has not been possible to include all aspects of care. In particular GP costs are not formally incorporated into the model. As these costs have been excluded, this equates to assuming these costs are equivalent for standard care and the Keiro service. In reality, it is likely that patients who have been rehabilitated within The Gateway will have fewer contacts with primary care due to improved overall health. However, data limitations mean this effect cannot be quantified for either the Keiro or standard care pathway. Similarly, it is conservatively assumed that adverse events will be the same in both pathways, again due to data limitations.

3.5 IMPACT OVER TIME

The main model follows one cohort of 40 patients, as they move through either the standard care or Keiro pathways, to estimate the total costs accrued. However, it is also relevant to view the impact on costs of multiple cohorts. This is because new patients will be admitted to The Gateway as patients in the initial cohort are discharged. A scenario has been developed which assumes that a new cohort of patients enters The Gateway (or the standard care pathway), once the previous cohort has been discharged.

Over this longer time period it is unrealistic to assume that The Gateway will be fully occupied at all times. Therefore, an occupancy rate of 80% has been applied in the central case. For each 40 patient cohort using the Keiro service, this equates to 32 patients entering The Gateway as normal, and the remaining 8 patients following the standard care pathway. The standard care pathway is unchanged.

For these calculations, it is assumed that patients remain in The Gateway for six months, and those moving onto transitional housing also have a six month length of stay. The impact on total costs is estimated over a 10 year time horizon. Therefore, the calculations assume 80 patients each year, equating to a total of 800 patients over 10 years, are managed in each of the Keiro and standard care pathways.

The impact of increasing the occupancy rate to 100% within The Gateway (i.e. all beds are occupied at all times) is also estimated.

3.6 SENSITIVITY ANALYSES

In order to examine uncertainty regarding parameter values, one-way and two-way sensitivity analyses have been undertaken. Sensitivity analyses involve altering parameter values within extreme but plausible ranges, to examine the impact this has on model results. A model can be considered robust if these changes do not significantly change the results. Within the model, the following parameters have been assessed during DSA:

- Length of stay in hospital;
- Readmission rate;
- Mean cost per stay in hospital;
- Community care costs;
- The cost of The Gateway and transitional housing.

A complete list of all the parameters assessed, and the value ranges used, are included in Appendix A. As discussed previously, it is also possible to alter the following in the model: length of stay in neuro-rehabilitation (The Gateway) over 3, 6, 8, 12 and 18 months; length of stay in transitional housing over 3, 6 and 12 months; and complete time horizon over 1, 2, 5, 10, 15 and 20 years.

Section 4: Results and Sensitivity Analyses

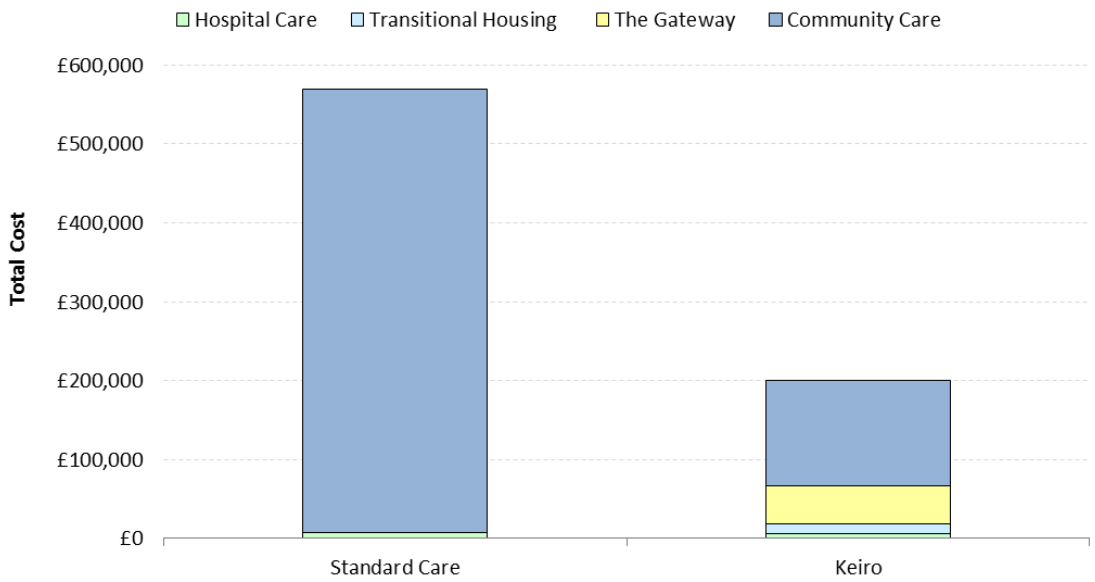
4.1 SUMMARY OF RESULTS

Under the central case, the cost of The Gateway service is estimated at £48,588 per patient for a six month stay, with transitional housing costing £11,295. This makes Keiro initially slightly more expensive than standard care. However, savings are generated over longer time horizons because the introduction of neuro-rehabilitation leads to a saving of £868 in hospital costs, from earlier discharge and avoided readmission, and £428,301 in community care costs over the 10 year period. Overall, the introduction of a pathway similar to that adopted by Keiro leads to total savings of £14.8 million for a cohort of 40 patients, reducing standard care costs from £22.8 million to £8.0 million. The equivalent savings per patient are £369,286. A full breakdown of per patient costs is given in Table 4.1, and shown graphically in Figure 4.1.

Table 4.1: Breakdown of results per patient (10 year time horizon)

	Standard Care	Neuro-rehabilitation at The Gateway	Impact of The Gateway
Hospital care	£7,300	£6,432	-£868
The Gateway	£0	£48,588	£48,588
Transitional housing	£0	£11,295	£11,295
Community care	£561,511	£133,210	-£428,301
TOTAL	**£568,811**	**£199,524**	**-£369,286**

Figure 4.1: Graphical depiction of total costs per patient over 10 years



The total costs of standard care and Keiro, over time, are shown in Figure 4.2 and 4.3. Figure 4.2 indicates that initially, whilst the person receives rehabilitation (with a duration of six months) that pathway is more expensive than standard care, with the breakeven point occurring around 12 months. Thereafter, the rehabilitation pathway becomes cost saving, and the magnitude of savings increases as time progresses, as shown in Figure 4.3.

