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Foreword

“The Electronic Health Record for Ireland will transform the delivery of health and social care by creating a shared patient record that is the primary information source for all health and social care professionals, and is extended to patients, service users and carers.”

HSE EHR Vision & Direction
Strategic Business Case

As Batalden and Davidoff wrote in 2007, everyone in Healthcare really has two jobs when they come to work every day: to do their work and to improve it.

An Electronic Healthcare Record (EHR) is one tool that can assist us in making it easier for Clinicians to do the right thing, by facilitating patient safety and quality improvement through the use of checklists, alerts, and predictive tools; through embedded clinical guidelines promoting standardised, evidence-based practices; through electronic prescribing and test-ordering, thus reducing errors and waste, while allowing remote access to information.

Faster, more accurate communication and streamlined processes can lead to improved patient flow across the continuum of care with less duplication of investigations, while making us more responsive to patient inquiries.

While this all sounds very compelling, we recognise the challenges encountered in other jurisdictions in successfully implementing an EHR. We acknowledge that successful implementation depends on strong leadership, full involvement of clinical staff in both design and implementation, as well as the need for staff training. We look forward to working with colleagues in the design and implementation of an EHR in Ireland and we believe that this business case is the first step in the right direction.

Dr Áine Carroll, National Director Clinical Strategy and Programmes Division, HSE

The delivery of an Electronic Health Record (EHR) for Ireland is the foundation for the reform of the health care system. The delivery of integrated care and the ability to truly place health information under the control of the patient is only possible with a digital fabric in place. Certainly, if our citizens are going to experience a truly joined up single health service then the health system will need to weave a digital fabric that supports health and wellbeing as well as integrated care.

The business case in front of you today has been created with great care and attention to how eHealth Ireland can deliver fully a core element of the digital health system. We are at a unique juncture where the Irish health system will learn lessons from many nations who have experienced EHR developments; we propose that Ireland must have an EHR that is implemented as a change project led by clinicians and Irish people, which will be facilitated by modern technology.

This business case has been created in that context and with significant clinical and patient involvement.

An EHR in Ireland can be delivered in a way that is in keeping with the current funding model of health and fully compatible with our clinical and administrative systems, whilst placing the patient at the centre of the system and enabling continuous service improvement to become the overall culture of health delivery in Ireland. Our approach is to harness the investments successfully made already and continue to build upon these. I am confident that we have set out a sound approach and programme and this business case also describes this plan.

I truly believe that Ireland, whose economy is one of the global leaders in the technology and health informatics industry, is perfectly positioned to establish a healthcare system that is digital by default. The timing of, and momentum behind the wider reform of the Health Service makes this a great time to make this investment and to be assured of the benefits to be gained.

Richard Corbridge, CIO HSE
Introduction
This document outlines the Strategic Business Case for the investment of up to €875 million over a 10 year period to deliver a National Electronic Health Record (EHR) across the Irish health system. This investment equates to approximately 0.65% of the total health system budget over that time period. Based on international experience of the implementation and adoption of EHRs, the characteristics and challenges of the Irish health system, and the level of ambition set out in this strategic case, we believe the programme is most likely to span a 10 year period of transformation. EHR directly supports the ambition of health reform in Ireland and therefore the effectiveness and success of the EHR programme will be assured through alignment with this reform journey over the same period.

The ambition to deliver a National EHR is driven by several overarching themes:

- The pressures on health and social care delivery in Ireland mirror those in other developed economies and the current trajectory is unsustainable,
- The implementation and adoption of Electronic Health Records is widely viewed as a pre-requisite for the delivery of patient centred, efficient and effective care in any modern healthcare system,
- The technology and solutions that underpin a modern healthcare system are viewed as the ‘fourth utility’ and a fundamental need. Continuing on a trajectory that fails to address this core need in a strategic manner is no longer an option in Ireland. In short, the ambition of reform in Ireland cannot be achieved without such a key enabler,
- The public are increasingly demanding a ‘digital first’ experience and consultations to date, in Ireland and internationally, have indicated an overwhelming demand for digital access to health services.

However, Ireland currently lags most developed countries in its adoption of EHR systems and creation of a national shared record, the benefits of which are increasingly evidenced. A significant investment and commitment to change is now necessary that leverages learning from earlier implementations across other jurisdictions. Within an Irish context:

- A National EHR will include operational systems to underpin care delivery in Hospitals and the Community (Primary Care, Mental Health, Health and Social Care Professional Services, Older Persons Services and Disability Services), a national shared record that is made available across care settings, and the integration solution necessary to bind all of this together and maintain integrity and security of data,
- Delivering a National EHR will open up a world that is digitally connected, allow patients to participate more in their health and wellbeing, overcome many of the issues and barriers to the delivery of truly integrated care in Ireland, and bring sustainable benefits in terms of patient experience, patient safety and efficiency of service delivery.

The Office of the CIO has engaged with clinical stakeholders, health service leadership, global eHealth industry and the wider public for over 12 months in defining the way forward for a National EHR. The aim has been to define an approach that meets the particular requirements of the Irish healthcare environment. A ‘Vision and Direction’ was published in August 2015 that set out the overall case for change, in particular the need to move to a more strategic approach to the realisation of a National EHR.

We have engaged with our counterparts in other health systems to learn from their experiences and share our own approach. We are pleased to have developed a strong working relationship with our colleagues in Northern Ireland who are in a similar position in many ways. There is potential for an all-island approach on some of the aspects of the programme, such as the provision of clinical information through portal technology. We will continue this International best practice engagement approach for our Programme.

The Strategic Business Case presented here provides greater detail on the overall case for investment including the development options, the scale of the overall investment, the implementation approach and the high level benefits associated with the EHR programme. It seeks agreement from key stakeholders to proceed with the next stages of the work and wider support needed to achieve success.
Changing the way we deliver and provide our services by utilising the capability of digital technology has been identified as part of the HSE Corporate Goals (2015-2017 – Corporate Goal 5: Manage resources in a way that delivers best health outcomes, improves people’s experience of using the service and demonstrates value for money).

A National Electronic Health Record (EHR), as presented in this document, is a comprehensive solution that supports the creation and sharing of key patient information. It is a key capability required for the future delivery of healthcare. It is intended to move us from a position where patient records and key information is locked in a paper format and within specific organisations, to an environment where digital patient records are shared securely across care settings with appropriate consent.

This will result in:
- Improved patient outcomes,
- Better, safer clinical decision making,
- More informed and engaged patients and citizens,
- Integration of services across care settings,
- Increased availability of information to enable proactive management of patients and conditions.

The National Electronic Health Record Vision and Direction document presented the case for change and outlined the need to create a strategy and overarching business case for the National EHR transformation. The creation of this Strategic Business Case is a key foundation to establish the National Electronic Health Record Programme.

The ‘fourth utility’ in Healthcare

Most sectors, for example the communications, financial, transport and retail sectors have been significantly transformed in terms of customer interactions via a digital environment. The promise of a similar transformation in health service delivery is as yet unrealised in most countries. However, some are leading the way and those in the healthcare industry that have been successful have incorporated technology adoption within wider and more comprehensive transformation efforts.

“\[I think we’re about to come to the next era of medicine \ldots as much as 30% of what we do today we will do differently \ldots how we evaluate patients, how we follow up on patients, how we bring the expertise in between clinicians\]”

Robert Pearl, MD, Executive director and CEO, The Permanente Medical Group

The deployment of technology in healthcare has often been slow but public demand is now becoming a key driver for change. The public increasingly demand and expect a ‘digital first’ experience and with 80% of the world’s adult population predicted to own a smartphone by 2020 this demand will accelerate. Therefore the ability of the public to interact with health services across digital platforms will become a core requirement in service delivery.

A survey of 7,000 patients in Britain highlighted that:
- 80% would like to view medical records online,
- 90% would use an online GP appointment booking service,
- 90% would use a service letting you ask a clinician a question.

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- 90% would use an online GP appointment booking service,
- 90% would use a service letting you ask a clinician a question.

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In an Irish context there is also evidence of similar public sentiment. A recent consultation with the Irish public carried out by eHealth Ireland indicated a strong view that interacting digitally with the health system would be a positive experience.

Source: Initial Findings from eHealth Ireland EHR Public Consultation (Sample Size: 269)

While there is a wide spectrum of solutions that are defined as technology in healthcare, Electronic Health Records can be viewed as foundational in terms of support for clinical environments and wider patient engagement. The National EHR is a significant investment and a long term commitment to transform health service delivery – it is not simply about adding technology to existing ways of work but incorporating digital solutions to support and enable changes and standardisation in clinical care.

As well as delivering operational benefit, a National EHR will also help increase public engagement and support Health & Wellbeing objectives. The data provided from a National EHR is essential for identifying cohorts of the population that are at risk and enables the development of care plans and efforts to support them. This is achieved through an integrated approach, not a set of activities tied to one particular care setting.

It is increasingly evident that technology is a fundamental enabler in the effective and efficient delivery of health services. In effect it is the ‘fourth utility’ without which a modern health service is not feasible.

International Adoption and Efficacy

Deployment and adoption of EHRs continues to be commonplace in developed countries with many at very advanced stages of adoption, e.g. in the US more than 80% of providers now use an EHR. While we currently lag other countries in this area, Ireland has an opportunity to make a step change and to learn from experiences elsewhere.

A selection of countries where significant programmes of work have, or are currently taking place, include:

UK – the National Programme for IT sought to introduce Community and Mental Health EHR’s; GP systems sharing core clinical data with a national Summary Care Record; widespread adoption in the acute hospitals of the core clinical capabilities (Clinical Notes, Orders and Results, and Medications Management); agreed standards for performance reporting; and developed a supporting industry of suppliers and people with the skills to develop, deploy, support and enhance these solutions.

As of May 2015, over 55 million patients in England can book GP appointments, order repeat prescriptions and access summary information in their medical record online. 97% of patients in England can now take advantage of online GP services. The implementation of the NHS Spine services has increased the adoption of the NHS Number as the prime patient identifier, enabling safer care by linking and tracing of a patient’s records across NHS organisations. 40.2 million enquiries are made to the Personal Demographics Service (PDS) every month to confirm correct identification and contact details for patients.

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1 Nuffield Trust (2016). Delivering the benefits of digital health care
2 https://www.england.nhs.uk/2015/05/patient-online-55-mill/
This has minimised misidentification of patients, assisted in linking health records, and improved data quality⁴.

**USA** – The insurance-funded, private sector model meant that imposition of a National EHR was neither feasible nor desirable. However, the US government recognised the need to ‘encourage’ EHR adoption and so developed ‘meaningful use’ – a ‘carrot and stick’ combination of voluntary standards linked to national health insurance tariffs – where failure to adopt resulted in reduction in income. The standards and measures for meaningful use have been re-evaluated and updated several times as lessons have been learned. It provides flexibility for health systems to select and implement their own EHR solutions, but adhere to national standards.

Kaiser Permanente, one of the largest not-for-profit healthcare delivery systems has 100% adoption of multifunctional EHRs. It has recently focused attention on greater patient empowerment through their investment in personal health records and connecting securely with patients. They have seen strong results such as a 57% reduction in medical errors, and a 50% reduction in hospitalisations⁵.

**Australia** – In their eHealth Strategy in 2008, the Australian Government identified the need for government intervention to ‘guide’ the market, define a vision, and set out a 10-year plan for implementing the national ‘health information highway’ infrastructure and accompanying rules to allow information to be seamlessly accessed and shared across the Australian health care system.

The largest eHealth project in Australia is the Personally Connected E-Health Record accessible to patients and providers. This involved an investment of $467million ($315million) between 2010 and 2012 and a 2015 budget of $140.6 million ($95million). From an adoption perspective, it is estimated that over 60% of GPs in Australia are connected to the PCEHR. National EHR penetration in 2012 was estimated at 66% for both hospital and ambulatory settings, but 142 New South Wales hospitals (80% of the bed base) had EHR functionality⁶,⁷.

**The Netherlands** – The Netherlands have created a national health information sharing infrastructure with defined interoperability standards. This infrastructure supports the sharing of information between operational systems. The provision of acute operational systems has moved from a highly fragmented market to one where a small number of suppliers provide the capability as the focus in the health system has been to reduce the number of different solutions in service.

As of January 2015 all prescriptions across the Netherlands health systems are electronic. Medication-related acute hospitalisation has reduced from 4.6% in 2005 to 3.9% in 2008⁸.

**Singapore** – Singapore has introduced major reforms in how health services are organised, and in parallel, has run a national eHealth records implementation which has incrementally delivered solutions since 2004. This has included the implementation of a secure exchange to share data in 2004, through to the roll-out of the summary care record in 2011. In 2015, Singapore launched a patient portal that enables the public to view their medical record.

**Andalucía, Spain** – Diraya is an Electronic Health Record system on a regional scale in Andalucia in Spain. It integrates the healthcare information for each patient on a single regional record. The system is based on a single health record number which links all patient information.

As of 2010, there were more than 7.5 million health records in Diraya and 840 primary care centres are connected, covering 97% of the region’s population. The outpatient clinics and emergency rooms of 26 hospital organisations and 3,500 private chemists were connected to the system. In the public health system, more than 17,000 operators use Diraya every day⁹.

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⁴ NHS Informatics (2013). Final benefits statement for programmes previously managed under the National Programme for IT
⁶ New South Wales Government (2013). A Blueprint for eHealth in NSW
⁸ Van Cauwenberge J. and Verhoyen G. (2014). E-Health in the Netherlands
⁹ Junta de Andalucía (2010). Healthy Andalusia
Ireland’s Position

Ireland is much less advanced in the area of eHealth in comparison to the countries outlined above. Within the European Union, Ireland lags behind many of our fellow member states when it comes to eHealth and EHR enablement. Based on a 2014 European Commission report\textsuperscript{10} which identified eHealth enablement within member states, Ireland scored poorly on the question of “Which of the following computerised systems has the hospital integrated?” as illustrated in the following table:

## Strategic Business Case

### Country Performance:

<table>
<thead>
<tr>
<th>Country</th>
<th>Referral Letters</th>
<th>Discharge Letters</th>
<th>Tele-Radiology</th>
<th>E-Prescribing</th>
<th>Medical Decision Support</th>
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<td>22%</td>
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<td>35% (Denmark: 100%)</td>
<td>43% (Austria: 84%)</td>
<td>9% (Estonia: 100%)</td>
<td>9% (Luxembourg: 67%)</td>
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<td>0%</td>
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</tbody>
</table>

*Source: European Hospital Survey: Benchmarking Deployment of eHealth Services (2012-2013)*
A National EHR for Ireland

“The Electronic Health Record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EHR automates and streamlines the clinician’s workflow. The EHR has the ability to generate a complete record of a clinical patient encounter - as well as supporting their care-related activities directly or indirectly via interface - including evidence-based decision support, quality management, and outcomes reporting.”

The Health Information Management Systems Society (HIMSS)

Within an Irish context, the scope of the National EHR Programme includes both the operational systems within Community Healthcare Organisations and Hospital Groups and the solutions needed to ensure sharing of electronic patient data across care settings. The aim is to make key patient data from operational systems accessible across the entire continuum of care by relevant users, including the patient themselves. This will be enabled by the Individual Health Identifier (IHI) and could include information from all healthcare providers, including GP’s, voluntary and private healthcare organisations. Critically, the National EHR will also support the broader Health and Wellbeing objectives in Ireland through the data that can be captured and analysed on a longitudinal basis and ultimately via greater patient engagement. The core information that is created and stored will provide national level data of value.

Figure 1: National EHR – Key Relationships
The National EHR Components

Four primary components have been identified that constitute the National EHR for Ireland. These are:

- National Shared Record,
- Community Operational Systems,
- Acute Operational Systems,
- Integration Capability.

Figure 2: Scope of the National EHR Programme

The Individual Health Identifier, delivered under a separate programme, will also be a key enabler of the National EHR.

This high level architecture has been drawn from the initial eHealth blueprint that was shared and validated with the eHealth industry and in consultation with a wide range of stakeholders. A number of key factors were identified during this engagement that have driven the overall configuration including:

- The need to allow flexibility for different operational areas across Ireland’s health system to progress in a semi-independent manner and at differing speeds,
- Facilitating a modular approach that delivers benefits within specific care settings and does so without the need to implement on a “big-bang”, all or nothing, basis,
- Enabling change to take hold at local level and gradually building on that change incrementally,
- Responding to current market structure – currently, there is no mature solution available that would meet the needs and requirements of the entire National EHR vision which spans the entire health service.

The four primary components are described below:

National Shared Record: A National Shared Record delivered through a national portal will contain key patient data drawn from the various operational solutions within the health service, e.g. from systems in hospitals, community services and broader population health information. It will aim to provide a longitudinal view of the patient’s care and enable collaboration among clinicians and care givers. It will support them in making better informed clinical decisions through a more comprehensive understanding of the patient. The
portal is the key means of providing access to specific records to user groups such as patients, carers and healthcare providers. Clinical need will largely determine which user groups have access to relevant and appropriate information in a secure manner and respecting privacy concerns.

**Community Care EHR Operational Systems:** Across the care areas within the Community setting (Primary Care, Mental Health, Health and Social Care Professional Services, Older Persons Services and Disability Services), an EHR is necessary to enable the delivery of efficient and effective care through the provision of supporting technology. Core capabilities include:

- Patient Administration and Scheduling that contains key patient demographics and care information, allows appointments to be managed with greater efficiency, and enables referral management,
- Clinical Notes that provide facilities for care givers to record structured patient care information are required in order to be able to create a record of care across disparate services,
- Test results that enable care givers to view the outcomes of investigations conducted in different locations,
- Population Health Management that facilitates screening and surveillance of patient cohorts to provide more proactive management of care,
- Referral Management to allow care givers to securely and quickly refer patients along the continuum of care,
- Mobile Clinical Management that facilitates the connectivity for remote working recognising that care is often given in different locations in the community, including in the patient’s home.

Key information must also be made available from these solutions into the National Shared Record in order to facilitate collaboration along the continuum of care.

**Acute Care EHR Operational Systems:** Within the acute hospital setting, dedicated ICT solutions are required to manage the delivery of care. These operational systems include core components such as:

- Patient Administration that contains key patient demographics and care information that facilitates scheduling and referral management,
- Order/Communications that enable materials/tests/diagnostics to be requested and results received,
- Clinical Notes that provide facilities for care givers to record structured patient care information,
- Medicines management that enables the tracking of all medications administered to the patient.

The availability of consistent, relevant patient information is necessary across the acute hospital system in order to be able to realise the objectives of the Hospital Groups to form effective care networks. Key information must also be made available from these acute solutions into the National Shared Record in order to facilitate collaboration along the continuum of care.

**Integration Capability:** From a technical perspective, a mechanism must exist that communicates patient data between the various healthcare service providers, enabling the delivery of comprehensive national shared records, while maintaining the integrity and security of that information. The integration capability provides the glue that binds the system together and ensures the security of the information being transmitted. It also enables integrated care pathways to be realised across care settings through information sharing and communication. The IHI will be a critical pre-requisite for effective integration.

Through the use of analytic tools, this data can aid population health planning, patient risk stratification and clinical research. Operationally, the systems will support areas such as; National Screening, Immunisation, Child Health, Sexual Health, and Health Promotion and Improvement. The rich information available will be of benefit to overall research efforts and can be aligned to the overall research approach that will emerge across the entire health service.

Other healthcare providers such as General Practitioners, Pharmacies and Private Hospitals can access and contribute to the National Shared Record. This will be achieved through the Integration Capability that will link systems and information with the portal solution for the National Shared Record.
Developments to Date

This Strategic Business Case builds upon work and consultation completed to date as part of a structured eHealth Vendor Engagement Process, the Knowledge and Information Plan and the National Electronic Health Record Vision and Direction. The Strategic Business Case is a further step along the journey for National EHR Development in Ireland.

Figure 3: Developments to Date

eHealth Vendor Engagement Process

The OoCIO held detailed discussions with over 50 EHR and related systems vendors and engaged with over 150 eHealth industry stakeholders overall. The purpose of this engagement was to gain insight into the capabilities of EHR vendors across the range of solutions and services required to deliver a national EHR, and also vendors’ preferences and recommendations for procurement and implementation. A set of assumptions was defined, including an overall eHealth Blueprint focusing on the core components of an EHR. The indicative intent of the health system and considerations around the implementation programme were communicated with vendors in advance of individual sessions.