Figure 4.2: Costs over time per patient – years 0-2

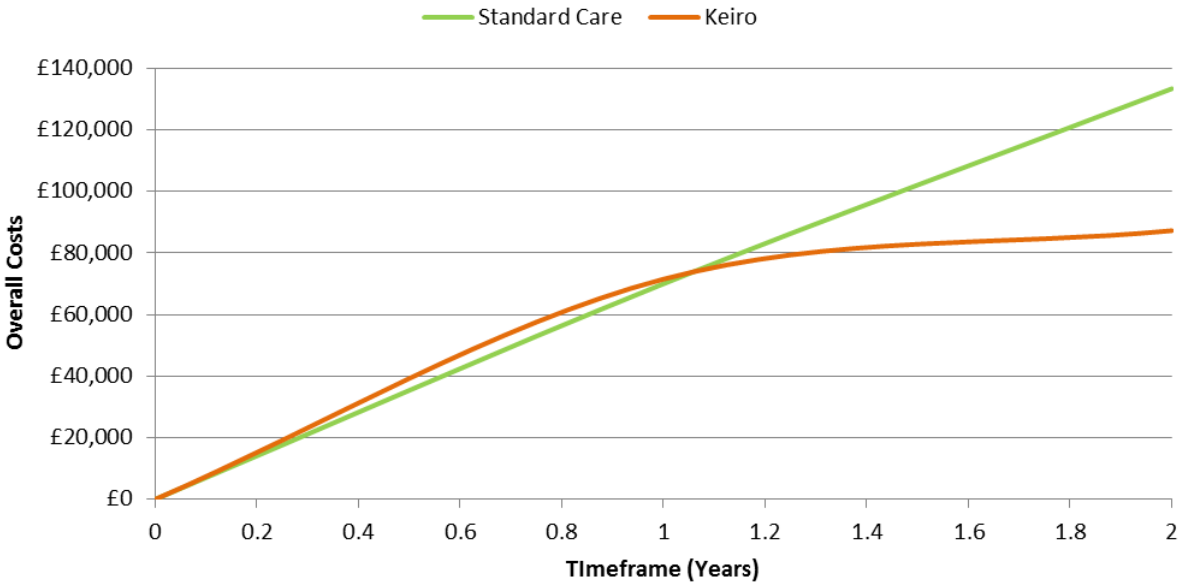
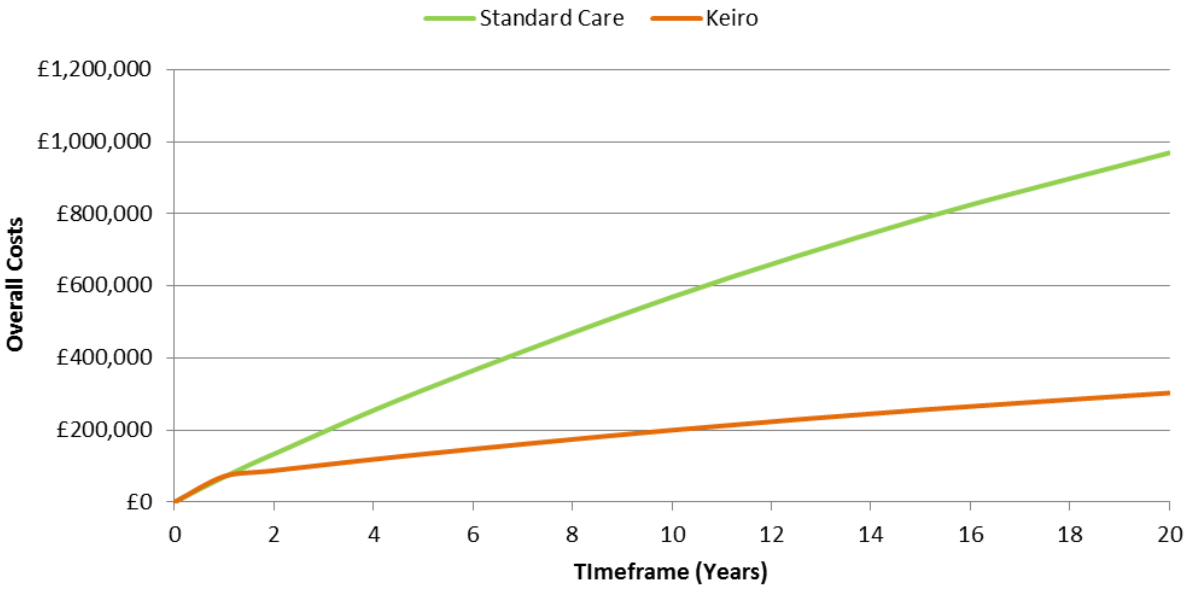


Figure 4.3: Costs over time per patient – years 0-20



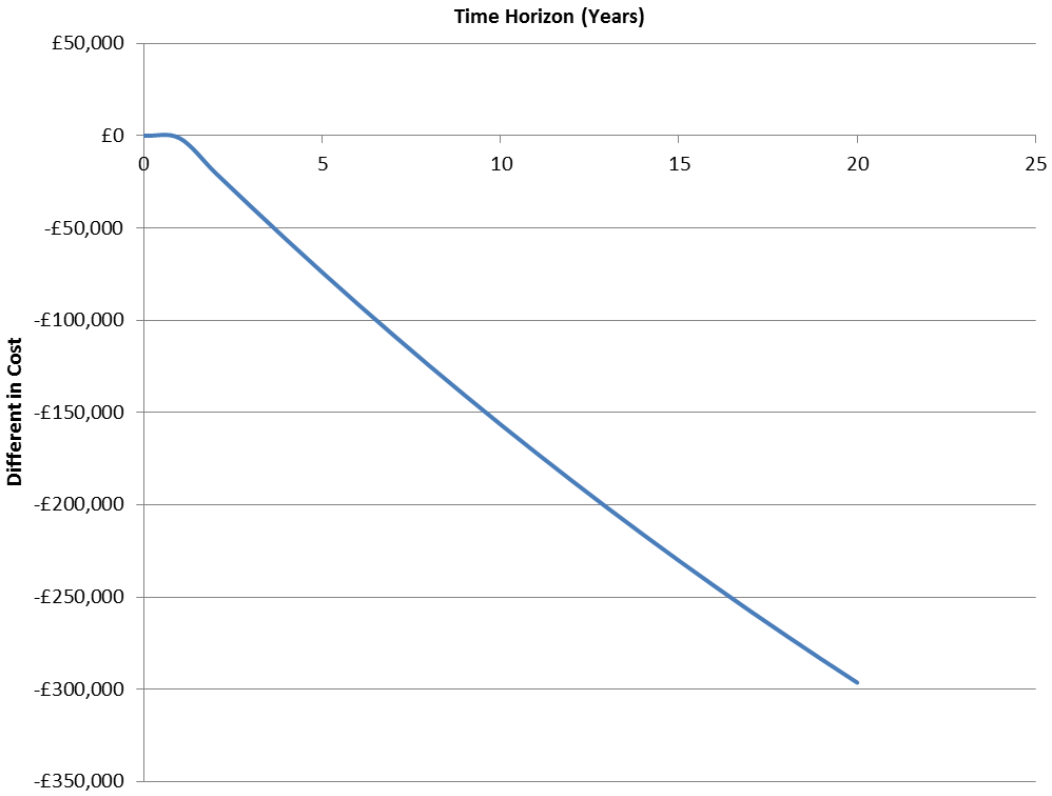
From the acute hospital provider perspective, adopting the Keiro service with the associated reduction in readmission episodes, leads to lower tariff payments of £442 per patient. However, this reduction in readmissions, combined with shorter hospital stays, leads to savings of £868 per patient. When the tariff payments and actual NHS costs are combined, this leads to a reduction in per patient costs of £425, indicating the adoption of Keiro will benefit hospitals.

4.2 IMPACT OVER TIME

Over the 10 year time horizon, and assuming a new cohort of 40 patients replaces each previous cohort at discharge, it is estimated that at an occupancy rate of 80% Keiro produces savings of £125 million, or £156,469 per patient. This equates to accumulated costs of £139 million in the Keiro pathway (including costs of £53 million for the 20% of patients who do not enter the Gateway) and £264 million in the standard care pathway. The cost difference between the standard care and Keiro pathways, over time, can be viewed in Figure 4.4. Over a 20 year time frame, the savings from commissioning community rehabilitation in a 40-bed facility such as The Gateway was estimated at £474 million (£296,397 per patient). However, it should be noted that this last estimation assumes that all standard care patients remain in high dependency care homes for 20 years. In reality, over this period a number of patients will die or move to a less resource intensive setting (e.g. own home with targeted support). As such, the cost difference is likely to be somewhat lower in reality.

Should occupancy of The Gateway increase to 100% (i.e. beds within The Gateway are fully occupied at all times), then it is estimated that Keiro produces savings of £156 million over the 10 year time horizon, with costs of £108 million compared to £264 million if patients are managed in standard care. This equates to per patient savings of £195,586. Over a 20 year time frame, the savings are estimated at £593 million (£370,469 per patient).