The engagement also tested and confirmed the validity of the eHealth Blueprint with respect to what could be provided by the market, and allowed the OoCIO to understand rough order of magnitude estimates of the cost of implementing core components of the National EHR.

Public and Healthcare Provider Engagement

Significant consultation efforts have commenced with the general public through the EHR Consultation video and feedback process. eHealth Ireland conducted a 2 month public consultation on the EHR during December and January where members of the public were asked for their views on deploying a National EHR. Other public communications have taken place such as the EHR Twitter Chat Hour where up to 209 participants (at its height) engaged over the future direction of a National EHR in Ireland. Further such communications will continue as part of the EHR Programme.

Clinician and care provider engagement has also been a fundamental part of the programme to date and in particular the interaction with the Council of Clinical Information Officers (CCIO) has helped shape this programme. The Council of Clinical Information Officers has been established to provide clinical governance to the delivery of eHealth solutions across the Irish Healthcare system. Its role is primarily as an advisory group, with primary governance oversight provided by the Office of the CIO and the eHealth Ireland board.
is composed of clinical leaders and those with hands-on successful programme delivery experience in the Irish healthcare system. There are deep and diverse experiences and perspectives represented on the Council which will support the development of national level programmes including EHR. Further clinician engagement and briefing will take place as part of the Programme.

The eHealth Ecosystem was established by the Department of Health and the HSE to connect communities involved in eHealth in Ireland in June 2015. It is well and widely attended by healthcare providers, patient representatives and suppliers. Thus far it has addressed themes aligned to the National EHR including:

- ePharmacy,
- Clinical engagement and research,
- The Electronic Health Record Programme,
- The EHR Lighthouse Projects.

It is now established as a forum where rich communications and deep engagement regarding the EHR Programme will develop. This will address the key communications and wider stakeholder communications challenge.

Knowledge and Information Plan

The Knowledge and Information Plan, published in May 2015, outlines how integrated information and enabling technology will support the delivery of innovative, safe and high quality patient care to meet the needs of the population across all patient pathways and care settings.

The strategy identifies future health service capability requirements, identified in consultation with the HSE National Directors and clinicians and sets a compelling vision for how healthcare will be delivered in the future. These capabilities are distilled into five focus areas which are key to facilitating the seamless delivery of healthcare across integrated care pathways and at all stages of care as illustrated below:

The delivery of integrated, patient centric efficient care requires the use of capabilities that can only be delivered through deploying EHR technologies. These capabilities support the delivery of improved clinical care, creating a patient record that can be shared across different care settings, using data that can provide real insight into health care decisions and makes best use of national systems that have already been deployed. An Electronic Health Record is essential to deliver integrated care. It cannot be achieved using the technology available in the health service today. For further details on the capabilities, see new Health Service Capabilities in the Knowledge and Information Plan.

National Electronic Health Record Vision & Direction

The National Electronic Health Record Vision and Direction document outlines the case for change and rationale behind the creation of a programme to develop the Electronic Health Record across the health system. The Vision and Direction document drew upon extensive consultation with many stakeholders on the overall direction for a National EHR, including a structured engagement with the eHealth industry to learn from their experiences.

Whilst key systems have been procured and implemented as national solutions (e.g. the National Integrated Medical Imaging System – NIMIS), there is an imperative now to act at a different scale in order to achieve wider benefits. There are several key drivers for progressing a National EHR Programme:
• Improving quality of care: An EHR is essential to address fragmented information, enable sharing of clinical records across multidisciplinary teams and locations and supporting collaboration and effective decision making,

• Enabling Reform: Implementing an EHR provides an essential capability for delivering reform, in particular key programmes such as Integrated Care, formation of Hospital Groups and Community Health Organisations, and the realisation of the Health and Wellbeing strategy. These reforms must be underpinned by better quality shared information,

• Supporting Community Care: Providing operational systems in the Community setting to not just support the delivery of care in that setting and the wider integration of care across the health service, but also to help realise the ambitions of forming the Community Health Organisations,

• Supporting Acute Care: Delivering improvements in the operational systems available in acute hospitals in order to support the delivery of improved care but also to enable acute hospitals to enrich the National Shared Record with relevant information. Introducing these EHR operational capabilities helps to realise the ambitions of the Hospital Groups in terms of working together as integrated hospital networks. Supporting the acute care setting also involves delivering the digital ambitions’ of the New Children’s Hospital. The ICT strategy for the hospital features an EHR as a core element. Decisions on this must be taken in the context of an overall national approach and immediate progress on the implementation plan outlined in Section 9,

• Releasing Potential in National Systems: the investments already completed and currently underway can only be fully leveraged to deliver the broader benefits within an integrated national approach.

Ongoing Health Technology Transformation Projects

There are a number of health technology initiatives that are either in the implementation process or are currently being planned. These initiatives are part of the overall eHealth agenda in Ireland. They are complimentary and in some cases, necessary, initiatives to support the National EHR. These initiatives are building blocks that go towards realising the eHealth Blueprint.

Key technology projects that complement the overall development of a National EHR include strategic programmes such as:

![Figure 5: Key eHealth Strategic Programmes Aligned to EHR](image-url)
### Individual Health Identifier

**What:** The deployment of a number (Individual Health Identifier – IHI) that uniquely and safely identifies each person that has used, is using or may use a health or social care service in Ireland. The IHI is being commissioned with initial health record systems and will roll out more widely thereafter.

**Relevance to EHR:** The IHI provides the reference point to identify patient data in

### ePharmacy

**What:** The programme focusses initially on the development of a national medicinal product catalogue. The programme will widen to include creating the ability to deploy digital solutions across different care settings to make the delivery of pharmacy safer and more efficient. The programme is currently being defined.

**Relevance to EHR:** Medication Management and ePrescribing are core elements of the EHR solution. The availability of drug catalogues and pharmacy solutions are key enablers for developing the Medication Management and ePrescribing capabilities. A robust prescription, fulfilment, and administration process is a key requirement for safe modern healthcare.

### National Medical Laboratory Information System

**What:** The project will replace all of the laboratory systems throughout the country with a single national system that will ensure Irish healthcare providers have 24-hour access to complete and up-to-date accurate laboratory data across all sites. The first hospital site will go live in Q4 2016 will have fully rolled out within 4 years.

**Relevance to EHR:** MedLIS will provide a core EHR element of capability – Diagnostics and Laboratory management as part of the overall eHealth Blueprint. The data available through MedLIS will form an important part of the overall health record for a patient that is to be available.

### Maternal and Newborn Clinical Management System

**What:** The Implementation of an electronic health record (EHR) for all women and babies in maternity services in Ireland. This record will allow all information to be shared with relevant providers of care as and when required. MN-CNS is due to commence roll-out in Q4 2016 and will take approximately 2 years to fully deploy.

**Relevance to EHR:** MN-CNS provides core EHR capability as the first widespread rollout of such an electronic patient record. Experiences will strongly inform the EHR programme. It will form a central part of the overall National EHR as information for this cohort of patients will be available for sharing across the health system.
**EHR Lighthouse Projects**

**What:** The projects will provide early EHR leadership exemplars in three clinical areas: epilepsy, haemophilia and bipolar disorder.

**Relevance to EHR:** These three initiatives build an understanding of the benefits of an Electronic Health Record in the Irish healthcare system.

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**Open Data for Health**

**What:** Structuring and Publishing health system data for third party reuse and increased overall health intelligence by identifying the current datasets which can be published, and establishing a plan to structure and publish further datasets over time. The programme is currently being defined.

**Relevance to EHR:** Open Data provides a valuable resource that can drive innovation and the development of services that can complement the core EHR capabilities.

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**eReferrals**

**What:** Deploying the facilities for GP’s to submit a referral electronically directly from their practice management system to the hospital in question using the HIQA approved referral form and immediately receive an acknowledgement confirming receipt of same. Phase 1 is nearing completion and the next phase will focus on integrating the submission of the referrals between the systems involved.

**Relevance to EHR:** eReferral capability is a component of overall EHR capability and part of the eHealth Blueprint. Richer functionality for referral management will ensure quicker, safer care is delivered.

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**Cancer Care eHealth**

**What:** The programme focusses on developing a solution to track oncology drug usage; and manage care as part of a patients medical oncology. The programme is currently in procurement. process.

**Relevance to EHR:** The medicines management capability will, as a specialist functionality, exist over the long term while being integrated with the National EHR. Over time, Hospitals may replace the EPR with the National EHR with its adoption.
The Strategic Business Case

Arising from the National Electronic Health Record Vision and Direction document, the Office of the CIO committed to developing a business case which would outline development options, the scale of the overall investment, the implementation approach and the high level benefits associated with the EHR programme.

This document delivers on that commitment and outlines the overall investment and implementation approach necessary to put a National EHR in place, while providing strategic direction for national EHR development across the health system.

This Strategic Business Case outlines the following:

- Investment objectives – how investing in EHR capabilities supports the reform agenda,
- The National EHR strategy – the way forward for the EHR programme,
- The project portfolio that defines the EHR Programme,
- The high-level costs for the Programme,
- The indicative benefits that have been delivered in other countries.

This document is delivered as part of an overall process that connects the EHR Vision and Strategy to more detailed implementation plans and procurement of elements to realise the National EHR.

The Strategic Business Case is informed by the consultation previously carried out in the creation of the Knowledge and Information Strategy and EHR Strategic Vision & Direction. It is also the output of recent engagement with the Council of Clinical Information Officers, broader clinical and technical stakeholders and senior leadership within the health service.

What Challenges are there from Doing Nothing?

As we outline in Section 2, implementing the National EHR is essential to enable real reform within the health sector. By doing nothing, it will not be possible to effectively achieve the following key ambitions or reform:

- **Integrated Care**: Provide the information that is required to be securely shared across care settings in order to realise the ambitions of integrated care. The relevant information cannot be safely provided in all relevant care settings through paper records. Additionally, activity workflows aligned to the care pathways cannot be safely created without core EHR capabilities in each care setting.

Taking the NCH as a practical example of integrated care, the vision of paediatric care designates the new children’s hospital as the central component of an integrated clinical healthcare system for Ireland’s children, young people and their families. This system will be based on a national clinical network of interconnected elements from home-based, primary care and local health centres, through local and regional hospitals, connecting into the national paediatric tertiary hub – the new children’s hospital. Within this network, which is presented below, the new children's hospital will provide national services of the kind that can only be provided in a centre with the scale of services and a critical mass of clinical subspecialist expertise and highly specialised healthcare facilities. At the same time, this development will support and enable a consistent approach to the provision of paediatric healthcare at multiple sites throughout the country based on a national model of paediatric care.
This ‘hub and spoke’ delivery approach relies on the ability to share patient information seamlessly across the three sites, allowing for collaboration of the Multidisciplinary Team (MDT) and effective care for children. ICT is the fundamental enabler of this data sharing and must be embraced for the Children’s Hospital Group (CHG) to successfully deliver world-class paediatric care through a multi-site organisation. Ultimately, the same integrated technology and data sharing systems will support the national model of paediatric care, across all paediatric facilities in Ireland.

- **Structural Changes:** While the introduction of National EHR is focused on delivering benefits to public and patients, both the CHO and Hospital Groups require EHR technology to work effectively. Being able to coordinate and deliver care within and across organisations, requires the core capabilities identified in this Strategic Business Case. Information must flow between hospitals and the community to ensure that effective and safe care is possible.

- **Financial Reform:** Linking activity to cost will be extremely challenging without the ability to understand the full episode of patient care. The National EHR provides the mechanism to understand the interactions that a patient has, in all care settings for each episode of care.

The opportunity exists now to shape and deliver the solution from a national perspective. This will ensure that the overall goal of a National EHR, with a National Shared Record of Care can be delivered. If there is not a national focus, and tactical solutions continue to be delivered locally, information will continue to be locked in silos tied to specific organisations within specific care settings. The opportunity to share information across care settings will be lost.
The Indicative Cost of the National EHR Programme

The diagrams below provide a high-level breakdown of the overall costs of the programme for two deployment scenarios over an 11 year period. For both the community and acute operational solutions, the costs relate to deploying and supporting the core capabilities identified in the National EHR Strategy section.

- **5 Year Deployment** – where the core community and core acute capabilities are deployed on a phased, modular basis over a five year period,
- **9 Year Deployment** – where the core community and core capabilities are deployed on a phased, modular basis over a five year period and the acute core capabilities are deployed on a phased basis over a nine year period.

Based on international experience of a large-scale transformation of this nature, the longer term deployment option is the most likely approach.

The costs are presented in further detail in the Programme Costs section, with annual cost profiles available outlining how indicative cost per programme year. The above costs do not include infrastructure upgrades (network, PCs and mobile devices for e.g. Community Nurses) or the cost of additional non-core capability deployment.

Where existing solutions are being replaced during the EHR journey, there may be cash savings as a result of consolidating support efforts through the solutions being deployed as part of the National EHR Programme. The deployment schedule in CHOs and HGs would influence these cash saving opportunities.

Immediate mobilisation requirements over the next 12 months

To progress the National EHR Programme, there are a number of key activities that will take place over the next 12 months at a cost of approximately €9 million. These activities include:

- Mobilising the full programme governance structures,
- Defining requirements including; overall national EHR requirements and acute, community, portal and integration requirements,
- Determining the readiness to proceed in each CHO and Hospital Group and progressing any actions necessary to improve readiness and to minimise implementation risks,
- Creating and agreeing the outline and full business cases for each of the four National EHR components,
- Commencing procurement activities for the four National EHR components and any other elements necessary to deliver the National EHR, and particularly ensuring the ability to provide a solution for the New Children’s Hospital within a national framework,
- Conducting any necessary Privacy Impact Assessments and resolving any outstanding data privacy challenges,
- Continuing to engage with the public and staff of the health system to generate and maintain buy-in for the overall journey.

What Agreement does this Strategic Business Case Seek?

This Strategic Business Case seeks agreement on the following:
- The overall strategy and direction as set out in the Strategic Business Case,
- To make provision for the programme costs over the period identified with the understanding that further business cases for the National EHR components will provide increased clarity on the costs and timelines,
- To provide the resources necessary to staff the programme effectively.
Supporting Reform
The challenges faced by health systems across the globe is a signal that significant change is needed in order to more effectively and efficiently meet the needs of patients. The scale of change under way or being considered in many countries is transformative in nature and many have identified an ambition to fundamentally reform their health system. Technology is invariably viewed as a critical enabler and in some cases a driver of reform. In most cases it is not possible to decouple major changes in technology adoption from reform itself.

Patient records provide information on patients over their lifetime and provide critical support to clinicians in their clinical decision making. A move to Electronic Health Records is transformative in relation to the use of patient data as it frees important data from paper which is difficult share and maintain reliably, and is often physically bound to the department or organisation where it originates. The National EHR is not tied to an organisation. It centres on the patient and provides care givers with the required information to deliver effective, safe and efficient care.

The implementation of EHRs opens up possibilities for:

- greater clinical collaboration,
- growing a richer shared picture of the patient to assist decision making,
- providing an increasingly sophisticated data source to support overall analysis of patient groups, disease prevalence, etc,
- involving patients in their own care through providing them with access to their data.

This type of change can be truly transformative for the public, patients, clinicians and wider healthcare professionals.

In an Irish context a National EHR can deliver a step change in terms of successfully executing on the strategic intent of organisations such as the Department of Health and the Health Service Executive. In particular:

- The health system of the future is based on activities such as service reform, structural reform and financial reform and supporting the ambition for health and wellbeing. Realising this future health system will require a National EHR as a core enabler,
- The HSE Corporate Plan – sets an ambitious agenda for the HSE over a three year timeframe from 2015 -2017. The National EHR is core to several elements of this plan, in particular the ambition of improving access, and the specific actions to deliver eHealth,
- System Reform – the overall programme of reform aimed at major changes such as establishing Hospital Groups and Community Health Organisations points toward a significant shift in the delivery of care and a focus on integrated care. Capturing patient data electronically and sharing patient records through a National EHR is a pre-requisite for the type of operating model that is envisaged for the future and to be delivered in this programme. Importantly however, the deployment of a National EHR will not be tied to any specific operating model or structure and instead is centred on the patient.

In overall terms, the delivery of a National EHR follows the path taken by most developed economies in establishing a key foundation for eHealth. In an Irish context it not possible to deliver on the vision for healthcare in Ireland without this foundation.

EHR and Transforming Care

While health services lag other industries in the adoption of information technology to improve the overall performance in the delivery of services, we have seen significant investments and increasing evidence in recent years of a desire to make a change and to catch up with other sectors.
Healthcare across the world is in a continued state of evolution and reform. A key focus of much reform is to evolve healthcare systems to achieve more connected care delivery between users including patients. The silos of care (acute, community, GP etc.) can be connected to provide an integrated care system that enables patients to receive care seamlessly anywhere along the continuum of care, with the aim being to provide care as close to the patients home as is practical and appropriate. The National EHR will act as a key enabler in this journey and the key changes between the system that exists today and the vision for the future are set out in Figure 8.

Figure 8: National EHR Capabilities
When combined with effective analytics it will make it possible to identify target populations for intervention, stratify risk and ensure continuity of care across the health system. Given the ongoing mandate in healthcare to reduce hospital admissions (and readmissions) and decrease emergency attendances, care givers across the health service can no longer afford to work with ineffective tools. Instead, they must continue to optimise their clinical environments, processes and technological tools to achieve the goals of the health service.

What has been achieved elsewhere?

As we have seen in examples in the Introduction section, the UK, USA, The Netherlands, Australia and Singapore have been on significant EHR journeys. There are a number of examples of the level of adoption that now exists within different jurisdictions and a study of EHR developments internationally identified a range of achievements:

- **In Northern Ireland** (population approximately 1.8m) there has been a successful summary care record programme underway since 2011. There is now a core set of information for health service users available to clinicians including encounters, discharge letters, medications, allergies and immunisations. This has enabled integrated care pathways to be established, for example for diabetes sufferers where the care is now co-ordinated in the community and overseen by Endocrinologists.

- **In Denmark** (population approximately 5.6m) nearly all primary care physicians have electronic health records with full clinical functionality. The Danish National Health Portal, which was introduced in 2005, gives patients electronic access to their EHRs and facilitates electronic communication between patients and their regional health service. Hospitals and hospital-based specialists use EHRs. By January 2014, 100% of hospitals, GPs, and specialists in the public sector were using a Shared Medication Record.

- **In Sweden** (population approximately 9.5m), EHRs are used for documentation by all physicians and most hospitals (and most ambulances). Hospital use has lagged use in primary care, but EHRs are now used in 97 percent of hospitals and 100 percent of primary care clinics. Four different EHR providers cover most of the Swedish market. About half of the regions have adopted a single EHR system for both hospitals and primary care, and most of the others are moving in that direction. The creation of a single record allows hospital physicians (with patients’ consent) to have access to patients’ primary care records and for hospitals to have reciprocal access.

- **Looking further afield**, New Zealand (population approximately 4.4m) regional hospitals began buying electronic administrative systems in the early 1980s. Specialised applications were added over time, including clinical intranets that linked organisational components together to create a single patient view. Electronic communications across providers’ systems commenced in 1994. Today, all of New Zealand’s 1,100 general practices use a practice-based EHR that supports a broad range of functions, including primary care records, problem lists, clinical progress notes, ordering of tests and medications, managing

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Developed countries have invested in introducing EHR capabilities as standard across their health systems. It is widely viewed as an essential element of any modern healthcare system and provides a basis for achieving reform.

EHR Supporting Irish Health Reform

The health service in Ireland is undergoing significant reform and transformation to move towards the healthcare system of tomorrow. Transformation ambitions identified by the Department of Health call for four inter-dependent pillars of reform; Health and Wellbeing, Service Reform, Structural Reform and Financial Reform. The resulting programme of work includes significant changes such as the increased focus on Health and Wellbeing, the establishment of Hospital Groups and Community Health Organisations, and moving to a different funding approach based on activity. The kind of changes envisaged cannot be achieved without the adoption of new technology. In particular, the deployment of EHR solutions across acute and community care settings is a prerequisite to enabling care to be delivered in a more integrated manner and allowing patients to receive a seamless service from providers.

The HSE Corporate Plan

The introduction of a National EHR is a long term initiative that will assist the HSE in delivering on its in-year commitments within its Service Plan and the broader ambition set out over the period from 2015-2017 within the HSE Corporate Plan. The contribution of a National EHR is most specifically evident within three of the five goals set out in that plan as outlined below:
Strategic Business Case

Figure 9: EHR Supporting HSE Corporate Goals

**HSE Corporate Goal**

**Goal 1**
Promote health and wellbeing as part of everything we do so that people will be healthier

**EHR contribution**
- Provide rich patient information that enables Health and Wellbeing initiatives to be progressed
- Increase the information available to care givers and patients to enable better management of chronic diseases

**Goal 2**
Provide fair, equitable and timely access to quality, safe health services that people need

**EHR contribution**
- Strengthen primary care services including general practice access to diagnostic services such as radiography and ultrasound
- Develop close working relationships between specialists in our hospitals and primary care physicians
- Implement a number of key Integrated Care Programmes

**Goal 3**
Manage resources in a way that delivers best health outcomes, improves people’s experience of using the service and demonstrates value for money

**EHR contribution**
- Drive the implementation of eHealth Ireland which is a strategy for Ireland that will improve population wellbeing, health service efficiencies and economic opportunities through the use of technology enabled solutions
- Implement the Individual Health Identifier Programme so that everyone who needs our services is accurately identified, thereby improving patient safety, efficiencies and effectiveness throughout healthcare
- Develop new programmes which will change the way we deliver and provide our services by utilising the capability of digital technology

**Things We Will Do to Achieve This Goal Include**
- Integrate prevention, early detection and self-management into the Integrated Care Programmes
- Reduce chronic disease
- Deliver person centred community based services which support independence and choice for older people and people with disabilities

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The HSE Corporate Goals will be realised through reform initiatives in the areas of Clinical Care, Structural and Financial Reform. EHR capabilities are essential to help support those initiatives.

System Reform Programme

The System Reform Programme under way in the HSE will drive the delivery of person-centred, integrated care across the health and social care services and better outcomes for patients and service users. Provision of care must be integrated by providing better and easier access to services for the public which are close to where people live. Services are being re-organised to ensure they are delivered in the most appropriate way. Three key areas of reform, i.e. Clinical Care, Structures and Financial reform are underway in this programme and the National EHR will make a significant contribution in each of these areas.

Clinical Care Reform

Clinical Care Reform focuses on the redesign of the delivery of care to increase care safety and to improve the care outcomes. This is being spearheaded through the design and implementation of integrated models of care. Clinical services are being re-organised to ensure they are delivered in the most appropriate and effective way through Integrated Care Programmes, National Clinical Programmes and Chronic Disease Prevention and Management.

As an example, the Integrated Care Programmes aim to engage and enable all clinicians to deliver the right care at the right time in a joined up approach, improving the end user experience of health and social care.

Whilst this has a significant clinical focus in terms of redesigning services and processes across the continuum of care, there are important technology enablers that are required in order to realise the ambitions of integrated care. The detail of how clinical care reform is achieved through specific elements of the National EHR is set out in the table below:

<table>
<thead>
<tr>
<th>Reform Objective: Clinical Care Reform</th>
<th>Key National EHR Enablers</th>
</tr>
</thead>
</table>
| Improved patient safety               | • Clinical Notes and Decision Support to allow full accurate recording of care  
                                         • Better access to more consistent records  
                                         • Better care co-ordination within and across settings  
                                         • Standardised pathways that drive consistency of care  
                                         • Closed-loop medications management  
                                         • Results notification with standardised order sets for diagnostics, investigations and materials  
                                         • Clinical audit and monitoring capabilities  
                                         • More rapid diagnosis through electronic ordering and provision of tests and results that are available to view for all relevant care givers across the continuum of care |
| Improved and standardised patient care| • Clinical Notes and Decision Support to ensure richer information on clinical decisions and patient processes  
                                         • Embedding improvements in evolving care pathways within and across settings  
                                         • Supporting evaluation of clinical outcomes leading to continuous improvement |
| Managed patient pathways and flow     | • Core pathway enabling functionality  
                                         • Referral and scheduling capabilities across the community and acute sectors |
### Reform Objective: Clinical Care Reform

<table>
<thead>
<tr>
<th>Reform Outcomes - Including</th>
<th>Key National EHR Enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Real-time tracking of bed utilisation</td>
</tr>
<tr>
<td></td>
<td>Secure communications and collaboration between care providers to safely transfer patients along the continuum of care with a shared view of the patient</td>
</tr>
<tr>
<td></td>
<td>Information sharing to enable treatment of patients in alternative settings</td>
</tr>
</tbody>
</table>

**Integrated models of care that allow patients to be treated closer to the home**

- Access for local care providers to a longitudinal and shared clinical view of the patient to support more effective clinical decision-making
- Secure communications and collaboration between care providers to safely treat patients along the continuum of care so that rich clinical data follows the patient between care settings
- Access for patients to key information for them
- Clinical Notes and Decision Support Pathways that support the clinical processes
- Active chronic disease management and scheduling across a range of services

**Empowered people who manage their health and care needs with support, and to live independently in their own homes for longer**

- Patient access to their own information
- Tailor self-management supports provided to patients
- Key patient information in Chronic Disease Registers
- Access for care providers to a longitudinal view of the patient
- Analytics and risk stratification tools to identify and manage cohorts of patients
- Supporting leading developments for remote monitoring and information capture
- Document and make accessible shared care plans between General Practice, hospitals and patients

As an example, to achieve the integrated model of care envisaged as part of the Paediatric and Neonatal Model of Care aligned to the new children’s hospital, it is essential that key patient information can flow seamlessly and securely between sites where care is being delivered. This cannot be achieved through the current paper-based records that are tied to organisational entities. To enable this type of integrated care requires the EHR capabilities identified as part of this Strategic Business Case.

Integration of care is only possible through integration and sharing of patient information and this will be delivered by the National EHR where information will be made available across the continuum of care.
Strategic Business Case

The formation of the Hospital Groups and Community Health Organisations (CHOs) is a major structural reform within the health system. A significant programme of change is underway to enable and drive the establishment of hospital groups and CHOs with the aim of delivering integrated services and better outcomes for service users.

Whilst the focus of the National EHR Programme is to enable services for the public and provide care givers with the tools to deliver effective care, the EHR capabilities are a key requirement in order to effectively create the Hospital Group and CHO organisational units. These capabilities are essential in order to enable the organisations to deliver clinical services in an integrated manner and operate as a group rather than individual organisations.

<table>
<thead>
<tr>
<th>Reform Objective: Structural Reform</th>
<th>Supporting EHR Enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reform Outcomes – Including</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Coordinated delivery of patient focused care across locations | • Scheduling capabilities within and across the community and acute sectors to enable resources to be managed effectively within and across the organisations  
• Information and analytics capabilities to manage resources across the HG or CHO  
• Real-time tracking of bed utilisation within Hospital Groups  
• Secure communications and collaboration between care providers to safely transfer patients across locations |
| Facilitated collaboration and multidisciplinary team care delivered across the Hospital Group and the CHO | • Access for care providers to a longitudinal view of the patient that enables multidisciplinary teams to have the required information to work together  
• Decision Support Pathways that help guide clinicians  
• Standardised care pathways and clinical documentation to ensure that care givers contribute at the required times during treatment  
• Information sharing to enable treatment of patients in alternative locations |
| Improved financial management of Hospital Groups and CHO’s | • Up-to-date, accurate views of activity and the totality of the episode of care for patients so resources used can be understood and tracked  
• Data and tools available for analysis and forecasting of service delivery requirements so that resource planning can be more effective and targeted |

In order to support the operation of CHOs and Hospital Groups as coordinated and integrated organisations, they must have sufficient ICT capabilities to record, store and share information in order to support clinical decision-making and drive standardisation.
Financial Reform

The Finance Reform Programme is seeking to improve financial planning and management across the health system in order to identify and manage risk and to ensure that healthcare services can be delivered against available funding. The programme centres on the creation and implementation of a new Finance Operating Model (FOM) and the introduction of a new financial management system.

The ability to operate the future health system results in the need to move towards a model of funding that would encourage treatment at the lowest level of complexity that is safe, timely, efficient and is delivered as close to the home as possible. The health system is currently working to deliver an Activity Based Funding model. This will require more accurate and granular information to provide a more comprehensive view of a patient’s episode of care. In essence, better insight into the delivery of care episodes and their associated costs is required.

Whilst the financial process changes and financial system implementation are being progressed, the ability to understand the activity that has been undertaken must be derived from the episode of care which is contained within the National EHR. The Activity Based Funding Implementation Plan13 outlines the current limitations within existing systems for supporting this future funding model, including the lack of ICT operational systems in the Community setting and the absence of relevant datasets in existing acute systems.

Reform Objective: Financial Reform

<table>
<thead>
<tr>
<th>Reform Outcomes – Including</th>
<th>Supporting EHR Enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved linkages between activity and cost</td>
<td>• Access for users to a longitudinal view of the patient to identify what services have been provided, by whom and when</td>
</tr>
<tr>
<td></td>
<td>• Recording preventive interventions to fully understand patient impacts</td>
</tr>
<tr>
<td></td>
<td>• Up-to-date, accurate views of the totality of the episode of care for patients</td>
</tr>
<tr>
<td></td>
<td>• Data and tools available for analysis and forecasting</td>
</tr>
<tr>
<td>Better understanding of the service implications of cost reductions</td>
<td>• Data and tools available for analysis and forecasting</td>
</tr>
<tr>
<td></td>
<td>• Key patient information in Chronic Disease Registers</td>
</tr>
<tr>
<td></td>
<td>• Analytics and risk stratification tools to identify and manage cohorts of patients</td>
</tr>
</tbody>
</table>

There must be a strengthening of the linkage between activity and cost. This can only be done effectively through the introduction of the National EHR that will capture and share data relating to the episode of care.

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What Cannot be Achieved Without EHR?

Changes in clinical care processes, structures and financial management will be central to the transition to the future health system, but National EHR capabilities, as a knowledge platform, will be an essential foundation for that transition. As organisations move to the healthcare system of tomorrow, it will be not be possible to achieve the aims of improving patient outcomes, enhancing the quality and safety of patient care and reducing costs without maximising the use of technologies including EHR.

Without a National EHR, it will not be possible to do the following and achieve the potential benefits that a National EHR will support:

- Deliver integrated care as care givers in different care settings will not be able to see essential information about the patient – *enabling improved patient safety and care*,
- Standardise care processes and pathways across the health service – *enabling improved patient safety and care*,
- Allow Hospital Groups to deliver care as a consolidated group where information about treatments and patients flow seamlessly across hospital boundaries – *enabling improved patient experience and improved patient safety and care*,
- Enable CHOs to provide an efficient, integrated service because of the continued reliance on paper based records and administration – *enabling more efficient delivery of health services*,
- Securely maintain and manage medical records electronically as opposed to the current paper-based formats – *enabling more efficient delivery of health services*,
- Provide greater visibility of real-time views of activity and resources across the entire health system to enable greater control of costs – *enabling more efficient delivery of health services*,
- Provide the linkage between activity and cost needed for Activity Based Funding. This can only be done effectively through the introduction of the National EHR that will capture and share data relating to the episode of care – *enabling more efficient delivery of health services*. 
What does the future look like with a National EHR?

Use case 1: Integrated care for long-term condition management

A patient with end-stage kidney disease and diabetes moves from hospital based to home haemodialysis. At each dialysis session, the haemodialysis machine updates the hospital clinical system via a secure Internet connection, and the patient updates his record if he experiences any symptoms during a session. The system alerts a hospital home haemodialysis team member in the case of any potentially clinically concerning readings, trends or events, and the session records are reviewed at regular intervals. The patient’s glucometer also automatically updates his record with blood glucose readings. A trend in the blood glucose readings falls outside of defined acceptable parameters, and a member of the general practice team is alerted. The patient is asked to attend his general practice surgery. The change from patient held blood glucose paper diaries to an electronic record integrated with the glucometer is illustrated below.

When the patient sees his practice nurse to agree a plan to manage his blood glucose levels, he also mentions that his haemodialysis access fistula is sometimes painful. The nurse reviews his national record, examines the fistula and sends an electronic message to the home haemodialysis team. The patient is then phoned and asked to attend the dialysis unit for assessment.

This scenario is enabled by operational acute systems integrated with home medical devices, general practice operational systems, a national portal or summary care record with clinical collaboration capabilities, allowing both professional and patient access, all underpinned by a national integration platform. These components of the national EHR enable patients to be managed safely at home and in general practice, with specialist support available when required. This results in improvements to patient clinical outcomes and quality of life, and reduced organisational and patient expenditure.
The role that Electronic Health Records can play in wider reform of the health service is set out in the previous chapter. While this, in itself, provides a strong rationale for investment it is important to draw out the specific benefits that are likely to accrue from the implementation of the programme set out in this business case.

Healthcare systems are inherently complex and defining cause and effect when making investments in any significant programme of change is challenging due to this complexity. For example, isolating and measuring the impact of improved staff training, investments in clinical equipment or significant transformation programmes is difficult given the variety of factors that influence care delivery.

The scale of investments internationally in Electronic Health Record solutions is such that there has been a continued focus on tracking the impact of these investments and evidence is continually building in this area. Both qualitative and quantitative benefits are described in international examples.

Qualitative benefits arise from the fundamental shift that occurs in moving to an environment that is digitally enabled. These benefits include the significant empowerment of patients as participants in their own care, greater ability for clinicians to collaborate and more effective decision support arising from more timely and comprehensive access to patient information. In a wider sense the growing information base of patient data provides improved capability for proactive management of the health service and informs research into areas such as population health.

Quantitative benefits of EHR implementations have been identified in many studies, and are primarily captured in specific areas of care, e.g. reductions in Length of Stay in Emergency Departments, rather than at a system wide level. These benefits can be categorised in three broad areas:

- **Improved patient experience** – better engagement with the public results in reduced length of stay and/or improved access to care, while patients also become more active participants in their care through a digital experience,
- **Improved patient safety and care** – the shared access to clinical information drives better informed clinical decisions, reduction in errors and a decrease in avoidable adverse events and hospitalisations,
- **More efficient service delivery** – achieved through a reduction in manual processes and overall visibility of the care delivery processes to support effective resource management.

Within a programme of this scale there will be wider benefits to the economy through the resulting improvement in the health of the population and also due to the demand for services and solutions that the Irish eHealth industry could satisfy.

This strategic business case focuses on benefits cited in other EHR implementations internationally. There will be a need for a structured and managed approach to benefits capture within this programme of work and that must start now with establishing the baseline from which benefits can then be tracked.

Realising Benefits in Healthcare Systems

Attributing cost/benefit impacts from transformational changes such as the one considered in this document is challenging given the complexity of the health system and the level of change being considered. Introducing EHR capabilities such as medicines management or clinical notes requires a complex set of changes in care delivery. Therefore the benefits that accrue are not simply from technology itself but from the wider change that results.

The National EHR is a crucial element that will help deliver new models of care and greater standardisation of care processes and pathways.

The benefits that accrue from this type of change are long term and strategic in nature. There is a growing evidence base that the introduction of EHR capabilities themselves can help realise specific, discrete
Strategic Business Case

benefits. In the acute sector, for example, research has shown that hospitals in advanced stages of EHR adoption (HIMSS Stages 5 – Closed loop medication administration, and above) are significantly more likely to set national benchmarks for performance in the areas of patient care and operational efficiency\(^{14}\). In the community healthcare setting for example, benefits such as the easy access to patient information that is not locked in paper-based records enables more effective and efficient delivery of care.

With a National EHR Programme on this scale, benefits will accrue in different areas and over varying timescales:

- **Benefits in specific areas**: there will be specific benefits achieved within certain disciplines (for example reductions of Length of Stay) and within certain care settings (for example improved access to patient information in the community),
- **Benefits at system level**: there will be benefits achieved across different care settings as a result of the introduction of EHR capabilities. An example would be greater coordination of care between acute and community care due to increased collaboration,
- **Timing of benefits being realised**: The timing of when benefits within those care settings can be realised will vary depending on the deployment strategy, associated process transformation and strong adoption of the technology. For benefits that occur across care settings, they can only be realised when transformation has taken place across all the relevant care settings including the adoption and optimisation of the EHR capabilities.

The benefits that are cited in many studies of EHR implementations are predominantly tied to particular patient groups, care settings or disciplines. Within this chapter, the benefits are categorised and summarised to illustrate the possibilities that are offered by a National EHR implementation. This serves to underpin the strategic business case. At this stage, the full implementation journey is yet to be defined in detail and will be the subject of further specific outline and full business cases relating to particular care settings and national solutions such as the Shared Care Record.

**The Context of Increased Demand**

There is growing demand for healthcare services in Ireland due to our population pressures and health characteristics. While funding has increased in recent years there will be a continued need to deliver more with the current resources. The health system a challenging backdrop to delivery planning:

\(^{14}\) HIMSS Analytics (2012). Quality and Safety Linked to Advanced Information Technology Enabled Processes
The benefits set out here should be viewed in the context of increasing demand and as a part of the strategic response to the trends in Irish healthcare.

Quantitative and Qualitative Benefits

Introducing EHR capabilities can deliver qualitative and quantitative benefits. Benefits such as reduced length of stay and reduction in adverse drug events can be quantified and measured. For example studies have shown that adoption of EHR solutions reduced likelihood of errors at ordering drugs by 68%.

Qualitative benefits (such as improved collaboration between clinicians) are difficult to place a value or measure on. However, they are equally important in terms of helping to drive improvements in patient outcomes and overall care delivery. Clinicians involved in design discussions around this programme have identified empowerment of patients as a key qualitative outcome from the introduction of a National EHR.

Quantifiable Benefits from EHR

Based on a literature review of international evidence and benefits realised in other jurisdictions, a significant range of quantifiable benefits have been identified. These benefits can often be linked to a number of different outcomes, e.g. the reduction of Length of Stay in Emergency Departments will result in an improved experience for patients but also drive down cost. In the following section benefits have been categorised across three broad outcomes:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Description</th>
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</table>
| Improved patient experience    | • Better information will support more efficient and effective clinical decisions, which should result in reduced length of stay and reduced wait times for patients  
  • Patients will become active participants in their health care journey and be better informed on their treatment options which increases their engagement and understanding of their care |
| Improved access to             | • Improved access to integrated and shared clinical information which will support more  |

Source: HSE Planning for Health – Trends and Priorities to inform Health Service Planning 2016
Strategic Business Case

<table>
<thead>
<tr>
<th>patient safety and care</th>
<th>effective clinical decision-making. This improves patient safety through benefits such as decreased instances of avoidable adverse events and hospital readmissions.</th>
</tr>
</thead>
</table>
| More efficient delivery of health services | - Reduced reliance on manual processes, with increased secure and robust automation of information collection, sharing and analysis to free up clinical and non-clinical resources  
- Greater visibility of patient flow, resource availability and other efficiency metrics across the health service allowing for more effective management of resources and overall improvements in efficiency |

The evidence of quantified benefits is summarised here in relation to these three outcomes. A simple breakdown is used to illustrate how various benefits deliver an overall outcome.