Figure 4.4: Per patient cost difference (cost of standard care minus cost of Keiro service) over twenty years



4.3 SENSITIVITY ANALYSIS

The impact of the overall time horizon, and the length of stay within The Gateway and transitional housing, are summarised in Table 4.2 and Table 4.3 respectively. Table 4.2 indicates that the break-even point occurs shortly after year one, and the cost difference increases for each subsequent year, showing that Keiro becomes more cost effective as time progresses. Table 4.3 shows that the length of stay in both The Gateway and transitional housing are important to the cost difference, with the length of stay in The Gateway having the most significant impact. Nevertheless, in all of these scenarios, the Keiro service remained cost effective compared to standard care after the 10 year time horizon assessed in the central case.

Table 4.2: Impact of the time horizon on per patient cost difference (Keiro service minus cost of standard care)

Time point	Overall cost difference
1 year	£1,537
2 years	-£46,069
5 years	-£177,804
10 years	-£369,286
15 years	-£530,510
20 years	-£666,256

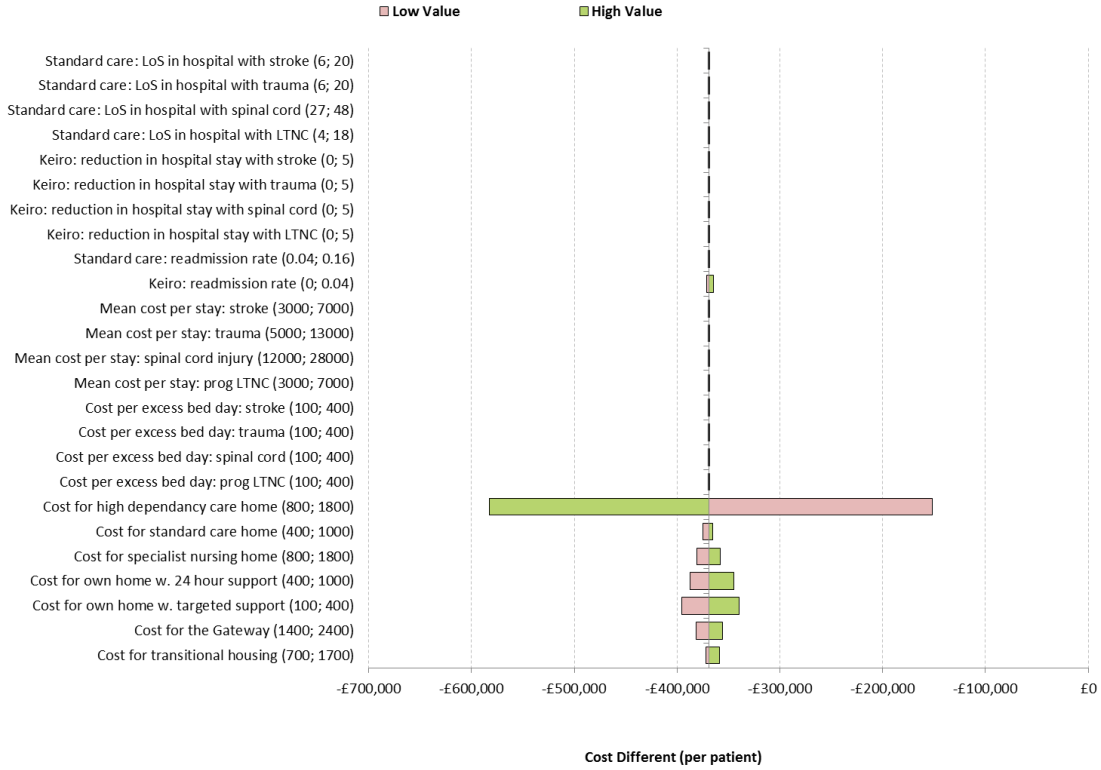
Table 4.3: Impact of length of stay within Keiro services on per patient cost difference (Keiro service minus cost of standard care)

Length of stay in care center		Overall savings (per patient)	Breakeven point
The Gateway	Transitional housing		
3 months	3 months	-£393,403	Keiro always cost saving
3 months	6 months	-£389,363	Keiro always cost saving
3 months	12 months	-£381,221	Keiro always cost saving
6 months	3 months	-£373,334	11 months
6 months	6 months	-£369,286	12.5 months
6 months	12 months	-£361,098	16 months
12 months	3 months	-£333,134	22 months
12 months	6 months	-£329,040	22.5 months
12 months	12 months	-£320,844	25 months
18 months	3 months	-£288,608	32 months
18 months	6 months	-£296,887	32.5 months
18 months	12 months	-£280,315	36 months

4.3.1 One-Way Deterministic Sensitivity Analysis

The DSA undertaken is summarised in Figure 4.5. It indicates that the model is robust to changes in input parameter values, as within the ranges assessed, alterations had little impact on the overall cost difference. The parameter with the largest impact was the cost of high dependency care homes. However, even at the lowest value assessed (£800 per week), the Keiro service still produced per patient savings of around £110,000 over the 10 year time horizon, with financial break-even at just over two years.

Figure 4.5: Summary of Sensitivity Analysis (via Tornado Diagram) on per patient cost difference (Keiro service minus cost of standard care)



4.3.2 Two-Way Deterministic Sensitivity Analysis

The DSA undertaken indicates that the cost of high dependency care homes has the largest impact on the model results. Therefore, the impact of this input parameter has been assessed in more detail using two-way DSA. This involves altering two parameter values simultaneously to see how this affects model results. The focus of the analysis is both the cost of high dependency care homes, and the model time horizon. However, the impact of length of stay in The Gateway, and the cost of The Gateway were also examined. In total three scenarios were assessed, and these are shown in Figures 4.6, 4.7 and 4.8. These scenarios indicate that the cost differences modelled are sensitive to simultaneous changes in the input parameters for the cost of high dependency care homes and the length of stay in The Gateway. However, even when extreme values were used for both parameters (i.e. a cost of £800 for high dependency care home stay and a length of stay of 18 months at The Gateway), the Keiro service still remained cost effective at 10 years, with associated per patient savings of £71,319 and financial break-even at year 6 (see Figure 4.7).

Figure 4.6: Two-way DSA – Scenario one: Impact of central case length of stay and weekly cost for The Gateway on cost savings

Key:

Red text	Cost greater than £0 = Keiro cost incurring
Green text	Cost less than £0 = Keiro cost saving

Parameters:

Length of stay in the Gateway = 6 months (central case value)

Average weekly cost of The Gateway = £1,869 (central case value)

		Time Horizon					
		1 year	2 years	5 years	10 years	15 years	20 years
Cost of High Dependency Care Home	£800	£25,805	£2,713	-£60,343	-£151,997	-£229,167	-£294,142
	£1,000	£16,194	-£16,607	-£106,862	-£238,052	-£348,511	-£441,514
	£1,200	£6,583	-£35,926	-£153,381	-£324,107	-£467,854	-£588,885
	£1,400	-£3,028	-£55,246	-£199,900	-£410,163	-£587,198	-£736,257
	£1,600	-£12,639	-£74,565	-£246,419	-£496,218	-£706,542	-£883,629
	£1,800	-£22,250	-£93,885	-£292,939	-£582,273	-£825,885	-£1,031,000

Figure 4.7: Two-way DSA – Scenario two: Impact of 18 month stay and central case weekly cost for The Gateway on cost savings

Key:

Red text	Cost greater than £0 = Keiro cost incurring
Green text	Cost less than £0 = Keiro cost saving

Parameters:

Length of stay in the Gateway = 18 months

Average weekly cost of The Gateway = £1,869 (central case value)

		Time Horizon					
		1 year	2 years	5 years	10 years	15 years	20 years
Cost of High Dependency Care Home	£800	£117,746	£83,606	£20,335	-£71,319	-£148,489	-£213,464
	£1,000	£108,135	£64,287	-£26,184	-£157,374	-£267,833	-£360,836
	£1,200	£98,524	£44,967	-£72,703	-£243,429	-£387,176	-£508,207
	£1,400	£88,913	£25,648	-£119,222	-£329,485	-£506,520	-£655,579
	£1,600	£79,302	£6,328	-£165,741	-£415,540	-£625,864	-£802,951
	£1,800	£69,691	-£12,991	-£212,260	-£501,595	-£745,207	-£950,322

Figure 4.8: Two-way DSA – Scenario three: Impact of 18 month stay and increased cost for The Gateway on cost savings

Key:

Red text	Cost greater than £0 = Keiro cost incurring
Green text	Cost less than £0 = Keiro cost saving

Parameters:
Length of stay in the Gateway = 18 months
Average weekly cost of The Gateway = £2,400

		Time Horizon					
		1 year	2 years	5 years	10 years	15 years	20 years
Cost of High Dependency Care Home	£800	£159,183	£125,044	£61,773	-£29,881	-£107,051	-£172,027
	£1,000	£149,572	£105,724	£15,254	-£115,936	-£226,395	-£319,398
	£1,200	£139,961	£86,405	-£31,265	-£201,992	-£345,739	-£466,770
	£1,400	£130,350	£67,085	-£77,785	-£288,047	-£465,082	-£614,141
	£1,600	£120,739	£47,766	-£124,304	-£374,102	-£584,426	-£761,513
	£1,800	£111,128	£28,446	-£170,823	-£460,158	-£703,770	-£908,885

Section 5: Qualitative Assessment of Benefits

5.1 PRAGMATIC LITERATURE SEARCH

A pragmatic literature search was undertaken to identify policy documents and clinical guidelines relating to neuro-rehabilitation plus related activities including self-management, peer support, emotional support, exercise, education; psychological support, and advice to people with neurological conditions. Websites searched include Department of Health, NHS England, National Institute for Health and Care Excellence (NICE), Royal Colleges, British Society of Rehabilitation Medicine, Care Quality Commission, King's Fund and Nuffield Trust. General Google searches were also conducted.

No formal inclusion and exclusion criteria were adopted. Rather documents were included if they provided information to answer the research question: *'What policy objectives and clinical standards apply to neuro-rehabilitation services such as those provided at The Gateway?*' A broad definition of policy and standards was adopted to include quality standards and evidenced based interventions. This pragmatic search does not provide the rigour of systematic review methodology.

5.2 FINDINGS

Three key documents were identified being:

- Care Act 2014 [11];
- NHS Mandate 2015/16 and Five Year Forward View NHS 2104 [12],[13];
- Wessex Rehabilitation, Reablement and Recovery Quality Guidance Document [14].

The relevant principles from these documents are presented, followed by a summary of other documents, grouped by authoring body. Findings are reported by publisher, starting with the Department of Health, NHS England, NICE and then other groups publishing standards. The final section suggests how this analysis may inform future research.

5.2.1 Care Act 2014

In April 2015, the majority of the Care Act 2014 came into force placing new obligations on local authorities when carrying out their care and support responsibilities and replacing most of the previous law regarding carers and people being cared for [11]. It identifies that the core purpose of adult care and support is to help people achieve the outcomes that matter to them, so focuses on promoting the 'wellbeing' of the person concerned and their carer. At the core of "wellbeing" is the concept of 'independent living", addressing:

- Physical and mental health and emotional wellbeing;
- Control by the individual over day-to-day life, including participation in work, education, training, recreation and society;
- Suitability of living accommodation.

Relevant principles which local authorities must have regard to when carrying out functions include:

(a) All care must be person-centred and the individual is best-placed to judge their wellbeing;

(b) Local authorities should deliver effective interventions at the right time to stop needs from escalating, and help people maintain their independence for longer.

Now local authorities must provide services, including rehabilitation, to support people with complex health conditions to regain skills and increase their independence. Such services should also improve the lives of carers, offering respite care and peer support groups to share learning and coping skills. Central to the vision is that the delivery of intermediate care through greater integration and co-operation between health, housing and local authorities. The Act places a duty on the local authority to carry out their care and support functions with the aim of integrating services with those provided by the NHS or other health related services (e.g. housing) to improve people's well-being. This is seen as one of the key ways to improve the effectiveness of commissioning and service delivery and to achieve efficiencies across the care and support system.

Other sections set out provisions relating to:

- Assessments, charging, cap on care costs, establishing entitlements, care planning, and the provision of care and support;
- Safeguarding of adults;
- Ensuring continuity of care where a provider fails;
- Transition for young people between children's and adult care.

Part Two of the Act seeks to improve care standards by putting people and their carers in control of their care and support and increasing transparency and openness. The powers of the Care Quality Commission and Monitor are also strengthened.

The principle of seeking to maximise an individual's potential wellbeing is key to the Keiro philosophy. It also recognises the need for timely, preventative interventions to delay or avoid the need for increasing care requirements over time.

5.2.2 NHS Mandate 2015/16 and Five Year Forward View NHS 2014

The Mandate [12] contains Government directions to NHS England which it is legally required to follow. Requirements include NHS England reporting progress against specified indicators. In the 2015/16 Mandate two new improvement areas were introduced relating to mental health and better integration of care across services.

The five areas identified as of greatest importance to people are:

1. Preventing ill-health, and providing better early diagnosis and treatment of conditions such as cancer and heart disease;
2. Managing ongoing physical and mental health conditions such as dementia, diabetes and depression; to improve quality of life, through integrated services;
3. Helping patients recover from episodes of ill health such as stroke or following injury;
4. Providing better care and treating patients with compassion, dignity and respect;
5. Providing safe care.

Each area has a range of objectives and, for each objective, specified indicators to measure progress. Directly relevant to Keiro are the improvement area and related indicators:

- 'Helping people to recover from episodes of ill health or following injury';
- 'Proportion of people who recover from major trauma';
- 'Proportion of stroke patients reporting an improvement in activity/lifestyle on the Modified Rankin Scale at 6 months.'

Several other indicators are congruent with the Keiro philosophy including:

- Ensuring people feel supported to manage their condition;
- Improving functional ability in people with long-term conditions;
- Reducing time spent in hospital by people with long-term conditions;
- Enhancing carers' quality of life;
- Helping older people recover independence after illness or injury;
- Ensuring people have a positive experience of care.

In October 2014, NHS England and partner organisations published a five year framework for further detailed planning about how the NHS evolves [13]. This had three main themes:

1. Greater emphasis on prevention and public health;
2. Patients having more control over their health and social care, with more support for unpaid carers and the NHS being a better partner with voluntary organisations and local communities;

3. NHS will encourage integration within health and between health and social care, with more care delivered locally.

Steps necessary to deliver such changes include empowering patients by improving the information accessed, providing group-based education for people with specific conditions and self-management educational courses, and encouraging independent peer-to-peer communities. The plan includes introducing integrated personal commissioning (IPC), described as 'a voluntary approach to blending health and social care funding for individuals with complex needs. As well as care plans and voluntary sector advocacy and support, IPC will provide an integrated, "year of care" budget that will be managed by people themselves or on their behalf by councils, the NHS or a voluntary organisation.'

The NHS England Business Plan 2014/15–2016/17 [15] is also be relevant. It sets out plans across 21 business areas, and identifies the resources devoted to the integration agenda.

5.2.3 Wessex Rehabilitation, Reablement and Recovery Quality Guidance Document

Wessex Strategic Clinical Networks has outlined its approach to rehabilitation, re-enablement and recovery [14]. Implementation of the general principles and quality requirements should ensure the equitable provision of clinically and cost effective community rehabilitation. It was produced in collaboration with patients, third sector organisations, commissioners and service providers. Its advice and guidance is judged relevant to all who are commissioning generic community rehabilitation services. Key drivers underpinning the guidance are:

a) NHS Outcomes Framework particularly Domain 2 - Enhancing the quality of life for people with long term condition, and Domain 3 – Helping people to recover from episodes of ill health or following injury;

b) Adopting a person-centred, whole system approach using integrated services.