*Improved Patient Experience* is an outcome that can be realised through a number of positive benefits arising from EHR capability introduction. This arises from positive impacts on areas such as reduced testing of patients and a reduction in the need for hospital attendance / admission:
Strategic Business Case

Improved Patient Safety and Care is an outcome that can be linked to a series of quantified benefits related to the adoption of Electronic Health Records:

**Figure 10: Improved Patient Experience - Quantified Benefits Logic Tree**

- ↓ Avoidable Hospitalisations
- ↓ Duplicate Imaging
- ↓ Inappropriate & Duplicate Lab Testing

- ↓ Average Length of Stay
- ↓ Emergency Department Attendances & Admissions
- ↓ Do Not Attend Rates
More Efficient Delivery of Health Services is the result of many of the quantified benefits cited for EHRs. Most of the benefits already described above can result in reduced cost/ better use of resource. The actual improvement in efficiency can be treated in different ways depending on particular policies, e.g. in some cases this could be used to reduce actual cost but in most instances it allows health systems to treat more patients and improve overall access to care.
The following table offers an indication of the potential for benefits and improvement arising from introducing EHR capabilities by referencing supporting evidence and benefits achieved in other jurisdictions.
<table>
<thead>
<tr>
<th>Benefit</th>
<th>Sample Supporting Evidence Base(^{15})</th>
<th>Potential Value for Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Average Cost Per Patient</td>
<td>In a study of 5m people in the US, patients treated in hospitals with advanced EHRs cost on average 9.66% less than patients admitted to hospitals without advanced EHR (Swanson Kazley et al. 2014) 81% of respondents in a recent HIMSS survey of hospitals at Level 6 or above reported that their organisation realised a positive impact in the area of savings (HIMSS 2016)  EHR capabilities reduce the need for manual activities associated with paper based record keeping. Wang et al. 2003 identified a 28% reduction of transcription costs from partial elimination of dictation in Primary Care</td>
<td>Reducing the average cost per patient will enable the health service to do more within the existing cost allocation</td>
</tr>
<tr>
<td>Reduction in Average Length of Stay (LOS)</td>
<td>Lee et al. 2015, in a study identified <em>0.59 days shorter ALOS</em> in hospitals with a full EHR. However, there are many contributing ways in which EHR capabilities can lead to a reduction in a patient’s length of stay (LOS). This can be within specific care pathways or through other improvements that deliver care quicker. Examples of these include:  - Reduction in ED LOS by <em>23 minutes per patient</em> through EHR efficiencies (Spalding et al 2009)  - 42% reduction in radiology turnaround time (Bridges et al. 2010, Mekhjian et al. 2002)  - <em>0.14 day reduction in LOS</em> per prescription (Mekhjian et al. 2002)  - <em>195 minute reduction in LOS</em> on average due to improved lab turnaround (Mekhjian et al. 2002)  - 18% reduction in LOS thanks to improved clinical outcomes through the sepsis clinical pathway (Hopper, 2009)  - 20% reduction in LOS thanks to improved clinical outcomes through the sepsis clinical pathway (Rotter et al. 2010)  - 30% reduction in LOS due to reduced surgical adverse events through medication management (Murphy et al. 2009)  - Banner Health, USA (2007) reduced LOS by 7.1% (case mix adjusted) by accelerating result turnaround times and reducing the need for repeat tests</td>
<td>Reducing the average length of stay for patients in hospitals helps patients to return to their community quicker. It also allows a greater number of patients to be treated within the existing resource base as the throughput of patients increases</td>
</tr>
<tr>
<td>Reduction in Mortality</td>
<td>The reporting of real-time data allows an opportunity for more timely intervention and in turn for greater safety for patients. This was the case at the Hospital Marina Salud de Denia where alerts and early interventions triggered by EHR capabilities led to a 32% reduction in sepsis mortality (Moncho, 2012)  A Harvard Study of EHR implementations found a 9% reduction in overall mortality rates (Hague, 2015)</td>
<td>Sepsis issues are prevalent in all healthcare systems, including Ireland. Alerting capabilities will help to reduce the number of Irish patients who die as a result of sepsis issues</td>
</tr>
</tbody>
</table>

\(^{15}\) References are available in the Bibliography
<table>
<thead>
<tr>
<th>Benefit</th>
<th>Sample Supporting Evidence Base(^{15})</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Reduction in Emergency Department Admissions</td>
<td>A US Study identified a 25% reduction in ED attendances after the implementation of an EHR. This was based on patients classified as “frequent visitors” (Stokes-Buzzelli et.al, 2010)</td>
<td>Emergency Departments in Ireland are extremely stretched in terms of dealing with the current levels of demand. A reduction in admissions in ED helps to reduce the demand for services and beds within the hospital network</td>
</tr>
<tr>
<td>Reduction in Primary Care Visits</td>
<td>Two years after electronic health records were fully implemented, age adjusted primary care visits decreased in two US regions by 11% (Garrido et al, 2005)</td>
<td>Reducing the primary care visits from existing levels helps to free up resources to help realise integrated care and true interaction across the continuum of care</td>
</tr>
<tr>
<td>Reduction in Avoidable Hospitalisations</td>
<td>Clinical decision support can reduce preventable hospitalisations by up to 37% (Wong, 2008) EHR capabilities can reduce readmission rate by 26% using data analytics, clinical guidelines and decision support (Amarasingham et al 2012)</td>
<td>There are challenges in Ireland in terms of demand for hospital beds. If a patient does not have to be hospitalised, it will improve their experience of the health service as they could have to wait for a bed in the current environment. For the health system, it reduces demand for beds</td>
</tr>
<tr>
<td>Reduction in Drug Costs</td>
<td>Drug costs can be reduced by 11% due to EHR capabilities suggesting cheaper alternatives where possible (McMullin et al. 2004)</td>
<td>The cost of drugs forms a significant cost element in the health system budget. Reducing drug costs would free up resources that could be reallocated to increased patient care</td>
</tr>
<tr>
<td>Reduction in Adverse Drug Events</td>
<td>There is evidence that 35% of medication errors occur at the at ordering stage (Bates et al. 1995, Leap et al. 1995, Howard et al. 2003, Winterstein et al. 2002, Gurwitz et al. 2003, Lagnaoui et al. 2000) and EHR capabilities have been shown to reduce the likelihood of errors at ordering by 68% (Seeley et al. 2004, Bates et al. 1998). Westbrook et al. 2011 found a reduction in potential ADEs of 71%; Radley et al. 2013 found a reduction in prescription errors of 48% leading to a reduction in medication errors of 12.5%; Nuckols et al. 2014 found a reduction in preventable ADEs of more than 50% through reduced medication errors; Blum et al. 2011 found a 43% reduction in ADEs caused by prescribing errors at admission; and Schnipper et al. 2009 found a 28% reduction in potential ADEs.</td>
<td>Adverse drug events can have a significant impact on patient safety. From a health system point of view, it can result in increases in acuity and lead to patients being hospitalised or spend additional time in hospital. Reducing these events can help reduce demand for hospital services</td>
</tr>
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### Strategic Business Case

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<thead>
<tr>
<th>Benefit</th>
<th>Sample Supporting Evidence Base</th>
<th>Potential Value for Ireland</th>
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<tbody>
<tr>
<td><strong>Increased Accuracy of Prescribing Dosage</strong></td>
<td>Standardisation of care in the area of drug usage can lead to a 10% increase in the accuracy of prescribing dosage (Teich et al. 2000)</td>
<td>Patient safety will be improved as more appropriate dosages will be given to patients. Drug costs constitute a significant portion of the health budget. More accurate prescribing will improve the effectiveness and efficiency of those drug resources.</td>
</tr>
<tr>
<td><strong>Reduction in Discharge Summary Errors</strong></td>
<td>A reduction of 76% in the number of errors in discharge summaries (Lisby 2005)</td>
<td>The safe transition of patients from one care setting to another is a key principle of integrated care. Being able to safely move patients and enable the different care settings to see all the patient information is essential to successfully deliver integrated care in Ireland.</td>
</tr>
<tr>
<td><strong>Reduction in Duplicate Imaging</strong></td>
<td>Duplicate imaging can be reduced by the implementation of EHR capabilities. This can result in a 0.9% reduction in the number of duplicate images taken (You et al. 2008).</td>
<td>In addition to the improvement in the patient experience by not having to have the same images taken repeatedly, diagnostic imaging resources will not be used ineffectively. The capacity gains from removing time spent duplicating images can be applied to dealing with unmet demand.</td>
</tr>
<tr>
<td><strong>Reduction in Inappropriate Lab Testing</strong></td>
<td>EHR decision support capabilities have been found to result in a 7% reduction in inappropriate testing (May et al.)</td>
<td>The patient experience will be improved by not executing tests that are not required. Additionally, the capacity gains from not conducting lab tests can be applied to dealing with unmet demand.</td>
</tr>
<tr>
<td><strong>Reduction in Duplicate Lab Testing</strong></td>
<td>The availability of patient information and decision support capabilities can decrease duplication of laboratory testing by 67% (UNSW, 2012)</td>
<td>The patient experience will be improved by not having the same investigations conducted on the same patients. Additionally, the capacity gains from removing time spent duplicating lab tests can be applied to dealing with unmet demand.</td>
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## Strategic Business Case

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<tr>
<th>Benefit</th>
<th>Sample Supporting Evidence Base&lt;sup&gt;15&lt;/sup&gt;</th>
<th>Potential Value for Ireland</th>
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<tr>
<td><strong>Reduction in Do Not Attend Rates</strong></td>
<td>National audits in the NHS have shown between 17%-65% reduction in Do Not Attend (DNA) rates, for trusts implementing appointment reminder services (NHS, 2012)</td>
<td>In 2014, the outpatient DNA rate was approximately 15% across Irish hospitals. This results in capacity not being fully utilised. Reducing the DNA rates increases throughput and also helps to prevent the acuity levels of patients increasing as a result of missing their appointments. The increased acuity levels places even greater demands on the health service in the longer run</td>
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<tr>
<td><strong>Reduction in the Cost of Managing Medical Records</strong></td>
<td>Barlow et al. 2004 observed significant evidence of savings arising from the reduced need for transcription services, reduced effort and cost for chart maintenance and creation, and reduced physical space requirements due to paperless records</td>
<td>Currently, records are paper based and require extensive storage facilities which are challenging to search through to find appropriate records. Additionally, it is not possible to determine who may have inappropriately accessed those records. In the future, the effort to securely hold an electronic, consolidated record for the patient will be greatly reduced. The ability to audit who has accessed and updated the records will be available</td>
</tr>
<tr>
<td><strong>Reduction in Coding Time</strong></td>
<td>Computerised coding as part of EHR capabilities can save time and result in higher quality coding with 50% of the effort saved per episode (Hohnloser et al. 1995) Truman Medical Centre in the US, observed in 2012 an increase in their clinical coder productivity by 9% as less time was spent deciphering notes or clarifying information.</td>
<td>Currently, extensive efforts are required to appropriately code patient episodes. Often this is as a result of having to decipher hand-written notes. In the future, this effort will be greatly reduced as a result of more accurate and contextualised information being captured through the clinical systems</td>
</tr>
</tbody>
</table>
Case Study: Kaiser Permanente

Context
Kaiser Permanente is an example of a health organization with an existing EHR and integrated model of care. Kaiser implemented EHR systems in 2004 and by 2007 launched a personal healthcare access portal.

Enablers

Acute Care
- Replacement EHR system and personal healthcare access portal for patients to be more involved in care
- Training staff to reduce impact on workforce and patient care during implementation
- Engaged and cooperative workforce through performance management regimes
- Strong leadership hierarchy and team-working environment
- Existing governance framework for EHR

Community Care
- 95% of users indicated ability to communicate electronically with their physicians enabled them to better manage their health (Chen et al., 2009)
- For patients with diabetes and hypertension, the use of secure patient-physician e-mail was associated with an increased likelihood that patients would meet each of the nine HEDIS measures (Zhou, Kanter, Wang & Garrido, 2010)
- When Personal Health Records (through an electronic system) allow and facilitate communication between patients and providers and enable data to be exported and imported from other information systems, and transform clinical measurements and observations into meaningful and actionable information, this constitutes fundamental shifts in healthcare delivery. Self-care by patients is also possible. The value of the integrated PHR is thus significant (Demor, Bloemroos, Raymond, Tange, 2008).
- Kaiser Dietitians integrating sharing knowledge and communicating more effectively through EHR (Mindoro & Batton, 2007)

Research
- Internal medical informatics department to mine health record data
- Kaiser already had access to information on benefits of EHRs, and an engaged workforce.

Outcomes

Acute Care
- Reducing time to access information, particularly for patients who have chronic conditions, especially in pediatric patients
- Diabetes patients visited the emergency room 29 fewer times per 1,000 patients and were hospitalized 13 fewer times per 1,000 patients annually after HealthConnect was implemented
- Eliminated 1,000 tons of paper records, 88 tons of x-ray film by switching to digital x-rays, 38 tons of toxic chemicals used to process film x-rays, 71.5 million gallons of water saved per year; 5 million gallons of gasoline saved per year from avoided medical visits

Community Care
- 95% of users indicated the ability to communicate electronically with their physicians enabled them to better manage their health (Chen et al., 2009)
- For patients with diabetes and hypertension, the use of secure patient-physician e-mail was associated with an increased likelihood that patients would meet each of the nine HEDIS measures (Zhou, Kanter, Wang & Garrido, 2010)
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- Kaiser Dietitians integrating sharing knowledge and communicating more effectively through EHR (Mindoro & Batton, 2007)

Research
- Data mining from the EHR supports Health Outcomes research
What does the future look like with a National EHR?

Use case 2: Unscheduled Care

A child presents at her local emergency department with a mild fever. Her parents advise that she is being treated for a long-term condition at the National Children’s Hospital. The paediatric emergency medicine doctor looks up her electronic national record and views her summary, including key clinical contacts and a plan in case of attendance at a local emergency department. He phones the child’s lead consultant and they agree, in conjunction with the local consultant paediatrician, that as her symptoms appear mild, they will admit her locally for observation, and review with the National Children’s Hospital lead consultant the next day. The local paediatrician admits the child, and the ward medical and nursing team access her national electronic record, which includes medication history and other key clinical information.

This scenario is enabled by operational acute systems, and a national portal or summary care record, allowing professional access, all underpinned by a national integration platform. These components of the national EHR enable professionals working in unscheduled care settings to deliver high quality care, based on a comprehensive view of patient history, even if patients have complex needs which are treated in external organisations.
Case Study: National Integrated Medical Imaging System (NIMIS)

Context

NIMIS today, enables Ireland’s health professionals to collaborate, seamlessly and securely sharing patient imaging data electronically. We have improved the quality of imaging, and the speed and accuracy of clinical decisions. NIMIS has led to a safer more patient centered imaging service within the Irish healthcare system.

We have better visibility of what is happening across the country and have enabled the data to follow the patient through the care pathway. As a result, the right data is available at the right time in the right place. With NIMIS, Ireland has one of the most advanced and integrated radiology IT infrastructures in the world.

Impact

“NIMIS has helped the NCH really live the title of being a National Rehabilitation Hospital. In many ways as clinicians, pre NIMIS, we worked blind not having access to previous neuroimaging etc for our complex patients. This resulted in unnecessary re-imaging, unnecessary transfers of care and incomplete MDT care planning. Having NIMIS has transformed our work and really helped us have appropriately fully informed patient centred conversations about care planning and provision. Connected care is better care.”

Dr Aíme Carroll, Head of Clinical Strategy and Programmes

- Sites live as of November 15, 2015: 38
- Hospitals at project completion: 47
- Users: 20,000+
- Studies: 6 million
- Reports: 9 million

Outcomes

- Significant reduction in unreported radiology examinations – NIMIS facilitates the easy identification and quantitation of such exams allowing local departmental and hospital management to monitor trends, address issues and prioritize workloads. The system has also facilitated the easy outsourcing of reporting batches / work where required in a number of centres to deal with backlogs, holiday cover, etc.
- Loss or Unavailability of Images - Internationally figures of up to 20% of images being unavailable when required has been reported in the literature. NIMIS eliminates this figure overnight in all centres where it has gone live.
- Transfer of Images and Patients - In many critical and acute situations there is a need to seek a second opinion from a tertiary level hospital or refer the patient to same. This can result in delays in getting the images to the referral hospital’s team and/or the unnecessary transport of the patient to the remote hospital. NIMIS eliminates this requirement by making the images available to the remote physicians immediately. This has saved money in transport/ambulance costs but more importantly results in better care of the patients.
- Electronic reports to GPs – NIMIS provides the reports of radiological investigations requested by GP electronically back to their GP practice management systems. This has resulted in significant savings in printing and posting reports to GP (£150,000 in 6 months) as previously was the case, but more so has resulted in a much more rapid turn-around time for such reports getting back to the GP. The former of these savings can be quantified locally.
- NHCD Time Saving - In a non-PACS / non-Order Comm environment, the NHCD can spend up to 10% of their time managing the radiology examinations of their patients. This time can be made up of bringing orders down to Radiology, looking for reports, finding relevant images etc. NIMIS has reduced this figure to 2-3% and saving NCHD’s in any particular hospital. This time is then made available for better patient care. Other time savings for NCHD result in the removal of the need to plan the use of the PACS system in each hospital they work as it is the same system with the same login details (the benefit of a national system).
- Generation of Statistics – NIMIS facilitates the generation of performance statistics at a hospital, group or national level in minutes. Such data includes examination turn-around times, numbers of unreported exams, workload per facility / scanner / section / etc. Prior to NIMIS, this was often a highly manual exercise taking substantial time inputs to generate.
- Procurement Savings – At the time of procuring NIMIS, the HSE had an option of doing individual procurements for each hospital for a PACS/RIS system and paying for these individually. The NIMIS project methodology has been estimated to have saved the HSE a number of tens of millions of euro as a result of the national solution proposed and installed.
Qualitative Benefits from EHR

Qualitative benefits are understood and valued by patients, care practitioners and healthcare administrators but do not lend themselves to easy quantification. Below we outline qualitative benefits which more holistically describe the full benefits that will be possible through the availability of an EHR.

<table>
<thead>
<tr>
<th>Benefit</th>
<th>How it is achieved</th>
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<tbody>
<tr>
<td><strong>Proactive management of care</strong></td>
<td>More comprehensive and integrated long-term condition management based on robust communications between professionals and complete clinical records being available. Decisions are no longer made on incomplete information and fewer patients ‘falling through the cracks’, leading to reduced admission rates, better outcomes, and a more satisfactory patient experience. Profiling and selection of people for care programmes enabling earlier intervention before conditions deteriorate Improved targeting of health advice to enhance health rather than treating sickness as part of Population Health management</td>
</tr>
<tr>
<td><strong>Empowered patients who help reduce the demands on the health service</strong></td>
<td>Access to information and services leads to improved patient, service user and carer participation in care. This leads to empowered patients and service users. There is potential for strong connections between healthcare professionals and patients when self-management approaches are used.</td>
</tr>
<tr>
<td><strong>Improved Multidisciplinary Collaboration</strong></td>
<td>With the longitudinal record being available electronically and standardised care pathways and decision support, the ability for care givers to collaborate is greatly increased. Care givers can view the same information in different locations and organisations to form multidisciplinary views on the treatment plans.</td>
</tr>
<tr>
<td><strong>Improved management of the acutely ill and/or deteriorating patient</strong></td>
<td>Facilitated through a complete patient record, advanced decision support and effective communication between professionals. Currently opportunities for early effective intervention are missed due to lack of available clinical data and lack of advanced decision support algorithms, leading to delays in specialist clinical involvement.</td>
</tr>
<tr>
<td><strong>More effective and safer handover of care and more timely involvement of specialist clinical involvement</strong></td>
<td>Enabled by electronic messaging of handover documentation, referrals and consultation requests, with automatic notification to recipients, who will then have the ability to access patient clinical data. Today the handover of care and requests for specialist clinical involvement are dependent either on paper documentation, often sent by post with consequent delays in receipt, or on phone conversations with consequent poor record keeping and governance.</td>
</tr>
<tr>
<td><strong>Improved clinical decision-making and outcomes, underpinned by stronger clinical governance</strong></td>
<td>Delivered through evidence based intelligent algorithms that leverage rich data to guide decisions, and track clinicians’ adherence to or variance from recommended practice. A better evidence base for future decisions is also created where interventions and outcomes form a linkable base of intelligence. Currently, clinical decision-making is supported by paper or static web protocols and guidelines with no systematic capability to actively</td>
</tr>
<tr>
<td>Benefit</td>
<td>How it is achieved</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Improved clinical audit and quality              | Clinical audit and quality improvement are supported by the availability of better quality data on adherence to clinical pathways. It allows for selecting cohorts of healthcare professionals for continuing professional development. Prioritisation dashboards and the use of alerts and notifications can prevent patients missing treatments they need. Additionally, these improvements in health services can result in benefits including:  
  • Improved patient care through development of Evidence-Based Guidelines and Clinical Practices  
  • Service Improvements (e.g. reducing LOS, increased throughput, increased patient satisfaction)  
  • Improved research programs (e.g. identification of suitable patient cohorts for research)                                                                                                                                                                                                                                                                                                                                 |
Wider Economic Benefits

Introducing EHR capabilities on the scale and level of investment proposed in this Strategic Business Case will target improvements in clinical outcomes. This leads to a healthier population which in turn results in a more productive population. Healthy Ireland, A Framework for Improved Health and Wellbeing 2013 – 2025 highlights that health is an economic good in its own right. Health is a key factor in employment, earnings, productivity, economic development and growth. Better health leads to economic growth, not only through an increase in total GDP as the population increases, but also, more importantly, through long-term gains in human and physical capital that raise productivity and per capita GDP. A study into the relationship between health and GDP proposes that a 1% increase in life expectancy results in an average 6% increase in total GDP in the long run, and 5% increase in GDP per capita.