Quality outcomes have been developed for the four priority areas that were identified by stakeholders being:

1. Movement out of hospital with two associated quality principles:
- Prior to admission or from admission, patients and their multidisciplinary teams plan and work towards a timely and safe discharge with agreed outcomes individualised to the needs of the patient that will promote health, wellbeing and quality of life;
- Patients are discharged from acute care with a clear and agreed plan of how their rehabilitation and care will continue in the community.

2. Accessing services (pathways) with three associated quality principles:
- A range of services are in place and easily accessible to support the individual long term needs of individuals and their carers;

- All individuals requiring rehabilitation/reablement/recovery should be able to access appropriate services regardless of their clinical condition and personal circumstances, ensuring that there is equitable eligibility;
- Rehabilitation/reablement/recovery services should be proactive, rather than reactive, and goal orientated.

3. Supported self-management with six associated quality principles:

- It is acknowledged that people have differing capacity to self-manage but, where appropriate, every person should be encouraged and supported to take ownership of their own care;
- There should be an ethos of moving from supported self-management to self-management, where at all possible, with an ideal of individuals being active rather than reactive;
- The whole person should be the focus, incorporating both physical and mental wellbeing, and involving family and carers as well as the individual themselves;
- Rehabilitation, reablement and recovery should be person led, evolving and lifelong in order to maintain health and wellbeing and achieve maximum potential;
- Services should instil hope, support ambition and balance risk to maximise outcome and independence;
- Support and information that enables choice and confidence to self-manage should be provided at the right time to meet the individual's needs.

4. Quality outcome measures and key performance indicators with one system, three process and six quality measures are recommended.

The recommendations for each area are supported by a rationale, related evidence, and examples of innovative practice and associated quality requirements. The document also addresses system design, commissioning, research, audit and improvement, workforce development and workforce collaboration.

Delivery of services such as those provided by Keiro is consistent with the second priority area, whilst Keiro's philosophy is one of supported self-management, consistent with priority area 3. Future plans include developing its existing performance indicators and outcome measures.

5.2.4 Department of Health Policy Documents

Many of these policy documents informed the Care Act 2014 and thus the policies have now been enshrined in statute.

5.2.4.1 Quality requirements NSF for long-term conditions

The NSF for Long-term Conditions [1] sets 11 quality requirements (QRs) designed to support people with long-term neurological conditions in living as independently as possible. These were informed by a literature review to identify evidence from services for people with

neurological conditions. These were to be fully implemented by 2015. The QRs most relevant to Keiro are:

- Improving access to rehabilitation services so that people disabled as a result of a neurological condition can achieve and maintain the greatest possible level of independence and social inclusion (QR4–6);
- Providing flexible services and packages of care and accommodation to help people live as independently as possible according to their own choices (QR7–8);
- Supporting families and carers (QR10).

Carers of people with long-term neurological conditions are to have access to appropriate support and services that recognise their needs as a carer and in their own right.

Some key research findings from the literature include:

- Community rehabilitation is cost effective. It can help reintegration, provide increased independence, improve wellbeing, lessen the burden on carers, reduce reliance on services, prevent unnecessary hospital admissions, enable social participation and lead to substantial long term savings;
- Targeted rehabilitation programmes can increase participation in social and leisure activities and reduce inappropriate behaviour and emotional problems;
- Counselling and psychological support aid adjustment to altered personal, family and social circumstances and are highly valued by recipients and their families;
- Appropriately adapted accommodation can improve independence and quality of life, reduce care and support needs, reduce risk of injury (e.g. from falls) thereby avoiding admission to residential or hospital care and the resulting loss of independence;
- Family relationships and carers can be put under severe financial and psychological pressure, particularly where there are cognitive, emotional and behavioural problems, leading to the family becoming increasingly isolated. Partners experience particular pressures which often cause deterioration in their physical and mental health.

Keiro's model of socially focused support, working with a range of partners, to help people regain their independence is designed to meet these Intentions and Outcomes. These objectives are patient centred and provide integrated care. However, there is no discussion of outcomes relevant to people with long-term neurological conditions. Recent research funded by the National Institute for Health Research [16] developed a checklist comprising 20 relevant outcomes in three domains – 'personal comfort', 'economic and social participation' and 'autonomy'. These domains are judged essential for patients' independence, choice and control.

5.2.4.1.1 Integrated health and social care services

Integrated services is a key policy objective to meet the needs of people requiring both health and social care [2]. Delivery requires co-ordinating people's care, allowing them to

choose what services are right for them and care being provided across partner organisations.

Keiro has an integrated care model designed to ensure no duplication of services or gaps between services, but rather an efficient pathway, encompassing health, social and housing, to enable patients to journey from the acute hospital setting to living independently at home as quickly as possible.

5.2.4.2 Wellbeing: Why it matters to health policy

In February 2014, the Department of Health identified health as the top issue impacting on wellbeing [17]. Other findings include:

- Frequency and quality of contact with family and friends are crucial determinants of wellbeing;
- Caring responsibilities for someone with a disability or in poor health is associated with lower happiness ratings and more depressive symptoms;
- Social relationships are a risk factor in mortality and exceed the influence of physical activity and obesity;
- Interventions designed for improving physical fitness, involvement in volunteering and neighbourhood social cohesion promote well-being;
- There is a lack of evidence that a particular intervention aimed at improving one aspect of people's lives (e.g., physical activity) also improves wellbeing. However, if we know a particular behaviour leads to increased wellbeing, we may hypothesise that improving this behaviour will also help increase levels of wellbeing.

This policy objective also fits with Keiro's ethos.

5.2.4.3 Helping carers to stay healthy

The Department of Health has a policy objective of supporting carers to get information, advice and breaks when needed [18]. This policy objective also fits with Keiro's ethos.

5.2.4.4 Helping people make informed choices about health and social care

The Department of Health has published documents underpinning this policy objective for different audiences including trusts, commissioners, independent providers and patients [19]. These mainly relate to the licensing system, the requirement that NHS procurement promotes choice and competition and the regulatory arrangements governed by Monitor. Key aspects include improving transparency within the NHS; introducing more choice to help people get appropriate care and support and make services more responsive to their needs; and ensuring access to information and advice to enable the 'right' choice.

As an independent provider this policy objective should be useful to Keiro as it promotes choice in this therapeutic area.

5.2.4.5 Increasing research and innovation in health and social care

In March 2013 the Department of Health announced plans to encourage more innovation within the NHS including establishing 15 Academic Health Science Networks by April 2014 to provide research skills and training to NHS staff and support innovative companies [20]. This policy has benefited Keiro & the NHS with the North East & Cumbria Academic Health Science Network picking Keiro as one of its five Regional Exemplar Small and Medium-sized Enterprises.

5.2.4.6 Improving quality of life for people with long term conditions

This policy strand aims to make England one of the best countries in Europe at helping people with long term conditions live healthily and independently [21]. Activities promoted include:

- Helping such people acquire the skills to manage their own health;
- Agreeing a care plan based on their personal needs;
- Making sure care is better coordinated;
- Using technology to support self-management.

These principles are also enshrined in the NHS Mandate (see Section 5.2.2) and are consistent with Keiro's operating practice and are all part of the wider technical advancement being demonstrated by the Keiro pathway model.

5.2.4.7 Equity and Excellence: Liberating the NHS

In 2010, the Coalition Government set out its long-term vision for the NHS [22] including:

- Putting patients at the heart of everything the NHS does and treating them with respect, dignity and compassion;
- Continuously improving healthcare outcomes;
- Empowering and liberating clinicians to innovate and improve healthcare services;
- Cutting bureaucracy and increasing efficiency;
- Treating patients and service users with respect, dignity and compassion.

Actions giving effect to these principles include:

- Introducing a national friends and family test to ask patients if they would recommend their ward or A&E department;
- Subsequent initiatives to give people information about health and care services to aid informed choices - for example through 'provider quality profiles', telling people about the training and qualifications of social care services staff;
- Introducing personal health budgets;
- Creation of HealthWatch England, an independent organisation through which the public has a say in health and social care services.

Again the Keiro ethos and operating practices converge with these overarching aims.

5.2.5 NICE Guidance

NICE has developed clinical guidelines on several neurological conditions including stroke, MS, Parkinson's disease, motor neurone epilepsy, neuropathic pain and urinary incontinence across all those with such a condition. Only those addressing neuro-rehabilitation are described in this Section.

5.2.5.1 Stroke rehabilitation

The Stroke Rehabilitation guideline [23] is the most detailed in respect of providing community rehabilitation. Recommendations address:

- Activities to be undertaken including goal setting; intensity of stroke rehabilitation; assessing emotional function;
- Identifying and meeting information needs including information about local resources, (for example, leisure, housing, social services and the voluntary sector);
- Support to enable the patient, family and carer to actively participate in developing rehabilitation plans;
- Providing education and support for the patient, family and carer;
- Encouraging self-care, community participation, including sports and leisure pursuits and stroke support groups; supporting patients' social roles, for example, work, education, volunteering and driving;
- Providing communication aids; the duration and type of exercise to be delivered by physiotherapists; using occupational therapists to improve activities of daily living and providing equipment and associated training needs.

These guidelines update those produced by the Royal College of Physicians in 2012.

The guideline developers note the literature does not provide robust evidence about the effectiveness of many interventions, particularly for different subgroups of people. It would, however, be possible to review evidence sources for each key activity and attempt to synthesise the evidence on the potential magnitude of change for each relevant outcome. Putting a value on such changes would be challenging.

Keiro will be able to identify the recommendations it meets and address any it does not. Compliance with these recommendations is judged highly relevant to commissioners.

5.2.5.2 Other NICE clinical guidelines

The NICE MS clinical guideline [24] addressed management of patients with MS in primary and secondary care but did not include explicit recommendations on specialist rehabilitation. It did include individual features that are incorporated in the Keiro programmes for these patients, such as:

- Reviewing information, support and social care needs regularly;
- Adopting supervised, comprehensive exercise programmes of aerobic and moderate progressive resistance activity, combined with cognitive behavioural techniques;
- Goal setting involving rehabilitation specialists and physiotherapists;
- Vestibular rehabilitation;
- Encourage people with MS to continue exercising after treatment programme ends.

Reviews of the NICE clinical guidelines on Parkinson's disease and Motor neurone disease are being scheduled. The original guidelines did not address rehabilitation per se but rather individual components such as provision of physiotherapy, occupational therapy, speech and language therapy and specialist nurse input (Parkinson's guideline only).

5.2.6 British Society of Rehabilitation Medicine

5.2.6.1 Standards for specialist nursing home care for people with complex neurological disability

In 2013, the British Society of Rehabilitation Medicine published evidence regarding best practice guidance for Specialist Nursing Homes managing patients with complex or profound disability following brain injury or progressive neurological disease [25]. Standards are recommended for provision of this specialist healthcare for patients having physical or cognitive and behavioural needs of varying complexities. These are grouped by:

- Nursing and medical care;
- Access to facilities and therapies;
- Rehabilitation programmes, goals and outcomes;
- Assessment, coordinated care, communication and discharge planning;
- Family and staff support;
- Legal issues;
- Advanced care planning and end of life care.

No specific outcome measures are recommended, apart from recording goal achievement consistently, but many sites (all Level 1 and 2 services) will submit data to the UK Rehabilitation Outcomes Collaborative (UKROC). Rather, minimum standards of staff, facilities and equipment are specified. For example, to manage residents with complex neurological disability the minimum requirements include:

- Safety equipment including low level adjustable beds, suctioning equipment, standing frames/tilt table, hoists and alarms;
- Disability-adapted resident rooms;
- A dedicated gym area.

Maintenance therapy programmes should be overseen by a qualified physiotherapist or occupational therapist with specialist experience in neurological disease.

We are aware work is on-going at Keiro around complying with the UKROC datasets.

5.2.6.2 Rehabilitation following acquired brain injury: national clinical guidelines

In 2003, British Society of Rehabilitation Medicine and the Royal College of Physicians published guidelines on patient rehabilitation following acquired brain injury (ABI) designed to reduce morbidity, restore function, improve participation and thus enhance the quality of life of patients and families [26]. Principal themes are:

- This patient group is challenging for service providers, requiring coordinated care plus good communication between services;
- Services should be planned in coordinated networks across geographical areas, with joint health and social services commissioning in liaison with other statutory and voluntary services, including employment, education and housing authorities. Those with complex needs must have access to appropriate specialist services;
- Staffing levels within rehabilitation and support services must be adequate, in terms of numbers and experience to meet caseload needs;
- Rehabilitation should be goal-orientated and individualised. ABI patients and their families should be offered appropriate information at every stage, and actively involved in decisions regarding care;
- Effects of ABI are long lasting and patients and their families require continued care and support, often for the rest of their lives.

These principles informed the NSF published in 2005 [1].

5.2.6.3 Long-term neurological conditions: management at the interface between neurology, rehabilitation and palliative care

In 2008, the Royal College of Physicians, National Council for Palliative Care and BSRM published guidance on managing patients with long-term neurological conditions including indications for referral to specialist rehabilitation services and care to be provided [27]. These address specialist rehabilitation rather than community rehabilitation.

5.2.6.4 A briefing paper for commissioners of clinical neurosciences

In 2008, a British Society of Rehabilitation Medicine briefing paper for commissioners of neurological rehabilitation services [28] reviewed the NSF requirements, extant clinical guidelines and evidence for the efficacy and cost-benefits of neurological rehabilitation. It noted such services should meet the policy requirements of each domain of Standards for Better Health [29] being:

- Safety by preventing unnecessary disability through early interventions;
- Clinical and cost-effectiveness by a focus on self-management, avoiding hospital admissions and facilitating hospital discharge;
- Governance as the services are led by consultants in rehabilitation medicine working within a specified set of specialist competencies;
- Patient focus by involving service users in planning and delivery of services; self-management through education and advocacy;
- Accessible and responsive care by being community-orientated;
- Care environment and amenities, with many services delivered locally or in the home, at point of need;
- Public health by implementing strategies for tertiary prevention and working with other agencies such as employment services and education.

These policy objectives have been refreshed in later documents but should still be relevant to commissioners.

5.2.7 Royal College of Physicians. Medical rehabilitation in 2011 and beyond

In 2010, the Royal College of Physicians concluded more investment was required in integrated, rehabilitation pathways across acute and community care, whilst encouraging greater patient participation, a stronger focus on vocational needs and family relationships, and returning to as normal a life as possible [30]. This work was informed by the NSF and the Darzi Report. Both emphasised the importance of providing personalised and integrated rehabilitation services, and to improve local access. The College recommendations were also informed by a literature review identifying evidence on clinical and cost-effectiveness of rehabilitation for specific conditions, such as following acquired brain injury. For example, it noted more work was required to demonstrate cost-effectiveness of community rehabilitation for those with sudden onset neurological conditions. In contrast there was strong evidence supporting such programmes for those with progressive and intermittent conditions including MS.

This work could inform evidence gaps particularly around cost-effectiveness of services such as The Gateway.

5.2.8 Other Information Sources

The King's Fund[1] has several publications on commissioning integrated care, managing quality in community services, future organisational models for service delivery, empowering patients and service redesign. These are not summarised here, as none are directly relevant to rehabilitation, but may be useful additional resources.

Similarly, the Health Foundation has undertaken a systematic literature review on the benefits of self-management, which identifies the positive benefits and components required to make it work well.