Increases in population health will lessen the number of days lost to sick leave every year. IBEC estimates that the average employee will miss almost six days a year through sick leave.

Growing the eHealth Sector in Ireland

The National EHR Programme will create a demand for skillsets and services that will support the expansion and development of the eHealth market in Ireland.

In addition to the benefits to the economy gained from enabling the realisation of a healthier population, the process of investing in the implementation of EHR capability will create supply-side opportunity. This will offer opportunities in terms of developing new jobs and supplier competencies focused on this area. Whilst some of the EHR capabilities may need to be obtained from non-indigenous suppliers, the capacity and
Strategic Business Case

Capabilities for implementing and maintaining the EHR solutions will need to be developed in Ireland. Realising the eHealth ambitions will offer opportunities for local small and medium enterprises to create innovative solutions that can play a role providing capabilities and supporting the realisation of a National EHR. These innovative enterprises will be in a position to target the global market for the next generation of eHealth solutions, including solutions based on cloud computing and open data.

Benefits Realisation

The EHR Programme is a transformation initiative, not simply a technology implementation. The real value of the EHR Programme will be to enable clinical, structural and financial reform as outlined in the Supporting Reform section. Therefore these complementary programmes need to be coordinated.

In order to realise benefits, the introduction of EHR must be closely coordinated and aligned with clinical programmes and reform initiatives.

Technology: The EHR Programme will introduce new technology and capabilities that users must be trained to use. The capabilities must be aligned to the wider reform objectives and programmes.

Process: Clinical care reforms are creating new integrated care and clinical processes. These processes must be supported and empowered by the EHR technology being introduced.

People: EHR is ultimately implemented for the benefit of users, i.e. clinicians, administrators, patients etc. EHR capabilities will be deployed in parallel with the establishment of the new Hospital Groups and CHO structures.

Benefits Realisation Approach

Benefit realisation is part of effectively managing the entire EHR programme, from formulation of the vision to achievement of the benefits over the medium to long term. It involves identifying, optimising and tracking the expected benefits through to their realisation. Identified programme benefits need to be traceable, with individuals accountable and responsible for delivering or enabling benefits and realising benefits. The Benefits Realisation Approach will focus on the following key activities:

Business Cases: As part of creating the Business Cases for component parts of the National EHR (e.g. Community EHR Operational Systems), there are key activities that must be completed:

- **Create Baseline:** Gather the baseline information for the benefits to be pursued within the relevant care processes. In some cases the information will be readily available. In other cases, measurement activities will have to be quickly completed.
- **Agree Benefits Targets:** Based on the evidence available on possible benefits, targets are to be agreed with key stakeholders within the care setting(s). These benefits will form a key element of the full business case.
- **Agree Benefits Realisation Plan:** Create and agree a plan on how the benefits will be measured, tracked, reported on and who will be responsible for the realisation of the benefit. The plan will be used as part of implementation management.
Implementing the Solution: During the implementation of the solution, there are activities as part of the management of the programme to track the benefits being delivered.

Case Study: Karolinska Hospital

Context
Karolinska University Hospitals is an academic health system that accounts for over 40% of the medical academic research conducted in Sweden. An EHR was introduced in 2004 and holds clinical documentation and referrals. It integrates with the national quality registry. Stockholm City Council implemented its new mutual health care database (QVD), which is a form of web-based portal to enable sharing of clinical information (e.g. Lab results) across care settings.

Enablers
Acute Care
- Exposure to EHR previously, accessible information on benefits and consultation prior to implementation assisted clinical engagement
- A consensus was developed about the need to use EHR
- Hospital-wide planning was undertaken
- Strong leadership to manage team and prioritise
- System selected was user-friendly, which reduced training requirements
- The system was piloting

Community Care
- New and better ways to work were incorporated into the system design

Research
- A Research & Innovation hub was established with industry partners to bring together researchers from the medical technology industry, hospital and academia
- Researchers can access data in the EHR through the links of each patient’s identity number to the national health registers (Eriksson, Aslind, Arkena, 2014)

Outcomes
Acute Care
- Patient surveys show that the patient satisfaction has increased.
- Waiting time for doctors in the emergency department has decreased by an hour over (approx.) over a period of two years. The proportion of patients finished within four hours has increased from 65% to nearly 85% (measured over a 24-hour period)
- Reduction of clinical data burden
- Better coordination of long-term patients
- Increased efficiency
- Enhance cooperation with other clinicians and saves time (Eriksson, Aslind, Arkena, 2014)

Community Care
- Swedish Rheumatology Quality Register (SRQ) – enables patients to access information and provide their own patient-derived information. It is a web-based interface and is linked to the electronic medical record (Eriksson, Aslind, Arkena, 2014)
- New and better ways to work were discovered, through doctors involved with a patient being able to share information and access it from one system (Olivett, et al., 2007)
- Enhance cooperation with other clinicians saves time (Eriksson, Aslind, Arkena, 2014)

Research
- Fosters benefits for research in that large numbers of patients available – also has impacts in terms of cost effectiveness in research (Eriksson, Aslind, Arkena, 2014)
- Linkage of each individual’s personal identity number to national health registers as well as to other quality of care registers, enhances the access to clinical information (Nelson, et al., 2012)
- Access to information to enhance research developments (e.g. recognising future developments such as electronic prescriptions) (Olivett, et al., 2007)
What does the future look like with a National EHR?

Use case 3: Discharge Management

Community teams are notified of a patient's planned discharge as soon as an admission date is scheduled, or on admission if unscheduled. The hospital and clinical teams then use shared tools, integrated with acute, community and general practice systems to collaboratively agree the individual patient's care plan and resultant requirements for community, social and nursing home care, any equipment or adjustments to housing, and transportation home. Teams then track and manage progress towards the completion of these arrangements during the pre-admission stage and inpatient stay.

The hospital clinical team records the patient's progress towards clinical fitness for discharge and, if relevant, the patient's and/or carer's progress against competency goals for safe self-care. Any change in the expected discharge date is automatically communicated to community teams. Hospital bed management teams have access to up to date information of all planned discharges, enabling them to manage proactively any delays in discharge arrangements and to plan future bed availability.

On the day of discharge, shared information optimises the efficient use of discharge lounges, in case of any delays in transportation or in the dispensing of discharge medications, and prompts timely actions to make beds available again. GPs and community teams receive timely discharge summary documentation and can access the broader patient record. Following discharge, the national EHR enables ongoing communication between GPs, community teams, and hospital clinical teams to manage patients safely in their own homes.

This is enabled by acute and CHO systems, and a national portal or summary care record accessible to professionals across all care settings, all underpinned by a national integration platform. The National EHR enables professionals to plan discharges collaboratively and track progress against the discharge plan to ensure a safe and timely discharge.

The national EHR also enables innovative models of care such as virtual wards where patients return home but remain under the care of the hospital consultant and team.
National EHR Strategy
The vision established for the National Electronic Health Record in Ireland represents a long-term aspiration for the adoption and exploitation of technology in a way that benefits patients, service users, carers, clinicians and extended stakeholders, and transforms the overall delivery of healthcare in Ireland. It spans a programme of activity that will continue over an ongoing journey to reach a level that would be considered comparable with the best in the world. It will evolve as technology continues to change and offer enhanced capabilities, including the increasingly sophisticated use of technology by the population as part of their daily lives.

The introduction of a National EHR is not simply a technology programme however. It is a transformation programme with a significant change effort required. It must be driven by strong clinical leadership.

The National EHR Strategy is based on a series of objectives that recognise the current situation within Ireland, including the challenge of such a significant transformation programme, the desire to take a credible staged approach, with discrete benefits at each stage, and the need to ensure security and privacy.

The overarching solution strategy across the four components of the National EHR is to evolve towards a single solution for Ireland in each component. It is recognised that, particularly within the acute operational systems, this journey will take a considerable time and various solutions will co-exist for specific periods.

The implementation strategy is focused on achieving a set of core capabilities in the Acute and Community settings, which are a subset of full EHR capabilities and can be extended in future. Any implementation of extended solutions must be based on the national solution in the first instance unless a compelling case existed to do otherwise.

The approach to deployment of Acute and Community solutions will be predicated on a readiness assessment across organisations. An objective assessment of the readiness of each organisation to participate in a phase of deployment, contribute resources, support the changes necessary, etc. will be a key part of deployment planning.

The National EHR

The development of the vision for a National EHR in Ireland considered a wide range of solutions and resulted in the development of the eHealth Blueprint. This has been further refined to identify the specific solution set for Ireland.

The National EHR in Ireland will be comprised of the following four key components:

- **National Shared Record**
- **Community Care EHR Operational System**
- **Acute Care EHR Operational System**
- **Integration Capability**

This chapter provides an overview of how these components will be delivered in Ireland by the National EHR programme.
Key Objectives of the EHR Strategy

In considering the overall journey there are a number of specific objectives that drive the roadmap design and act as a guide to how the vision for the National EHR is achieved over time. The ambition is to provide the right information, at the right time, to the right people for the right reasons to support more effective and efficient care. The objectives that underpin the roadmap are:

1. To allow the evolution of a National Shared Record in viable stages that are increasingly information rich, i.e. it is necessary to start small and with what may be achievable over the short term in relation to the delivery of one true view of common information covering the life of the patient, and to continually improve this picture in discrete phases,

2. To support the demands of “business as usual” across the healthcare system while maintaining alignment with the overall vision and direction. We recognise that ongoing demands will arise for information and technology solutions to address key issues in the health system, e.g. the critical need for more effective information to support Emergency Departments. The roadmap must allow a degree of flexibility to accommodate these needs but in a controlled way that aligns with the strategic direction,

3. To leverage and integrate existing national systems and investments. There are national systems that currently exist or are being deployed across the ICT landscape in the health system, which will be leveraged to deliver elements of the national EHR. This includes deployed systems such as The National Integrated Medical Imaging System (NIMIS) and systems being deployed such as the Maternal & Newborn Clinical Management System (MN-CMS) and the National Medical Laboratory Information System (MedLIS),

4. To encourage and harness innovation in the wider eHealth ecosystem in Ireland and internationally. Given the rapidly evolving landscape of emerging, innovative solutions that will enhance the National EHR landscape it is critical that the roadmap for implementation allows these solutions to be considered and, where appropriate, incorporated in the evolving model,

5. To reliably address the existing and emerging needs of security and privacy. It is recognised internationally that security and privacy of patient information is a critical factor in the success of EHR programmes. Confidence and trust in the EHR system and the organisation running its programme is necessary for success. The delivery roadmap must continually support these needs both in terms of the technical delivery and in the effectiveness of the communication with key stakeholders throughout the journey.

The National EHR must become the trusted place where patients can have their information shared with those providing their care.
Strategic Business Case

Solution Strategy

The EHR supplier market is complex and there are a significant number of existing and emerging vendors offering a vast range of products and services. These range from specialist (or “best of breed”) solutions, to broader enterprise solutions that cover a wider range of requirements in an integrated manner. In developing the overall solution strategy for the realisation of the National EHR, there was significant consultation with the supplier market, clinical and technical stakeholders, and wider leadership across the health system.

To create the strategy, focused workshops were conducted with representatives from across the continuum of care, where key questions were explored in order to achieve the overall vision of creating a shared patient record that is the primary information source for all health and social care professionals, and is extended to patients, service users and carers.

What will drive success?

International practice, engagement with significant EHR vendor community, and broader engagement with clinical, technical and economic stakeholders in Ireland have informed the identification of a series of key features that will underpin success in the delivery of the National EHR.

- **Governance** – there will be many decisions to be taken involving clinical, technical, financial, and information based considerations. These cannot be fully envisaged up front or “designed in” to any long term solution. Therefore there is a need to ensure the overall integrity is maintained through a balance of strong governance and leadership that closely involves the leaders in the health system, both clinical and administrative,
- **Future Focus** – the design and delivery of any solutions within the National EHR landscape must support the broader vision for healthcare in Ireland. Therefore the solutions must be built and deployed in a manner that will support and encourage the future healthcare environment in line with overall reform,
- **Clinical Leadership** – the delivery of a National EHR is predominantly focused on improving the clinical environment and related outcomes. Therefore the overall leadership for the delivery programme must be firmly rooted in clinical needs and investments must be directly linked and aligned to the transformation of care through new models of care delivery and clinical processes,
- **Readiness for Change** - the implementation of the National EHR across different organisations in the Irish healthcare landscape requires significant commitment, motivation and capability to change from those institutions in order to make effective use of any technology solutions, i.e. they must be ready to drive and support the changes. It is clear that different organisations are at different states of readiness based on evidence to date. Therefore the timing and decisions to commence implementations within individual organisations must be based on a thorough assessment of that readiness and only commence when the conditions are appropriate,
- **Modular and Phased Delivery** – the delivery of this programme must be phased due to the scale of change and the capability of the system to absorb this. A modular approach is critical to enable the overall vision for a National EHR to be achieved on a phased basis with clear and discrete benefits delivered at each stage of stability.
The vision places a significant emphasis on the national agenda of sharing information and achieving a richness in the shared patient record through the integration of individual operational solutions.

The National eHealth Blueprint provides an overall view of the technical solutions and components that will make up the future environment and acts as a guide for the specific solution strategy developed.

**Principles of the Strategy**

There are several characteristics of the Irish healthcare environment, the current market capabilities, and the overall capability to adopt solutions as part of a transformation that set the context for the solutions strategy and guide its definition. These include a number of principles that were reached by consensus at the workshops:

- The current environment is not a “greenfield” one, particularly within the acute setting. In the community care setting, there are virtually no EHR capabilities currently in place. There are a large number of systems currently in use across the Acute setting that provide partial capabilities. This includes significant national systems such as NIMIS but also more specialist systems such as the Epilepsy Electronic Patient Record. The long term solution therefore will involve integrating some existing systems with others being retired as the national solution is fully implemented,

- The need to build using proven solutions for the most critical components. There is a need to minimise overall risk within the primary components of the National EHR and therefore necessary to focus on proven solutions that are mature and widely adopted,

- The overall solution space articulated within the National eHealth Blueprint is extensive and represents a large scale undertaking in terms of delivery. We must have a pragmatic approach to change so we identify and break down components of the overall solution that would be implemented on a modular basis. Allied to the current solution landscape, the approach must be to build as you go in a modular approach and reuse what you can that is fit for purpose in the future National EHR landscape,
Innovative and emerging solutions are capable of delivering enhanced capabilities as part of the broader solution landscape. The adoption of these solutions, in a controlled manner under the right governance model (technical, clinical, information, security), will be part of the long term solution for Ireland and support emerging players in the Irish and international market.

**Single Solution Vs Best of Breed**

The analysis on choosing between best of breed or enterprise/single solution in the area of Electronic Health Records is one that is ongoing and has compelling arguments on each side. A best of breed approach typically offers a greater level of functionality for specific specialities or departments but demands significant investment to realise overall integration, while a single solution approach offers more comprehensive data integration “out of the box” at the expense of some functionality. Some of the advantages and disadvantages of each approach from the perspective of the National EHR programme are outlined further in the table below.

<table>
<thead>
<tr>
<th>Best of Breed</th>
<th>Single Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
</tr>
<tr>
<td>• Ability to use multiple vendors and therefore not overly dependent on any particular vendor</td>
<td>• Achieves national integration with less investment – achieving a national shared record is simplified both in initial implementation and in its ongoing maintenance</td>
</tr>
<tr>
<td>• Use of multiple vendors increases capacity to implement various solutions in parallel and may shorten overall timescales</td>
<td>• Allows cross setting pathways, workflows and shared decision support without any need for integration</td>
</tr>
<tr>
<td>• Greater flexibility to adjust to business as usual challenges as not tied to one overall implementation scope</td>
<td>• Uniformity of processes achieved across the entire health system</td>
</tr>
<tr>
<td>• Leverages existing fit for purpose systems in place through additional investment and focus on integration</td>
<td>• Supports staff mobility as system training needs are considerably reduced</td>
</tr>
<tr>
<td>• Local ownership of solutions likely to gain greater support for the overall change</td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• Significant complexity in the realisation of a national shared record that prevails across the system – overall achievement of this is much less certain within a complex and diverse environment</td>
<td>• Dependent on the capacity per component for one supplier to deliver which may extend the implementation period</td>
</tr>
<tr>
<td>• Higher investment required in the integration of systems and information</td>
<td>• The design of the overall approach to workflows, care processes, etc. need to be agreed at a high level nationally to effectively leverage a single solution – this has proven challenging and time consuming in other areas of health reform.</td>
</tr>
<tr>
<td>• Ongoing management and system support overhead is complicated and requires more resources</td>
<td>• Less flexibility to adopt to changing needs, particular where those needs are localised</td>
</tr>
<tr>
<td>• Significantly increased challenge in implementing cross-setting pathways, workflows and shared decision support.</td>
<td>• More complex transition from existing systems with less flexibility to accommodate a hybrid environment</td>
</tr>
<tr>
<td>• Does not support staff mobility as considerable training required across</td>
<td>• More challenging to achieve a sufficient degree of ownership at a “local” level, e.g. at the level of</td>
</tr>
</tbody>
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In relation to each component the solution strategy and rationale is as follows:

- **National Shared Record** – while there are critical dependencies on current projects such as the Individual Health Identifier, and integration requirements with national solutions such as NIMIS and MEDLiS, the implementation of a national shared record is largely a new and discrete initiative. The preferred solution strategy in this instance is to deploy a single solution but with a significant emphasis on standards and broader integration requirements that must be developed at a national level, to allow for local context portals where necessary.

- **Integration Capability** – in a similar way to the national shared record, an integration platform solution to support the National Electronic Health Record is a new and discrete initiative. The integration requirements will be developed in parallel with all considerations of the operational EHR solutions, and standards will be critical in ensuring that the ongoing integration tasks are feasible and cost is minimised. The solution strategy is to deploy a single solution for integration.

- **Community Care EHR Operational Systems** – the systems currently deployed in this area are limited in scope and implementation and there is therefore limited legacy to consider or build from. Part of the overall ambition in establishing CHOs is to achieve greater consistency in operating models across the sector and this is also reflected through discussions with key stakeholders from this area of the health system. Finally, the engagement with a range of vendors suggests that there are solutions in the market that support the range of requirements suitable for initial deployment of core capabilities in the CHO areas. The preferred solution strategy is therefore to deploy a single solution for CHOs that encompasses the core needs for individual disciplines including Primary Care, Social Care, Mental Health and local Health & Wellbeing services,

- **Acute Care EHR Operational Systems** – Various systems of significant importance in the EHR landscape already exist in the hospitals and/or are currently being deployed. Additionally, there are ongoing requirements that may need to be addressed urgently in advance of any national EHR deployment. It is not felt that a single solution can be deployed in a “top-down” manner but that we must evolve towards a single solution. The realisation of a true single EHR solution within all hospitals in Ireland will take many years and over the course of this journey a multi-vendor EHR environment will exist and need to be managed. All new investments will be made in line with this solution strategy and any decision to deviate from the strategy will be taken on an exception basis.

**Evolving to a Single Solution**

In the development of the solution strategy and subsequent implementation approach there is broad recognition that such an ambitious programme cannot be achieved in a single step and that the journey will
take many years. It is also clear that there are many ongoing initiatives of varying scale that will contribute to the final vision of a single solution set in Ireland. Therefore the journey must accommodate:

- **The requirement to implement critical tactical solutions.** For example certain hospitals are in immediate and urgent need of solutions to support patient administration. These needs may need to be addressed in advance of the overall procurement and deployment of an acute EHR, through a separate solution. This would subsequently be replaced once the national solution is procured and the organisation is ready for deployment,
- **The development of innovative specialist solutions.** There are a number of highly innovative EHR Lighthouse Projects underway such as the development of the Epilepsy EPR, the bipolar solution and the Haemophilia project. While the solutions in these projects may ultimately be replaced through the National EHR programme, they can contribute significant learning to the overall national EHR implementation and will enhance the overall solution that prevails in the long term,
- **Other national solutions.** The programmes underway to implement the national solutions such as the imaging solution and the Maternal and Newborn Clinical Management System will continue and be an important part of the overall national solution landscape.