A simple Google search identified evidence on the benefit of peer support; facilitators to physical activity in people with neurological conditions and cost-effectiveness of rehabilitation (mainly papers by Professor Turner-Stokes). The search was not sufficiently robust that it identified a comprehensive set of evidence for each topic and hence there is no benefit in providing a qualitative synthesis of it. However this could be undertaken as further research.

5.3 FURTHER RESEARCH

This summary of polices and guidelines identifies the most relevant drivers for shaping future direction of NHS services and measuring the impact of changes. These changes are complex, requiring a multi-component approach to achieve improved patient outcomes. There is no single or limited set of strategies, which will deliver the improvements required to the health and social care system to enable it to meet the growing population needs, within a challenging financial environment.

Keiro's current services and philosophy are consistent with the innovatory solutions now demanded by statute through the Care Act 2014, the Department of Health and NHS Forward View. The company can map its activities such as encouraging self-management, psychological support, encouraging education, provision of information, peer support to policy needs. However, the company recognises the gaps in the evidence base such that quantifying the improved outcomes and associated savings cannot readily be demonstrated without making heuristic assumptions.

[1] http://www.kingsfund.org.uk/

One approach to improving the evidence base, and hence updating the economic model, would be to identify which of the quality measures advised in the Wessex standards document apply to community rehabilitation, as delivered by Keiro, and develop a plan to measure these. A gaps analysis would then be conducted to identify:

- Which of the outcomes required in the model will not be captured;
- Relevant outcomes from the NHS Plan which will not be captured.

The feasibility of capturing these should be examined and the analysis plan updated accordingly. Information on the values for comparators would be informed by data from national data sets, a structured literature review and expert opinion.

Section 6: Discussion

This Section summarises the findings, addresses strengths and limitations, identifies a potential way forward and provides some conclusions.

6.1 SUMMARY OF MODEL RESULTS, STRENGTHS AND LIMITATIONS

The results from the economic model indicate that the Keiro service generates substantial per patient savings compared to the current standard of care (i.e. discharge to high dependency care homes). Over the 10 year time horizon adopted in the central case analysis, the Keiro service was estimated to save £369,286 per patient when patients remained in The Gateway for six months, with 50% of these patients also requiring a six month stay in transitional housing. The majority of the savings are made in the community, because provision of community rehabilitation empowers patients to live more independent lives, with fewer patients requiring resource intensive care/nursing homes. Rather, patients are able to move to care homes with low levels of support, or their own homes with varying levels of support. All of these options are significantly cheaper than high dependency care homes, while having the potential to produce better outcomes.

These cost savings provide incentives to both NHS and social care commissioners to provide a service akin to The Gateway. Shorter length of stay and fewer readmissions reduce the costs of acute care for Clinical Commissioning Groups (CCGs). Commissioners of NHS Continuing Healthcare and social care services also benefit from the substitution of expensive CCG/joint funded long term care home placements with more cost effective long term housing and support packages.

The Keiro model also promotes Government policy to encourage integration across all sectors of the care system (i.e. acute, community, social care and housing). The Keiro model produces savings across the whole health and social care system, whilst also improving quality of life for patients and carers and encouraging community participation.

6.1.1 Model Strengths

The model has been constructed to be as flexible as possible. This ensures that the model can be easily updated for local adaptations, such as for each of the other 21 national trauma centres in the UK. Furthermore, the model can be updated whenever new data become available, which will be advantageous as Keiro develops the evidence base for patients managed in The Gateway.

The impact of both tariff payments, and the cost of care, has been considered within the analysis. This allows both providers and commissioners to consider the impact of the Keiro service from their perspectives.

6.1.2 Model Limitations

The major limitation to the wider analysis relates to the limited evidence base. This has occurred largely because the Keiro service has only been operational for a short period, and as such has limited experience to draw data from. This means it has not been possible to incorporate important factors such as patient quality of life and mortality. As such, Keiro may choose to collect data to quantify the impact of The Gateway on patient quality of life. Similarly, there is currently no robust evidence regarding Keiro's impact on patient length of stay in hospital and readmission rates. Therefore, conservative assumptions have been used within the model.

The analysis focuses on patients who are currently discharged from an acute setting, into high dependency care homes. This simplification excludes the value of benefits to other patient groups using the rehabilitation services provided by Keiro. This includes patients who do not reside with The Gateway and/or transitional housing, but who require to step up to that service for a short period and users of Keiro's auxiliary services such as the Wellbeing Hub and vocational training at Middlesbrough College.

6.2 SUMMARY OF RESULTS FROM QUALITATIVE REVIEW OF POLICY AND CLINICAL GUIDELINES, STRENGTHS AND LIMITATIONS

The qualitative review used a pragmatic search of websites for organisations publishing policy documents or clinical guidelines/standards. This was supplemented by hand searching references and Google searches using appropriate terms, including those describing specific neurological diseases (e.g. stroke, MS) and by intervention (e.g. self-management, peer support). Relevant documents may have been missed which would have been identified by a more systematic and sensitive search. This risk is not judged material given all policy documents are listed on the Department of Health website and the main source of clinical guidelines and standards is NICE.

The Care Act 2014 [11] sets out the legal framework for the provision of adult social care in England including the general responsibilities of local authorities to provide care and support for the local community. The aim of services is now to promote the wellbeing of adults with care and support needs (including carers), contribute to the prevention or delay of developing care needs, or improve the quality of care in the local authority's area. Particularly relevant to Keiro is the requirement that local authorities should make the best use of community facilities to prevent, delay and reduce needs for care and support and the duty to promote the integration of care within health services and housing and leisure organisations. Principles such as person-centred care and maximisation of independence map well to the Keiro ethos.

The main themes in NHS England's five year framework [21] similarly emphasise promotion of independent living, patient centred care and integration of services, again consistent with Keiro's aims and objectives.

The Wessex Strategic Clinical Network guidance [14] on commissioning rehabilitation services is also highly relevant and should inform the research plan for Keiro as it seeks to develop its own quality measures.

The principles enshrined in statue by the Care Act 2014, have been informed by existing policy documents including the need for patient-focused care; “joined up” service provision; close collaboration between healthcare and social services; excellent communication, the importance of supporting carers and families, and a “seamless continuum of care” which aims to maximise an individual’s potential for independent living.

The strategic direction, operating practices and ethos of Keiro are congruent with these high level principles and Keiro can demonstrate leadership in adopting these innovative approaches.

6.3 POTENTIAL WAY FORWARD

Evidence gaps have been discussed in Sections 2 and 6.1. Section 5.3 sets out a potential way forward, building on the evidence collated by Wessex [14], augmented by the data required for the model itself and that suggested by the NHS Five Year Plan.

6.4 CONCLUSIONS

The economic model identifies considerable financial benefits to commissioners from investing in timely rehabilitation as part of an integrated pathway for highly dependent patients with neurological disease. The central estimate of savings is £369,286 per patient over a ten year time horizon, compared to the current pathway. The results are robust to a very wide range of sensitivity analyses and the intervention is never cost incurring under the potential scenarios tested.

The qualitative review of Government policy and clinical and quality standards required for rehabilitation services such as Keiro’s identifies an apparent good correlation between requirements and the Keiro approach. This is a high level judgment and should be supported by more detailed analyses.

For commissioners, adopting the Keiro integrated community rehabilitation model is cost-effective compared to providing long-term nursing home accommodation for people with long-term neurological conditions. This result is robust in a wide range of sensitivity analyses. We note that the quality of evidence is low-grade and that origin of several key assumptions is Keiro managers.

For patients, adopting the Keiro integrated partnership community rehabilitation model has the potential to provide them with the best possible opportunity to regain and retain their independence and deliver the best outcomes for them and their whole family.

The Keiro Model is also consistent with the high-quality care demanded by the NHS in its Five Year Forward vision. Further work could usefully benchmark Keiro's Model to the indicators set out in that Plan.