The complexity of the solution landscape means that there will be a requirement for agility and effective governance to navigate the journey toward the overall National EHR vision.

An effective Design Authority will be a key requirement within the governance structure to ensure that all decisions and investments are made in way that recognises the long term ambition and balances that with immediate needs.

**Figure 14: Evolution to a Single Solution – Example Systems and Projects**
Implementation Strategy

The solution strategy outlined above serves as a guide to overall implementation with further consideration needed in relation to overall phasing and approach to realising a National EHR. The success factors outlined earlier also highlight the need to take a modular / phased approach to any national implementation. This serves as an overarching theme of the implementation strategy and a coordinated approach is proposed for delivering a National EHR that allows a degree of flexibility and autonomy within different care settings to meet urgent needs.

The breakdown of solutions set out here supports an evolution towards increasing levels of maturity in the deployment and use of EHR functionality and the development of a national shared record. At the care setting level there are three areas of functionality considered:
**National Core Solutions of Record:** This represents a set of core functions, based on a single vendor solution, that serve as the minimum viable functionality for each care setting. The deployment of these core functions, such as patient scheduling, would allow the health system to achieve a common capability at an operational level and underpin a national shared record of considerable value to stakeholders. The core solutions of record in the acute sector would be deployed at a Hospital Group level on a hospital by hospital basis. The core solutions of record in the community would be deployed at a CHO level.

**National Extended Solutions:** These solutions provide enhanced capability, as provided by the current national imaging solution, that may be deployed on a gradual basis and at a pace that reflects local needs and implementation capability. The default position, in line with the overall single solution strategy, would be to adopt extended solutions from the vendor providing the core solutions. However, in some exceptional circumstances a best of breed approach may be considered and adopted based on specific local criteria.

**Innovative / Emerging Solutions:** The market for solutions that support clinical environments is vibrant and dynamic with new solutions emerging on a continued basis that are focused on specific / niche areas, for example an app to support diabetes patients. This includes solutions from within the Irish market. The overall National EHR environment must support the adoption of these solutions as a means of extending capability across the health system.

The benefits of this overall implementation approach include:

- **Standardisation of Core Processes:** The core solutions support the critical processes within the health setting. Transitioning to a single solution for the Core helps to promote standardisation of processes and the ability for staff to work across different locations,

- **Controlled Flexibility:** Separating Extended Solutions from the capabilities in the Core provides a degree of flexibility to progress solutions in these areas to meet diverse needs over different timescales. Where the existing core solution vendor has a solution that meets the needs, that solution should be leveraged, thus reducing integration efforts. Where a new provider is introduced for an extended solution it must be considered for adoption as a national solution to limit the creation of an overly disparate IT landscape. NIMIS is an example of such an extended solution currently in use nationally,

- **Fostering Innovation:** Innovative, condition specific solutions often emerge from niche providers in a market that is dynamic and maturing. The potential for these solutions to be incorporated without impacting on the main capabilities of the overall EHR landscape is an added benefit.

**Operational Systems**

Based on stakeholder consultation, the eHealth Blueprint and the capabilities identified in the Knowledge and Information Strategy, EHR Operational Systems have been identified. These are different for both community and acute, highlighting the need for different approaches to meet the core needs and broader requirements of the care settings.

**Community Care EHR Operational System**
The Community Care EHR Operational System is agnostic to the differing care settings present in the Community area, for example Mental Health and Primary Care. The capabilities it describes are required across the entire care setting.

The core community capabilities of; Patient Administration, Referral Management, Population Health Management, Mobile Clinical Management, Test Results and Clinical Notes & Records will be deployed at a CHO level.

The Core Solutions of Record in the Community Care EHR Operational System are:

<table>
<thead>
<tr>
<th>Capability</th>
<th>Description</th>
<th>Current Provision within the Public Health System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Administration</td>
<td>The ability to record the patient's demographics (e.g. name, home address, date of birth) and details all patient contact. Scheduling resources (staff, materials) and patients to optimise flow and throughput including individual and group working and managing case load. Workflows and processes to support clinic administration and management.</td>
<td>Limited disciplinary and/or local solutions not extended nationally</td>
</tr>
<tr>
<td>Referral Management</td>
<td>Receipt of electronic referrals and integration with scheduling to effectively manage appointments and resources while providing real time feedback to the originating source. Creation and sending electronic referrals to other services with integration to receive scheduling updates.</td>
<td>Limited functionality from Community to Acute through eReferrals</td>
</tr>
<tr>
<td>Population Health Management</td>
<td>Provision of coded information to enable population health management across the health system.</td>
<td>Available across the Community Setting</td>
</tr>
</tbody>
</table>
### Strategic Business Case

<table>
<thead>
<tr>
<th>Surveillance)</th>
<th>Mobile Clinical Management</th>
<th>Test Results</th>
<th>Clinical Notes and Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ability to use EHR functions remotely and on mobile devices</td>
<td>Not currently provided</td>
<td>Provision of notifications of the completion of orders and flagging of any key results/outcomes. Allow view of discrete data for each patient from Labs, Pharmacy and DI Systems as a snapshot, including but not limited to: laboratory tests, diagnostic tests and reports, medications, allergies, problem lists</td>
<td>Core process support for clinical notes and assessments summarising interactions that occur between patients and care providers</td>
</tr>
</tbody>
</table>

**Acute Care EHR Operational System**

The core components of Hospital Patient Administration, Order/Comms, Clinical Note & Records and Medications Management will be deployed at a Hospital Group level on a hospital by hospital basis. New hospital builds such as the New Children’s Hospital may require extended solution capabilities in addition to the core. The National EHR Programme costs presented in the Programme Costs section include the cost to deploy only the acute core capabilities in all the Hospital Groups.

![Figure 17: Acute Care EHR Operational System](image)

The Core Solutions of Record in the Acute EHR Operational System are:
<table>
<thead>
<tr>
<th>Capability</th>
<th>Description</th>
<th>Current Provision within the Public Health System</th>
</tr>
</thead>
</table>
| Hospital Patient Administration (PAS)    | The ability to record the patient’s demographics (e.g. name, home address, date of birth) and details all patient contact with the hospital, both outpatient and inpatient. Gathering and presenting real time bed status information including estimated dates of discharge to drive flow and prediction models. Scheduling resources (staff, materials, theatres) and patients to optimise flow and throughput. Workflows and processes to support departmental activities such as:  
  - Workflows and processes to support A&E administration including payment capability  
  - Workflows and processes to support Theatre administration | All hospitals have PAS basic functionality however some hospitals use technology that is no longer fit for purpose or is no longer in support                                                                                     |
| Order/Comms                              | The ability to create electronic orders, and forward as appropriate, for a variety of clinical activities including: laboratory tests, diagnostic imaging tests, referrals for specialists, and other health care services. Receiving notifications of the completion of orders and flagging of any key results/outcomes | Only 4 of hospitals have closed loop Order/Comms capabilities                                                                                                           |
| Medications Management (ePrescribing and Pharmaceuticals) | The ability to create, store, maintain and display prescription or other medication orders with sufficient information for correct filling and administration by a pharmacy. The ability to check for potential interactions between medications to be prescribed and current medications and alert the user at time of prescribing if potential interactions or allergies exist | Only 1 hospital has a medications management capability                                                                                                                  |
| Clinical Notes and Records                | The ability to record structured clinical notes summarising interactions that occur between patients and healthcare providers with specific departmental supports such as:  
  - Specific support for A&E processes / workflow  
  - Specific views and data input methods suitable for theatres | No hospital in Ireland has clinical notes and records capability                                                                                                          |
The Community Care and Acute Care EHR Operational Systems define the scope of the capabilities to be introduced within the community and acute sectors as part of the EHR Programme, as set out in this Strategic Business Case.

The Community and Acute core capabilities provide information to improve the safety and coordination of care within the care settings, while also providing rich clinical information on the patient that can be viewed across care settings through the National Shared Record.
Delivering the National EHR

Establishing the National Shared Record is an overarching goal of the National EHR Programme. The National Shared Record will be delivered via a portal solution. The information contained in the portal will be transmitted through and an integration capability that will share patient information to, from, between and within the EHR operational systems in Community Care and Acute Care.

Delivering the National EHR Strategy will require the following four key phases of activity:

- **Preparation**
  - The assessment of the readiness of each entity helps to inform the deployment strategy and is necessary in order to finalise the procurement effort. Procurement efforts can begin without final details being available such as definitive national information datasets. The key preparation activities are:
    - **Design**: The identification and agreement of requirements both within the four National EHR components (National Shared Record, Integration Capability, Community Care EHR Operational System and Acute Care EHR Operational System) and the national requirements in terms of information data sets and standards that will apply across the National EHR. It must generate and share information that is relevant and serves to meet the needs of the entire health service. As a result, these national requirements must be developed and agreed in order to fully inform and underpin the development of those National EHR components. These must be created during the initial activities of the EHR,
    - **Readiness**: Working with the various organisational units (CHOs and Hospital Groups) to understand and progress their readiness to undertake such a large-scale initiative. Identifying any actions necessary in order to drive success. This work will help to define the deployment strategy and plan for each component,
    - **Procurement**: Creating and agreeing the business cases for the relevant component in line with the deployment strategy and conducting exercises to procure the required components of the National EHR.

The key activities identified as part of the programme over the next two years are presented in the EHR Next Steps section

**Delivery Timeframe**

Delivering the National EHR Strategy for the community and acute sectors is based on deploying the core capabilities at a CHO level and Hospital Group level respectively. For the purpose of identifying the indicative timeframes, costs and resources, we have modelled the delivery based on two different deployment scenarios. Based on international experience of a large-scale transformation of this nature, the longer term deployment option is the most likely approach. The two scenarios are:

- **5 Year Deployment** – where the community and acute core capabilities are deployed on a phased basis over a five year period:
### 9 Year Deployment

- Where the community core capabilities are deployed on a phased basis over a five year period and the acute core capabilities are deployed on a phased basis over a nine year period:

#### Indicative Delivery Timeframe – 9 Year Deployment Scenario

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
<th>Year 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHO 1</td>
<td>CHO 4</td>
<td>CHO 7</td>
<td>CHO 2</td>
<td>CHO 5</td>
<td>CHO 8</td>
<td>CHO 3</td>
<td>CHO 6</td>
<td>CHO 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute HG 1 - CHG</td>
<td>Acute HG 4</td>
<td>Acute HG 5</td>
<td>Acute HG 6</td>
<td>Acute HG 7</td>
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Figure 20: Indicative Delivery Timeframe based on Phased 9 Year Deployment Scenario
EHR capabilities are a fundamental means of sharing information and supporting collaboration required to deliver a modern healthcare system. The experience of other countries shows that EHR implementations of this nature are a long-term journey. However, it is a journey that will transform the overall delivery of healthcare in Ireland, to the benefit of patients, service users, carers, clinicians and extended stakeholders. Examples of rising costs, slow take-up and elusive productivity gains are found in virtually every health system around the world. The Irish journey will not be without its challenges, challenges not only associated with the adoption of new technology, but also challenges as a result of the evolving nature of the delivery of care within Ireland.

From the experiences of other countries and taking account of the particular landscape in Ireland, the major challenges are likely to include:

- Maintaining alignment with the vision across the health service, especially given urgent and local needs that require immediate action,
- Addressing any public or care provider concerns over data privacy and the sharing of information,
- Maintaining stakeholder support over such a long multiannual programme,
- Having the capacity across the health service to absorb the change, given that there will be other Reform efforts ongoing during the duration of the National EHR Programme,
- Providing the resources necessary over the period of the programme, including clinical and management resources.

Maintaining Alignment with the Vision Across the Health Service

There are significant structural changes underway regarding how healthcare will be delivered through the formation of the Hospital Groups, Community Health Organisations and reconfiguration of the HSE supporting services. As we have seen in Section 2, EHR capabilities are an essential enabler to support that reform.

Aligning and then maintaining the National EHR vision across the Health Service is a challenge that requires the following:

- A solution approach that balances autonomy with the creation of a National EHR: This Strategic Business Case and the EHR Roadmap sets a direction regarding core elements necessary to deliver the National EHR, but it also allows for flexibility to meet local needs as long as it operates within the National context in terms of standards and ability to realise the National EHR. This will require a strong governance framework to ensure that decisions are taken with the National EHR in mind,
- Strong engagement and communications: A key facet of the programme will be the engagement and communication activities. Initially, this must involve getting the requisite buy-in from the relevant parties to proceed with the strategic direction, but then to continuously engage with CHO, hospitals, patients and the public during the duration of the programme to keep buy-in and alignment with the strategic direction,
- Deployment Strategy: The Health Service will not be able to absorb all the change proposed by the programme at once. The development of the National EHR will have to be a phased approach. As a result, there will need to be decisions made on the deployment strategy and the pace of change. The differing priorities of the differing areas will have to be taken into consideration when determining and agreeing the deployment strategy. For example, as mentioned, the New Children’s Hospital requires EHR capabilities in time for opening. This will play a role in influencing the deployment strategy of the
Acute Care EHR Operational Systems. The readiness of organisations to proceed with their elements of the National EHR in terms of resources available and maturity of operating models will play a role in agreeing the deployment strategy,

- **Strong representative governance**: Establishing governance structures that have senior representatives across the clinical, service delivery, technical and management dimensions of the health service. Also a structure that represents all the care settings. This governance structure will be charged with maintaining the integrity of the national strategic direction but provide flexibility when required to meet local needs or address urgent issues.

For example, the Children’s Hospital Group has a specific requirement and timeline for the deployment of acute capabilities in order to support the opening of the New Children’s Hospital.

**Data Privacy Challenges**

The need to introduce an EHR in Ireland and the importance of protecting the privacy of the health data stored in EHRs is supported in through the EU Cross Border Healthcare Directive (Directive 2011/24/EU).

Where EHR’s have been implemented in other countries, privacy concerns have been highlighted as key issues that have had to be resolved.

Studies have identified that the biggest barrier to successful EHR implementation is achieving citizen acceptance, with information privacy representing citizens’ biggest concern regarding EHRs. Engagement has started with the Irish Public on the EHR journey through the EHR Public Consultation Survey conducted by eHealth Ireland in December and January.

The issue of consent and access to information was one of the key questions asked as part of the consultation. The overriding view was that the public would give consent to all health professionals to access their data. However, this is an indicative view and further work and consultation will have to take place to ensure the public are satisfied with the information protection and sharing protocols that will be put in place.

![Consent Response from EHR Public Consultation](image)

There are different dimensions of privacy concerns that must be addressed as part of the EHR Programme:

- **Collection** – concerns over the amount of personal information that is being stored,

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19 Chhanabhai, P, Holt, A. (2007). Consumers are ready to accept the transition to online and electronic records if they can be assured of the security measures. Medscape General Medicine Jan 2007
- **Primary Access** – concerns over improper access to data by unauthorised people,
- **Secondary Access** – concerns that the information may be used for a different purpose without permission,
- **Control** – concerns over the degree to which a person does not have adequate control over their information.

The protocols and procedures around these dimensions must be developed and agreed by all stakeholders within the health service to ensure that public concerns can be dealt with via engagement and communication.

The mechanism by which people interact with the health service must also be agreed upon. There are two main approaches:

- **Opt-In** – where people give explicit permission for their information to be used and shared either within a particular care setting and/or across care settings. This is an overt approach to give the patient the control. It does, however, place significant demands at the point of care to establish permission,
- **Opt-Out** – where it is assumed that patient information can be shared across authorised users in the health service. The patient does have the option to remove the permission to stop their information being shared. Where this approach has been used, a key element of transparency, and a degree of self-policing, is to allow the patient to view who has been accessing their information.

Different countries have taken different approaches and have experienced different challenges associated with privacy and EHRs. A sample of experiences is presented below:

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<table>
<thead>
<tr>
<th>Region</th>
<th>Solution Details</th>
<th>Privacy Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>Health summary linked to all healthcare providers. Not fully implemented yet.</td>
<td>Some GPs refused to participate in EHR due to privacy concerns.</td>
</tr>
<tr>
<td>Wales</td>
<td>65% GPs linked to system with the EHR being a summary of patient details.</td>
<td>A comprehensive EHR record was initially proposed but was rejected following negative press associated with EHR implementation in England.</td>
</tr>
<tr>
<td>Germany</td>
<td>Began rollout of medical card with chip containing health information and linking all healthcare providers</td>
<td>Postponed due to privacy and security concerns. A staged implementation recommenced at the end of 2013</td>
</tr>
<tr>
<td>Australia</td>
<td>Introduced a personally controlled EHR which was slowly adopted.</td>
<td>Received a great deal of criticism for failure to acknowledge eHealth privacy issues related to eHealth initiatives</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>A national infrastructure that securely transfers patient information between providers to create a shared record</td>
<td>Programme postponed after significant investment due to the opposition to the opt-out model of consent. Restarted with an opt-in approach that has led to successful adoption</td>
</tr>
<tr>
<td>Alberta, Canada</td>
<td>A shared record viewable by providers within different care settings</td>
<td>Started with an opt-in model that created a significant administrative burden and increased costs. Changed to an opt-out model with stringent privacy impact assessments for new systems that are published to promote transparency. This has driven adoption significantly</td>
</tr>
</tbody>
</table>

The privacy challenge is one that must be addressed through a dedicated workstream. That workstream will focus on establishing the information governance protocols and procedures that will give the public the confidence to share their information in order to help deliver better care. Ongoing engagement will be required with the Data Protection Commissioner in order to ensure that all obligations in this area are being considered and met.

**Maintaining Stakeholder Support in a Multiannual Programme**

It will be challenging to maintain support and enthusiasm for the programme over the long time frame.

Certain measures can be taken to maintain momentum, including:
• **Getting buy-in at the beginning:** All stakeholders must understand the nature of the journey from the very outset. This will enable them to understand that there will be short-term, medium-term and long-term results as part of the phased approach to developing the National EHR. They will understand why the delivery is being structured in this way. This must be achieved through the significant stakeholder engagement and communication mentioned earlier,

• **Communicating the challenges:** Following the introduction of the capabilities, there will be a natural period where performance and productivity struggles as a result of adapting to new ways of working. This has been the experience in nearly all large-scale implementations. It is important that this is recognised and understood in advance. This enables people to stay positive about the overall journey but also, importantly, put in place measures to ensure that patient care is not compromised in any way during the transition periods,

• **Feel local:** While the programme will be coordinated nationally, it must be delivered locally. Local resources will be involved in shaping their future usage and adoption of the EHR capabilities. Change must be felt from the “bottom-up” and this will be achieved through local delivery teams who are supported by national resources. This gives people local ownership of the implementation and enables them to participate in and feel the changes,

• **Incremental Benefits:** The overall solution approach aims to implement core capabilities and then build on that. It is essential that there be short-term wins that people see and that are celebrated and communicated to everybody. The Deployment Strategies agreed must take stock of the need to deliver quick-wins. Additionally, early baselines measures need to be gathered so that progress and quick-wins can be identified and championed.

### Absorbing the Change

Developing the National EHR is a significant programme of work and will require local resources to lead the delivery of EHR capabilities. This will take place alongside other reform efforts across the service such as the introduction of new models of care, integrated care processes and the formation of the CHOes and Hospital Groups.

⚠️ There will be a significant challenge in terms of providing support for delivery of the programme and also the capacity of the workforce to absorb the changes.

A key way to address this challenge is to focus on the readiness of each organisation to undertake the EHR transformation:

• **Confirm readiness:** Implementing the EHR capabilities alone requires a significant investment in time and resources at a local level. As part of the preparation for the programme, a readiness assessment will be conducted with the CHOes and the Hospital Groups to understand if they are able to participate in the process from the point of view of resource availability, leadership and sponsorship commitment, maturity of operating capabilities, any critical/urgent needs that may exist, the status of existing initiatives that are occurring (both clinical reform and technical projects) and the existing systems and infrastructure that are in place. There may be actions identified that need to be completed prior to commencing any EHR implementation. It is a principle of the EHR Programme that implementation in any area will not commence until readiness has been proven.

### Resourcing the Programme
Resourcing a programme of this scale with the right people will be a challenge. There will be different types of people needed to deliver and support the programme as presented in the Programme Resources section. This includes resources with a clinical background including Consultants, Senior Registrars, Nursing professionals and Health and Social Care Professionals. They will lead and guide the design and delivery of the solutions from a clinical perspective to ensure that they are clinically safe and fit for purpose. They will champion the adoption of the solutions and lead the overall governance of the programme. It must be recognised that these activities will constitute a significant component of their time and will impact on clinical commitments at times. Arrangements will have to be made to provide for cover to facilitate the essential clinical participation.

Technical resources, Configuration resources and Delivery resources may not currently be available in the volumes needed to support the progression of the programme. Capacity may initially need to be sourced from the market to provide these capabilities but an objective of the EHR Programme is to build local capabilities in these areas by having national support teams work with the local teams to help them build their capability. This helps to ensure that in the longer-term, the local organisations and health system as a whole has gained in terms of enhanced skills and experience.

Programme management resources will also be required to ensure effective management of the programme. These resources must also be mindful of the wider change and reform that is ongoing within the health service and ensure that the development of the EHR capabilities locally supports the reform efforts that are taking place. Again there may be an initial need to source the required capacity externally, but the objective is to build this capability locally over the course of the programme.
Lessons for Success

In addition to the factors that will drive the success of the EHR Roadmap, looking at failures in other jurisdictions to derive the full value from digital technologies in healthcare points to other important lessons about how to achieve real benefits from a strategy that delivers EHR capability:

- **Ensure the technology meets clinical needs** – The belief among staff and other users that a new technology will improve patient care, and do so fairly quickly is fundamental to success. ‘Must have’ features for making this more likely include ensuring that electronic systems are contextualised to who is viewing them (although integrated at the back end) and that data collection must as far as possible be automated and built into the routine practice of clinicians, and not require extra work,

- **Align ‘thoughtflow’, workflow and technology** – Successful implementations take great pains to understand the complex interplay between a new information technology, the ‘thoughtflow’ (how clinical decisions are made) and the “workflow” (how they are acted on) within the services to be transformed. Achieving alignment requires meaningful involvement of staff and a dedicated effort to secure continued buy-in. Too often the users of these systems are treated as passive recipients of change,

- **Ensure sound Information Governance processes are in place** – Sound Information Governance (IG) procedures are essential to ensure confidential patient data is used safely and effectively. Robust and transparent IG mechanisms are also instrumental in giving patients the confidence to willingly share their protected health data across care settings,

- **Develop analytical capability** – Successful implementations have included a focus on analytical and performance management capabilities. This enables them to leverage the learning and insights from the data collected within clinical and non-clinical systems. Too often health services will plan for the outlay on capabilities that gather data, but not the people and skills that will enable them to learn from it,

- **Support functional interoperability** – To support integrated care, it is essential to facilitate data sharing across multiple settings. While customising some EHR capabilities is important to productivity, over-customisation may inhibit data sharing even when the same system is in
Steps to Date to Begin to Address Potential Challenges

Significant steps to begin to address potential challenges have been taken to date as part of the National EHR Programme. These include:

- The Council of Clinical Information Officers has been established to provide clinical governance to the delivery of eHealth solutions across the Irish Healthcare system. Its role is primarily as an advisory group, with primary governance oversight provided by the Office of the CIO and the eHealth Ireland board. It is composed of clinical leaders and those with hands-on successful programme delivery experience in the Irish healthcare system. There are deep and diverse experiences and perspectives represented on the Council which will support the development of national level programmes including EHR. This group will be important to both ensure good engagement with Clinical leaders; and to use as a channel for communications with the wider community and to secure involvement in the programme,

- The eHealth Ecosystem was established by the Department of Health and the HSE to connect communities involved in eHealth in Ireland in June 2015. It is well and widely attended by healthcare providers, patient representatives and suppliers. It has had themes addressed including ePharmacy, Clinical engagement and research, Electronic Health Record programme and the EHR Lighthouse Projects. It is now established as a forum where rich communications and deep engagement regarding the EHR Programme will develop. This will address the key communications and wider stakeholder communications challenge,

- A public consultation process was conducted around a National EHR which sought opinions from members of the public on areas such as privacy, data sharing and deployment priorities,

- Wider public and healthcare provider engagement has taken place as outlined in the Introduction section and will continue to take place as part of the Programme.
The most demanding requirement for the National EHR Programme to succeed is harnessing the right people to deliver it. At its core, there will be a large team of clinical, technical, management, delivery and support staff drawn from the health system, the solution suppliers and the wider market.

In this section we present:

- The overall resource requirement for the programme team, in terms of both numbers and types of resources,
- An indication of how the resources will be sourced and managed over the life of the programme,
- The impact of the programme on the wider health system.

Prior to agreeing the funding to be made available for the programme and understanding the readiness of each area to participate in the deployment of the solutions, it is not possible at this point in time to give a definitive view on the roll-out schedule. For the purposes of this Strategic Business Case, we outline the resources based on the two deployment scenarios.

**Programme Resource Requirements**

This programme will need a substantial and dedicated team to deliver, operating at National, Hospital Group/CHO, and individual hospital/community site level.

The charts below summarises the overall health system resource requirements across the four National EHR components over an eleven year period for the two deployment scenarios. Both scenarios involve deploying the core capabilities in the community and acute sectors as well as the National Shared Record and Integration Capability.

![Figure 22: Full Time Programme Resource Usage – 5 Year Deployment Scenario](image)
At the programmes peak of activity in Year 4, 469 full time resources are required in the 5 Year scenario.

In the 9 Year scenario, at the programmes peak of activity in Year 4, 410 full time resources are required.

The greatest resource requirement is to support the development and deployment of the Community and Acute solutions. This is due to the fact that they span so many entities and touch so many health system staff who will need to be supported via training and change management efforts. In all areas, staff numbers have been estimated by reference to guidance provided by the supplier community, and experience from recent deployments in Ireland and beyond.
For the Portal and Integration solutions, the teams are much smaller because there is a single national solution that is implemented once, and the effort to deploy across all sites is much smaller.

Resource Types Required

To successfully deliver this programme requires a number of resources with different types of experience and focus.

- **Clinical** – resources with a clinical background including Consultants, Senior Registrars, Nursing professionals and Health and Social Care Professionals. They will lead and guide the design and delivery of the solutions from a clinical perspective to ensure that they are clinically safe and fit for purpose,
- **Technical** – resources who provide technical leadership during the programme such as Technical and Solution Architects,
- **Configuration** – resources who work with the clinicians and the suppliers to help set-up the solutions so that they meet the requirements,
- **PMO** – resources who provide leadership, managerial and administrative support and oversight. This also includes resources who will lead the gathering of requirements, conduct readiness assessments and lead procurement activities,
- **Delivery** – resources responsible for implementing the desired solutions in the Hospital Groups and CHOs including areas such as managing the local implementations, testing, training and data migration activities.

The required resources to deliver the National EHR Programme represent a broad range of skills and backgrounds as illustrated in the two charts below.

![Resource Types Required for Delivery 5 Year Deployment Scenario](image)

![Resource Types Required for Delivery 9 Year Deployment Scenario](image)

**Figure 24: Programme Resource Split – Delivery Resources**

Following the deployment of components of the over National EHR, resources will be required to provide support on an ongoing basis. Again, there will be a mix of skills and backgrounds required to provide this support as illustrated in the diagrams below:

![Resource Types Required for Support 5 Year Deployment Scenario](image)

![Resource Types Required for Support 9 Year Deployment Scenario](image)
Furthermore, in addition to the health system resources above, the solution suppliers will also be applying a similar number of resources to the programme. Supplier roles will be more balanced towards technical and configuration, but will also include substantial numbers with clinical backgrounds. A small number of supplier resources, particularly in support roles, may be off-shore, but the vast majority will need to be based in Ireland, working alongside health system staff.

Availability of Resources

There will be a substantial requirement for people with EHR related skills combined with health experience, both within the health system and across the supplier community. Given the limited existence of EHR solutions in Ireland to date, very few people with this combination of skills exist, and as a result, a hybrid and evolving resourcing model is required.

Initially, many programme resources are likely to be external or contract, potentially drawn from the Irish diaspora, or other country (e.g. UK) nationals, where there is much greater experience of delivery of EHR solutions. Whilst these people will bring the necessary technical and delivery skills, there will also be a need to populate the team with clinical, administrative and technical staff seconded from operational health system roles – who will provide detailed knowledge and understanding of the specific requirements and constraints of the Irish healthcare system.

It will be key, throughout the programme, to pro-actively manage the development of local resources, so that progressively, there can be a migration from external and contract, to local and permanent employees in the health system. This will enable deployments to ramp-up across the whole healthcare system, provide a robust pool for support and future phases, and drive down unit costs. Experience from the UK suggests that this process can take up to five years.

It will also be key to ensure that clinical staff seconded into programme roles are regularly rotated, so that their clinical perspective remains up-to-date, and their ability to represent their clinical colleagues is not diminished.

Impact of the Programme on Health System Resources

Finally, the programme will have an impact on other health system resources, most notably:

- Involving clinical and operational staff in design and change management activities,
- Large-scale training – which will result in almost all staff having 2-3 days away dedicated to new system training,
- Increased workload dealing with the impact of go-live activities,
- All of these will need to be addressed via Hospital Group and CHO operational plans, to ensure continued smooth provision of services.

The overall planning, readiness and ongoing management of the programme will have a significant focus on resources. It represents one of the most significant challenges to the programme, but if done correctly, will leave a legacy of new capability across the health service to support change and reform of clinical care.
In developing this Strategic Business Case, analysis of the one-off programme costs and consequential impact on operational costs has been undertaken. This section summarises these costs and provides further detail on:

- The breakdown of costs across different categories,
- The basis on which they have been estimated,
- Sensitivity analysis.

**Overall Cost Estimate**

The overall costs of the National EHR Programme have been estimated over an eleven year timeframe by reference to each of the major delivery streams, reflecting both one-off programme costs and consequential impact on operational costs. The resource and cost elements in Year 1 do not reflect a full 12 month period. As mentioned previously, it is not possible at this point in time to give a definitive view on the roll-out schedule. For the purposes of this Strategic Business Case, we outline the costs based on the two deployment scenarios.

Costs have been defined as Programme Costs and Operational Costs:

**Programme Costs:** These are the one-off costs to deliver the solution. They include:

- establishment of the health system team and procurement to initiate the programme,
- design of the national configuration,
- technical delivery of the solution including (setting up the hosting service),
- supplier and health system costs for deployment.

**Operational Costs:** These are the ongoing costs to maintain and support the solutions once live. They commence during delivery and continue for the life of the solutions, and include:

- annual hosting charges,
- annual software maintenance and supplier service management (including major upgrades),
- ‘back office’ teams in each Hospital Group / CHO to manage user access, minor configuration changes, etc,
- national teams to maintain standard national configuration.

The cost estimates do not include the following:

- Infrastructure upgrades (network, PCs and mobile devices for e.g. Community Nurses),
- Additional non-core capability deployment.

The diagrams below provides a high-level breakdown of the overall costs of the programme on a yearly basis for the two deployment scenarios. Both scenarios involve deploying the core capabilities in the community and acute sectors as well as the National Shared Record and Integration Capability.

*VAT Inclusive*
For short-term and specialist roles, (e.g. establishing the Programme Governance, defining requirements, and procurement) it is assumed that external expertise will be required. For enduring roles, e.g. running the Programme Office and Design Authority, costs have been estimated on the basis of some initial external support migrating over time to an all internal health system staff model. This will enable more rapid ramp-up, greater flexibility during the initiation stage, and access to resources with specific, relevant experience of similar programmes in other countries.

Delivery of the programme will be phased over time, with incremental approval and commitment of costs, based on the readiness of all participants and evidence of proven solutions from early deployments before wider roll-out.

This will enable the programme to adapt to new opportunities (e.g. emerging technologies) and changes in the environment (e.g. new requirements to underpin the reform agenda). The graphs below summarise the forecast indicative cost profiles.

**Figure 27: Indicative Annual Cost Profile – 5 Year Deployment Scenario**

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<thead>
<tr>
<th>Year</th>
<th>Cost</th>
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*VAT Inclusive

The annual cost peaks in Year 3. As the programme costs reduce, the operational costs increase as the emphasis switches from deploying solutions to supporting solutions.

**Figure 28: Indicative Annual Cost Profile – 9 Year Deployment Scenario**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost</th>
<th>Year</th>
<th>Cost</th>
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</thead>
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*VAT Inclusive

In this 9 Year scenario, the peak annual cost is in Year 4.

Delivery of the outcomes and benefits of the National EHR programme is intrinsically linked to other major programmes across the health system.

In particular, the migration from paper to digital records will place greater emphasis on the need for ubiquitous, reliable and robust local infrastructure and support services. Costs for upgrades to local infrastructure (e.g. resilient WAN, LAN and WiFi; PCs and tablets to support mobile working; and 24/7 infrastructure support services) have not been included in the EHR Programme cost estimates. It is assumed that, where required, these investments will be made to underpin the delivery of the National EHR.

Similarly, it is assumed that the overall Reform Programme is running in parallel and will be driving the operational change that the National EHR solutions will enable and underpin.
Cost Breakdown

For each area, costs have been assessed for the initial delivery programme and then for the ongoing operational running of the solution / service. Costs are made up of resources (permanent health system and contract) to support deployment and subsequent service management, and supplier charges (including licence, hosting and maintenance). More detailed breakdown of costs is provided in the appendices.

The major components are set out below.

Indicative Cost to Deploy Core Community Capability

There is no difference between the modelled deployment schedules for CHOs for the 5 Year and 9 Year Deployment scenarios. The difference between the two scenarios relates to the acute roll-out.

Figure 29: Indicative Community Annual Cost Profile – 5 Year and 9 Year Deployment Scenarios

*VAT Inclusive

The annual community costs peak in Year 5 and Year 6 to coincide with a period where a number of CHOs are being deployed and others already in place have moved into support mode. There are no programme costs from Year 8 onwards as deployment has finished.

Indicative Cost to Deploy Core Acute Capability

Figure 30: Indicative Acute Annual Cost Profile – 5 Year Deployment Scenario

*VAT Inclusive

The annual costs peak in Year 3 as a result of four Hospital Groups being in the process of deployment during that time. There are no programme costs from Year 8 onwards as deployment will have finished.
The annual costs peak in Year 9. This is a period where there are a number of hospital group deployments being finalised and operational support costs for the already live groups occur. There are no programme costs in Year 11 as deployment will have finished.

Indicative Cost to Deploy Portal Capability for the Summary Care Record

There is no difference between the modelled deployment schedules for Portal for the 5 Year and 9 Year Deployment scenarios. The difference between the two scenarios relates to the acute roll-out.

Portal costs peak in Year 5 as a result of core deployment finish and operational costs increasing. There are no programme costs from Year 7 onwards as ongoing development and maintenance of the portal is managed through operational support.
Indicative Cost to Deploy Integration Capability

There is no difference between the modelled deployment schedules for the Integration Capability for the 5 Year and 9 Year Deployment scenarios. The difference between the two scenarios relates to the acute roll-out.

Figure 33: Indicative Integration Annual Cost Profile – 5 Year and 9 Year Deployment Scenario

Integration costs peak in Year 4. There is a ramp up in operational costs as the ongoing maintenance and development of integration capabilities is largely conducted through operational support.
Cost Control

For a programme of this size and duration, it is critical that costs can be committed, controlled and well managed. This will be achieved through a combination of the business case approval, procurement, readiness assessment and deployment processes:

- Incremental Business cases will ensure robust and detailed analysis and cost control for each programme delivery stream,
- Procurements will be structured to address the totality of the potential deployment scope, but with each individual deployment project as a ‘call-off option’ for which costs only become committed as each project is commissioned,
- Readiness assessments will be completed before any projects are commissioned, to ensure that all parties are ready and able to successfully deliver,
- Supplier payments will be linked to delivery outcomes (e.g. completed roll-outs).

This will provide for regular measurement of costs incurred against outcomes achieved, and enable the programme to refine scope, processes and/or timeframes in order to manage the overall cost envelope and the annual spend.

It will also provide flexibility to agree changes, adapting to new opportunities or changes in the environment, whilst minimising the need to re-negotiate substantial pre-existing commitments.

Basis of Estimates

The concept of a National EHR programme as envisaged here has few directly comparable implementations. However, the component parts that make it up are not new or unique to Ireland. All have been previously designed, developed and delivered in other jurisdictions.

In estimating the costs, the following reference points have been taken into consideration:

- Market testing with global EHR suppliers, during the eHealth industry engagement, that provided estimates for the deployment of solutions for the National Children's Hospital and across the acute and community sectors,
- Experience from National and Regional solutions deployments, including:
  - National Patient Administration System and the National Maternity solution in Ireland,
  - the national portal in Northern Ireland,
  - the national integration ‘spine’ in England,
  - Acute and Community deployments in London and the South of England,
  - Insights gathered from national projects in Singapore and Australia,
- Experience from individual hospital / community provider projects including:
  - Various Acute and Community solution deployments in the UK and US,
  - Portal implementations in South East and South West London.

Whilst each of these has unique elements of scope, existing solutions, integration and training needs, combined they provide an evidence base to support each of the components of the cost estimates above. There are a number of assumptions that underpin the cost estimates. These are presented in the appendices.

In determining overall costs, a traditional software licencing / on premise approach has been assumed as the baseline for estimates. A full comparison of the Total Cost of Ownership between this approach and a cloud based/Software as a Service approach has not been carried out at this stage as the data available from various sources is limited to on premise solutions. Further analysis and a comprehensive and robust comparison may take place within future phases of the work and may be built into the overall procurement of solutions. In addition the ultimate model will be based on broader government direction on the longer term model for public sector software procurement and deployment.
Sensitivity Analysis

Final costs will not be determined until procurement and planning are complete. There are the key sensitivities by which the estimates in this Strategic Business Case may change (or may be changed):

- **Phasing** – the profile of costs is driven by the extent of parallel deployments, and the speed of deployment. Extending the deployment window by running fewer projects in parallel would reduce the annual spend, without significantly affecting the overall programme costs. Speeding up deployments (for instance, by driving greater consistency) could reduce the overall costs,

- **Resource costs** – the numbers of specialist resources required to deliver the programme exceeds the number currently available in Ireland. Experience from the UK was that, at the start of the national programme, fee rates for scarce resources increased substantially. Rapid delivery phasing is therefore likely to both increase the demand for resources and increase the rates that need to be paid for them. The model has been prepared on the basis of a ‘slower start’ with significant contract resources, being gradually converted to salaried staff over time,

- **Procurement efficiencies** – costs have been estimated based on experience and on a conservative basis. Given the scale of a pan-Ireland programme and the opportunity to be the lead supplier, with a well-run procurement process, significant procurement efficiencies may be achieved. In other procurements, supplier co costs (as bid) have been seen to reduce by 20-30% from initial estimates.
Procurement Approach
The key objectives of the procurement are:
- Procure solutions that meet the health system’s requirements as they evolve over the next ten years,
- Drive delivery and cost efficiencies so that the country as a whole benefits from having a single National EHR,
- Enable benefits to continue to be reaped from existing systems, where these don’t need to be replaced,
- To foster innovation and development of Irish healthcare IT expertise.

This section sets out further details of the context and overall strategy for the procurement, and then describes the individual procurement lots needs to support the National EHR.

Context
Following initial market engagement with potential EHR suppliers conducted in 2015, it is clear that there is significant interest amongst suppliers to engage with this programme, confirming that it will be possible to conduct a vibrant competition to secure the best solutions cost-effectively.

These sessions, and intelligence garnered from international experience, suggest four key factors will determine the overall procurement strategy:
- Currently available solutions are largely segmented between acute, community or portal,
- Different suppliers have quite different approaches to services and workshare (i.e. the split of responsibility between supplier and customer for service management),
- No single supplier currently has sufficient presence in Ireland to support an overall programme of this scale,
- There are multiple ways to define or divide the detailed services to achieve the overall goal.

Whilst many solutions, particularly acute solutions, have in-built community and portal capability, this is often based on a US-model of community care and an acute-centric view of data. As a result, solutions that most closely match the needs of the Hospital Groups, CHOs and National Portal are likely to be separate solutions connected by the National Integration capability. This does not preclude a single supplier providing more than one element, but does indicate that procurement as separate Lots will yield the optimal result.