Further research is needed to improve quality of the evidence base, ideally through primary research, but the prospect of success with such an approach requires to be tested.

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APPENDIX A

One-Way Sensitivity Analysis - Ranges Assessed For Each Input Parameter

The input parameters assessed during sensitivity analysis, and range of values assessed for each parameter, are shown in the table below.

Parameter	Baseline value	Low value	High value
Standard care: LoS in hospital with stroke	11.8	6	20
Standard care: LoS in hospital with trauma	11.5	6	20
Standard care: LoS in hospital with spinal cord	37.5	27	48
Standard care: LoS in hospital with LTNC	9.5	4	18
Keiro: reduction in hospital stay with stroke	10.6	0	5
Keiro: reduction in hospital stay with trauma	10.4	0	5
Keiro: reduction in hospital stay with spinal cord	33.7	0	5
Keiro: reduction in hospital stay with LTNC	8.5	0	5
Standard care: readmission rate	9.18%	4.00%	16%
Keiro: readmission rate	1.00%	0.00%	4%
Mean cost per stay: stroke	£4,441	£3,000	£7,000
Mean cost per stay: trauma	£8,243	£5,000	£13,000
Mean cost per stay: spinal cord injury	£18,448	£12,000	£28,000
Mean cost per stay: prog LTNC	£3,395	£3,000	£7,000
Cost per excess bed day: stroke	£265	£100	£400
Cost per excess bed day: trauma	£268	£100	£400
Cost per excess bed day: spinal cord	£122	£100	£400
Cost per excess bed day: prog LTNC	£262	£100	£400
Cost for high dependency care home	£1,305	£800	£1,800
Cost for standard care home	£750	£400	£1,000
Cost for specialist nursing home	£1,305	£800	£1,800
Cost for own home with 24 hour support	£655	£400	£1,000
Cost for own home with targeted support	£241	£100	£400
Cost for the Gateway	£1,869	£1,400	£700
Cost for transitional housing	£878	£2,400	£1,700

APPENDIX B

The NHS Mandate Indicators

AREA 1: PREVENTING PEOPLE FROM DYING PREMATURELY

Overarching indicators

1a Potential years of life lost (PYLL) from causes considered amenable to healthcare:
- i Adults;
- ii Children and young people.

1b Life expectancy at 75 i Males ii Females;

1c Neonatal mortality and stillbirths.

Improvement areas

Reducing premature mortality from the major causes of death:

1.1 Under 75 mortality rate from cardiovascular disease;

1.2 Under 75 mortality rate from respiratory disease;

1.3 Under 75 mortality rate from liver disease;

1.4 Under 75 mortality rate from cancer:
- i. One- and five-year survival from all cancers;
- ii. One- and five-year survival from breast, lung and colorectal cancer;
- iii. One- and five-year survival from cancers diagnosed at stage 1&2.

Reducing premature death in people with mental illness

1.5
- i Excess under 75 mortality rate in adults with serious mental illness;
- ii Excess under 75 mortality rate in adults with common mental illness;
- iii Suicide and mortality from injury of undetermined intent among people with recent contact from NHS services.

Reducing deaths in babies and young children

1.6
- i Infant mortality;
- ii Five year survival from all cancers in children.

Reducing premature death in people with a learning disability:

1.7 Excess under 60 mortality rate in adults with a learning disability.

AREA 2: ENHANCING QUALITY OF LIFE FOR PEOPLE WITH LONG-TERM CONDITIONS

Overarching indicators

2 Health-related quality of life for people with long-term conditions

Improvement areas

Ensuring people feel supported to manage their condition

2.1 Proportion of people feeling supported to manage their condition:
- i. improving functional ability in people with long-term conditions;

2.2 Employment of people with long-term conditions.

Reducing time spent in hospital by people with long-term conditions

2.3 i Unplanned hospitalisation for chronic ambulatory care sensitive conditions;
ii Unplanned hospitalisation for asthma, diabetes and epilepsy in under 19s.

Enhancing quality of life for carers

2.4 Health-related quality of life for carers.

Enhancing quality of life for people with mental illness

2.5 i Employment of people with mental illness;
ii Health related quality of life for people with mental illness.

Enhancing quality of life for people with dementia

2.6 i Estimated diagnosis rate for people with dementia;
ii A measure of the effectiveness of post-diagnosis care in sustaining independence and improving quality of life.

Improving quality of life for people with multiple long-term conditions

2.7 Health-related quality of life for people with three or more long-term conditions.

AREA 3: HELPING PEOPLE TO RECOVER FROM EPISODES OF ILL HEALTH OR FOLLOWING INJURY

Overarching indicators

3a Emergency admissions for acute conditions that should not usually require hospital admission;
3b Emergency readmissions within 30 days of discharge from hospital.

Improvement areas

Improving outcomes from planned treatments

3.1 Total health gain as assessed by patients for elective procedures:
i Physical health-related procedures;
ii Psychological therapies;
iii Recovery in quality of life for patients with mental illness.

Preventing lower respiratory tract infections (LRTI) in children from becoming serious

3.2 Emergency admissions for children with LRTI.

Improving recovery from injuries and trauma

3.3 Survival from major trauma.

Improving recovery from stroke

3.4 Proportion of stroke patients reporting an improvement in activity/lifestyle on the Modified Rankin Scale at 6 months.

Improving recovery from fragility fractures

3.5 Proportion of patients with hip fractures recovering to their previous levels of mobility/walking ability at i 30 and ii 120 days.

Helping older people to recover their independence after illness or injury

3.6 i Proportion of older people (65 and over) who were still at home 91 days after discharge from hospital into reablement / rehabilitation service;
ii Proportion offered rehabilitation following discharge from acute or community hospital.

Dental health

3.7 Decaying teeth ii Tooth extractions in secondary care for children under 10.

AREA 4: ENSURING THAT PEOPLE HAVE A POSITIVE EXPERIENCE OF CARE

Overarching indicators

4a Patient experience of primary care:
- i GP services;
- ii GP out-of-hours services;
- iii NHS dental services.

4b Patient experience of hospital care;
4c Friends and family test;
4d Patient experience characterised as poor or worse:
- i Primary care;
- ii Hospital care.

Improvement areas

Improving people's experience of outpatient care

4.1 Patient experience of outpatient services:
- i. Improving hospitals' responsiveness to personal needs.

4.2 Responsiveness to inpatients' personal needs:
- i. Improving people's experience of accident and emergency services.

4.3 Patient experience of A&E services.

Improving access to primary care services

4.4 Access to:
- i GP services;
- ii NHS dental services.

Improving women and their families' experience of maternity services

4.5 Women's experience of maternity services.

Improving the experience of care for people at the end of their lives

4.6 Bereaved carers' views on the quality of care in the last 3 months of life.

Improving experience of healthcare for people with mental illness

4.7 Patient experience of community mental health services.

Improving children and young people's experience of healthcare

4.8 Children and young people's experience of inpatient services.

Improving people's experience of integrated care

4.9 People's experience of integrated care.

AREA 5: TREATING AND CARING FOR PEOPLE IN A SAFE ENVIRONMENT AND PROTECTING THEM FROM AVOIDABLE HARM

Overarching indicators

5a Deaths attributable to problems in healthcare;
5b Severe harm attributable to problems in healthcare.

Improvement areas

Reducing the incidence of avoidable harm

5.1 Deaths from venous thromboembolism (VTE) related events;
5.2 Incidence of healthcare associated infection (HCAI):
- i MRSA;
- ii C. difficile.

5.3 Proportion of patients with category 2, 3 and 4 pressure ulcers;
5.4 Hip fractures from falls during hospital care.

Improving the safety of maternity services

5.5 Admission of full-term babies to neonatal care.

Improving the culture of safety reporting

5.6 Patient safety incidents reported.