There is a core element of software and services than underpins all solutions; and for all but a few, the expertise to undertake complex configuration is also concentrated with the solution provider. However, the best balance between customer and supplier capabilities and the split of responsibility between supplier and customer for service management differs depending upon the solution, and hence the procurement will be clear about what services are required, but flexible about how and by whom they are delivered. Identification of this balance will be a key feature of the procurement process, and hence Competitive Dialogue will be the most appropriate mechanism in most cases.

Access to suitably skilled and experienced resources, both for suppliers and the health system will be critical to the success of the delivery programme. A key element in the selection of potential suppliers will be their approach to resourcing. Lessons from other national programmes clearly demonstrate the need for a combination of solution knowledge and local health system experience.
Overall Procurement Strategy

The overall procurement strategy is built around six core procurements to deliver the key solutions and services components of the National EHR. These are:

- National Community Solution
- National Acute Solution
- National Portal Solution
- National Integration Capability
- National EHR Hosting Service
- National EHR Deployment Resources

**Figure 34: Procurement Areas**

The core components will be procured on the basis of a combination of fixed price for fixed services payable on successful deployment (e.g. for the delivery of the acute solution across a Hospital Group); and days’ effort where more flexible delivery models are required.

Economies of scale in hosting provision will be achieved via the procurement of a National Hosting Service, which will also provide technical and service delivery benefits for the solution.

As set out in Section 6, there will be a substantial need for deployment resources working within Hospital Groups and CHOs, to support, for example, change, integration, testing and training activities. These will need to be called-off flexibly as required from a variety of skilled and experienced providers.

Finally, there will also be a number of smaller procurement activities, particularly related to existing systems providers, to amend existing contracts so that, as far as possible, current systems can be integrated and their key clinical data made available via the National Portal.

**Community Solution**

The National Community solution supplier must provide a single solution platform with flexibility on deployment phasing and timing.

The required flexibility can be achieved either through a framework and call-off structure, or via a number of itemised and costed deployment options. In either case, CHOs will be able to commence and organise deployments in a fashion that reflects their readiness; and charges will reflect delivery achieved.

**Acute Solution**

Similarly to the National Community solution, the National Acute solution procurement needs to accommodate core national requirements; some variation in detailed requirements between Hospital Groups; uncertainty over deployment phasing and timing; and commitment of funding only as deployment readiness is proven, whilst also delivering a single, consistent national solution.
To achieve all of these, a single supplier framework will be established with core terms and requirements aligned to the national requirements. As each Hospital Group then becomes ready, it can call off its deployment.

The framework established via Competitive Dialogue, and structured to include a wide range of core and additional solution and service options in a catalogue that lives for the life of the call off contracts. This will enable the solution to be tailored and extended to meet the developing needs of each Hospital Group over the life of the programme, without need to undertake further procurements.

Portal Solution

Portal functionality can be provided in a number of different ways, such as specific healthcare portal solutions; extended functionality on healthcare integration engines; or bespoke development using generic web technologies. All of these approaches have been successfully deployed elsewhere.

It is key that this procurement initiates on the basis of what is required; and then focuses in parallel on how it is delivered, to ensure both the right functional and technical solution is achieved.

The portal will also be closely linked with the National Integration capability, so running these procurements in parallel, and evaluating the two solutions to ensure that they work together will also be key. It is anticipated that this will be achieved as two Lots of a single procurement, with shared dialogue sessions for bidders offering solutions for both Integration and Portal.

Integration Capability

The National integration capability will serve the integration requirements of other components of the National EHR, and support other local, regional and national integration initiatives. These will be a mix of requirements known at the time of procurement, and future requirements that emerge as the programme progresses.

As a result, the national integration capability procurement will procure an initial set of software and services (to meet short-term needs); training and support to enable health system staff to continue to develop the capability; and integration expertise days to assist with more complex needs.

EHR Hosting Service

Hosting services are a commodity for which economies of scale will be achieved by consolidating across the acute, community and portal solutions. Also, given the sensitivity of health data, it is critical that it is stored securely within Ireland.

Given the well-defined nature of these services, this procurement is anticipated to follow a Restricted Procedure.

EHR Deployment Resources

Resources will be required at all levels and at all stages of the delivery programme, particularly during the early stages when the number of locally available, experienced people will be low.

A multi-supplier framework will be established which will address both particular healthcare deployment work-packages (e.g. healthcare data migration) and provision of resources. This framework will target the broad range of skills needed to successfully delivery acute and community deployments. In this way, a flexible pool of resource will be created that can be called off as projects are initiated.

This framework will be established via a Restricted Procedure, as any more detailed discussion on resource needs will be established at the time of the call off of services.

Other Procurements

Finally, there will need to be a variety of changes agreed to existing suppliers (e.g. CSC iPIMS, and Clanwilliam GP systems), in particular to enable data from these to be integrated into the National Portal.
These will each be dealt with individually with an approach that reflects the variety of current contractual positions.
The National EHR Strategy is based on a series of objectives that recognise the current situation within Ireland including the challenge of such a significant transformation programme, the desire to take a credible staged approach, with discrete benefits at each stage, and the need to ensure security and privacy.

The implementation strategy is focused on achieving a set of core capabilities in the Acute and Community settings, which are a subset of full EHR capabilities and can be extended in future. To realise the ambitions of the National EHR also requires the implementation of a National Shared Record which will evolve and mature over time. As outlined, an integration capability is required to enable the information to flow between systems.

The approach and timeframes for deployment of Acute and Community solutions will be predicated on a readiness assessment across organisations. It is not possible at this time to give an exact view of that deployment as it is dependent on the readiness of each organisation (CHO or Hospital Group) to commence the deployment and also the resources available to support it.

There are key activities that can be identified over the next 24 month period that are necessary in order to progress the programme. There are also a number of key decision points during that period. This includes decisions within the health system stakeholder group (such as agreeing requirements) and decisions that involve other outside agencies such as the Department of Health (DoH) and Department of Public Expenditure and Reform (DPER) securing financial commitment.

The following section presents the overall approach and plan for the National EHR Programme for the next 24 Months and the approach and plan for each of the EHR components.

There are several activities needed over the short, medium and long-term to successfully deliver the National EHR. The immediate steps along the journey will allow us to identify, shape and procure the solutions needed to meet the current and future needs of the health service.

The Strategic Business Case Review and Approval Process

The Strategic Business Case is reviewed and approved as follows:

1. **EHR Programme Steering Group Review**
2. **EHR Programme Steering Group Approval**
3. **eHealth Ireland Committee Review**
4. **Department of Health Approval**
5. **Department of Public Expenditure and Reform**
6. **HSE Leadership Team Approval**
7. **Cabinet Approval**
Figure 36: National EHR Programme Plan for the Next 3 Year Period
The key activities as part of the National EHR Programme Plan for the Next 3 Year Period include the following:

<table>
<thead>
<tr>
<th>Programme Roadmap Activity</th>
<th>Description</th>
<th>Indicative Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Strategic Business Case</td>
<td>Create of the Strategic Business Case for the National EHR which gains agreement from all relevant parties to proceed with the programme activities</td>
<td>Early in Year 1</td>
</tr>
<tr>
<td>2 – Communications and Engagement</td>
<td>Carry out EHR communications and engagement with the both those within the health service, stakeholders and the wider public</td>
<td>Ongoing during the programme</td>
</tr>
</tbody>
</table>
| 3 – Governance | Put in place the governance structures and groups to run the programme, including:  
- Operating structures and processes  
- Design Authority  
  - Clinical Advisory Group  
  - Technical Advisory Group  
  - Information Governance Advisory Group  
- Mobilise the Programme Management Office | 3 months to mobilise  
Ongoing during the programme |
| 4 – Procurement Office | Create a procurement office that will focus on executing the procurement processes for the main development areas, including:  
- National Shared Record – Portal  
- Integration Capability  
- Community EHR Operational System  
- Acute EHR Operational System | 1 month |
| 5 – National Requirements | Create and agree the national standards and requirements that need to be delivered and maintained throughout all elements of the National EHR. These include:  
- National Shared Record Information Requirements  
- Population Health Information Dataset Requirements  
- Activity Based Funding Dataset Requirements  
- Performance Management and Reporting Dataset Requirements  
- Technical Infrastructure Standards and Requirements  
- Integration and Interoperability Requirements  
- Security and Privacy Standards and | 6 months |
<table>
<thead>
<tr>
<th>Programme Roadmap Activity</th>
<th>Description</th>
<th>Indicative Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Requirements</strong></td>
<td>These standards and requirements will be needed for procurement purposes and will be upheld by the Design Authority</td>
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<tr>
<td>6 – Portal and Integration Requirements</td>
<td>Develop requirements for the portal and integration solutions. Agree the requirements amongst the relevant stakeholder groups. The requirements will be informed by the National Requirements and will feed the procurement efforts</td>
<td>6 months</td>
</tr>
<tr>
<td>7 – Acute Requirements</td>
<td>Develop requirements for the acute EHR solution. Agree the requirements amongst the relevant stakeholder groups. The requirements will be informed by the National Requirements and will feed the procurement efforts</td>
<td>6 months</td>
</tr>
<tr>
<td>8 – Community Requirements</td>
<td>Develop requirements for the community EHR solution. Agree the requirements amongst the relevant stakeholder groups. The requirements will be informed by the National Requirements and will feed the procurement efforts</td>
<td>6 months</td>
</tr>
<tr>
<td>9 – Deployment Strategies</td>
<td>Create the initial deployment strategy and plan based on the outcome of Readiness Assessment and also the resources available. The deployment roll-out strategy will set out the indicative roll-out plan for the Acute and Community EHR capabilities in order to help inform the procurement process</td>
<td>2 months</td>
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<tr>
<td>10 – Readiness Assessments</td>
<td>Conduct readiness assessments at Group Level (including within hospitals) and at CHO level to identify the current state of readiness to undertake such a large programme of work. The factors to assess include: • Leadership and sponsorship commitment • Resource availability • Maturity of operating capabilities • Critical/urgent needs • Existing initiatives that are occurring (both clinical reform and technical projects) • Assessment of existing systems and infrastructure The readiness assessments will help inform the deployment plans but also create a set of actions to improve the preparedness for implementation</td>
<td>6 months</td>
</tr>
<tr>
<td>11 – Prepare to Deploy</td>
<td>Execute any actions arising out of the Readiness Assessment and continue to communicate the benefits of</td>
<td>6 months</td>
</tr>
<tr>
<td>Programme Roadmap Activity</td>
<td>Description</td>
<td>Indicative Duration</td>
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<tr>
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<tr>
<td>introducing the EHR to user groups.</td>
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</table>
| 12 - Procurements         | Execute the procurement processes necessary to procure the main solution components including:  
  • Portal  
  • Integration  
  • Acute  
  • Community  
  This timeframe includes the completion of all contractual arrangements with successful suppliers. The Acute procurement will be the longest in terms of duration at approximately 12 months. | 12 months          |
| 13 - Implementation       | Roll out the solutions in line with the Deployment Strategy, Readiness Assessment and resources available                                                                                                    | As identified in Deployment Strategy |
| 14 – Business Cases       | Create and agree outline and full business cases to gain approval to procure the components necessary to deliver a National EHR. This will include business cases for:  
  • A portal solution  
  • An integration capability  
  • Acute EHR capabilities (Core with options for Extended Solutions)  
  • Community EHR capabilities (Core with options for Extended Solutions)  
  The business cases for Acute and Community EHR capabilities will be linked to the Deployment Strategy for each sector. They will require iterative development | 6 months           |
| 15 – Privacy and Data Sharing Procedures | Explore and agree all privacy and data sharing procedures and protocols based on the findings of privacy impact assessments. Significant engagement will be required with the Data Protection Commissioner to ensure that all relevant guidelines are being followed and requirements being met | As per assessments |
There are a number of key decision points along the journey as presented in the programme plan. These include:

<table>
<thead>
<tr>
<th>Programme Roadmap Decision Point</th>
<th>Description</th>
<th>Primary Parties Involved</th>
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</thead>
<tbody>
<tr>
<td>A – Strategic Business Case</td>
<td>Agreement with the direction and activities proposed as part of the Strategic Business Case</td>
<td>HSE, DoH, DPER</td>
</tr>
<tr>
<td>B – Business Cases: start</td>
<td>Agreement to proceed with creating business cases for the National EHR solutions and to also commence the procurement efforts</td>
<td>HSE, DoH, DPER</td>
</tr>
<tr>
<td>C – Community Requirements</td>
<td>Agreement with the community requirements used to inform the procurement process</td>
<td>HSE (CHO(s))</td>
</tr>
<tr>
<td>D – Acute Requirements</td>
<td>Agreement with the acute requirements used to inform the procurement process</td>
<td>HSE (HG(s))</td>
</tr>
<tr>
<td>E – National Requirements</td>
<td>Agreement with the overall requirements that will be included within each procurement process to ensure that the National EHR can be realised</td>
<td>HSE</td>
</tr>
<tr>
<td>F – Portal and Integration Requirements</td>
<td>Agreement with the portal requirements used to inform the procurement process</td>
<td>HSE</td>
</tr>
<tr>
<td>G – Deployment Strategies</td>
<td>Agreement with the deployment strategies to be specified in the procurement exercise for each solution element</td>
<td>HSE (HG(s) and CHO(s))</td>
</tr>
<tr>
<td>H – Business Cases: end</td>
<td>Agreement with the full business cases for each solution and to allow procurements to conclude</td>
<td>HSE, DoH, DPER</td>
</tr>
<tr>
<td>I – Procurement</td>
<td>Vendor(s) selection for each relevant solution component</td>
<td>HSE, DoH, DPER</td>
</tr>
</tbody>
</table>
Outline Programme Governance Structure

The outline governance structure for the National EHR Programme is presented below. The Programme governance has the following key characteristics:

- Clinical representation at EHR Programme Board level will be provided through a senior CCIO representative, two clinical representatives for Acute and a clinical representative for Community,
- In addition to the EHR Programme Board, clinical leadership and guidance will be a core component to the constituent project boards operating under the EHR Programme Board,
- eHealth Ireland has input to advisory groups which includes clinical, technical, information governance groups,
- Opportunities will also be pursued to have patient and service user representation as part of the governance structure. This will enable their perspectives to be incorporated into programme delivery.

Approach to Progressing the EHR Components

The National EHR will be progressed through the following key phases of activity:

- **Design**: The information dataset to make up the National Shared Record must be defined by clinicians across the continuum of care, based on international practice. There will be National Requirements that will also define the datasets and portal requirements. The design phase will also identify the deployment strategy and plan for the National Shared Record.
The creation and agreement of national community and acute focused requirements outlining the functionality that the community and acute solutions need. National requirements will also be required to ensure that there is interoperability between the Community and Acute EHR Operational Systems and the wider National EHR, including the National Shared Record. This will also include the creation and agreement of deployment strategies and plans as to the sequence of where the solution will be implemented. There will be strong linkage between the work on defining readiness and the creation of the business cases in order to fully define the deployment strategies and plans.

National integration requirements will also be required. These will be informed by the National Shared Record, Community and Acute requirements,

- **Readiness**: Working with the CHOs and Hospital Groups to assess their readiness to undertake such a large-scale initiative. Identifying any actions necessary in order to drive success including any actions necessary in advance of commencing deployment. This work will help to inform the deployment strategy and plan,

- **Procurement**: Conducting a procurement exercise along with getting agreement on supporting business cases (outline and full) where required for the components. The business cases will need to be informed by the deployment strategies and plans,

- **Delivery**: Implementing the portal and National Shared Record as per the deployment strategy and plan. The National Shared Record will mature over time as more information is made available from operational systems. Starting off, existing information would be leveraged to create an initial record drawn from current systems such as hospital PAS systems, national imaging and labs systems. The parallel delivery of the Integration Capability will be essential in order to transfer information between operational systems and the portal. Implementation and updating of the National Shared Record will continue as more information becomes available and the solution matures.

Implementing the Community and Acute EHR Operational Systems as per the deployment strategies and plans. The Integration Capability will be essential in order to transfer information between such operational systems and the portal.

Wherever possible and appropriate, we will deploy an outcome based programme methodology informed by agile principles. Within each project as part of the overall programme, discrete outcome based deliverables will be defined, developed, confirmed and iterated in as rapid a cycle as possible for the project components, and the clinical and project setting. This approach will ensure that the Delivery Programme continues to design and improve as it matures its capability.

The overall approach to delivering the National Shared Record, Community and Acute components is presented in greater detail below.
National Shared Record and Integration Capability Development Approach

Mid Year 1
- Define National Requirements
  - Develop National Requirements and Standards that will promote overall interoperability
- Develop Business Cases
  - Develop and agree the outline full business cases for the Portal and Integration Solutions. The approval of the full business case will grant permission to fully complete the procurement processes

Start Year 2
- Procure Solutions
  - Conduct the procurement exercise to obtain portal and integration suppliers

Mid Year 2
- Implement Phase 1
  - Create the first phase of the National Shared Record by utilizing existing information that is available at the point in time. This could include leveraging existing national information sources: PAIS, Imaging results, Laboratory results, Maternity and Newborn information

Start Year 3
- Implement Phase 2
  - Expand the National Shared Record by adding additional information to the record from sources that have been deployed in both the Community and Acute sectors
- Implement Phase 3
  - Further add to the richness of the National Shared Record by adding additional information as it becomes available

Figure 39: Plan for Progressing the National Shared Record and Integration Capability
Community EHR Operational System Development Approach

**Preparation**

- Mid Year 1: Complete Readiness Assessment and Prepare to Deploy
  - Conduct readiness assessments at CHO level, including within hospitals, to identify current state of readiness to undertake such a large programme of work. The key factors to assess include:
    - Leadership and sponsorship commitment
    - Resource availability
    - Maturity of operating capabilities
    - Critical urgency needs
  - Existing initiatives that are occurring (both clinical reform and technical projects)
  - Assessment of existing systems and infrastructure

- Start Year 2: Define National Requirements
  - Develop National Requirements and Standards that will promote overall interoperability

- Start Year 5: Define Community Requirements
  - Develop and agree community requirements at a level that enables procurement efforts to commence

- Start Year 7: Develop Business Cases
  - Develop and agree on the outline and full business cases for Community EHR Solutions. The approval of the full business case will grant permission to fully commence the procurement processes

**Implementation**

- Mid Year 2: Create Deployment Strategy
  - Create a national strategy based on the outcomes of the Readiness Assessment and also the resources available

- Start Year 5: Procure Solutions
  - Conduct the procurement exercise to obtain Community EHR solutions

- Start Year 7: Implement
  - Deploy the Community EHR capabilities as per the agreed Deployment Strategy
    - CHO 1
    - CHO 2
    - CHO 3
    - CHO 4
    - CHO 5
    - CHO 6
    - CHO 7
    - CHO 8
    - CHO 9

Figure 40: Plan for Progressing the Community EHR Operational System
Figure 41: Plan for Progressing the Acute EHR Operational System
Workshop Participants
The following people participated in key workshops and working groups during the development of the Strategic Business Case.

**National Integration Representatives**
- Emma Benton – Portfolio Manager and Therapy Professions,
- Kevin Conlon – Principal Officer, Department of Health,
- Richard Corbridge – CIO, HSE,
- Mary Fitzsimons – CCIO and Head of Department of Neurophysics at Beaumont Hospital,
- Gemma Garvan – Head of Healthlink,
- Dr. David Hanlon – Clinical Advisor and Group Lead,
- Fergal Marrinan – EHR Programme Manager,
- Frank McGuinness – Head of IT, Children’s Hospital Group,
- Neil O’Hare – Director of Informatics, St. James’s Hospital,
- Fran Thompson – Programme Director for the Strategic e-Health Programme for the Office of the CIO,
- David Wall – Head of IT, Tallaght.

**Community EHR Operational Systems Representatives**
- Emma Benton – Portfolio Manager and Therapy Professions,
- Tony Canavan – Chief Officer CHO Area 2,
- Kevin Conlon – Principal Officer, Department of Health,
- Robert Cooke – IT Delivery Director for Community Health,
- Richard Corbridge – CIO, HSE,
- Pat Dunne – Assistant National Director, Primary Care,
- Gemma Garvan – Head of Healthlink,
- Dr. David Hanlon – Clinical Advisor and Group Lead,
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