National Clinical Programmes: Aligning Process Improvements with Information Technologies

Strategic Framework proposal

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Executive Summary

Within Ireland, the clinically led National Clinical Care Programmes are under development by the HSE and professional training bodies (e.g National Colleges) and are now moving into the challenge of implementation. To deliver on these key programmes related ICT support in the form of an Integrated Electronic Patient Record is now acknowledged as the number one innovative change required by the clinical services.

As a means towards an integrated approach between the National Clinical Programmes and ICT elements of the Irish Health Service, this report proposes an initial strategic framework. Aligned with the overarching governance and strategy for ICT by the DOH/HSE, this change should be led by a Chief Medical Information Officer, with involvement from a steering group made up of the key stakeholders involved (e.g. NCP, Colleges, ICT, HIQA etc).

Process improvement efforts by the NCP should attempt to identify and improve generic processes that cross pathways and programmes.

Information is a key element of clinical care processes. By providing and/or capturing information related to these key generic processes at the point of care effectively, this supports the patient's journey and forms the basis of the Electronic Patient Record. In addition, such information could/should be made available, as a by-product, to support other tactical and strategic processes such as audit, research, performance management, financial analysis, etc. Knowledge in the form of electronic guidelines and protocols in real time will be key to the NCP.

Technical options are explored, commending a move towards integration of key legacy systems, support for the key clinical 5 or 10 requirements via a common platform and a more Service Oriented Architecture, reusing a blend of productive local and international eHealth developments as worth early consideration and effort.

While Ireland has had limited experience and involvement in the eHealth standards efforts to date with very limited resources in this area, it is assumed that the key players involved (HIQA, HSE, DOH) will all be keen to leverage internationally useful material from elsewhere and so should actively explore engagement with these key efforts.

While public monies are scarce and current capacity is limited, given the scale of the changes the National Clinical Programmes offer, substantial investment in ICT is required to see them to fruition. In addition such investment is needed as Ireland prepares for Universal Health Insurance. As such investment would help foster the integration of healthcare and information technology industries, this has significant potential to offer jobs into the knowledge economy.

An integrated iterative approach that quickly pulls these key elements together would be well placed to steer the combined efforts of NCP and ICT towards a more coherent and cohesive approach to change across the Irish healthcare system.

1 Introduction

1.1 Context

Across the globe, many nations are struggling to satisfy insatiable demands for healthcare and balance the burden of medical disease with the promise of medical advances, thereby putting all international healthcare systems under stress and strain. In addition to these established factors, there are now unprecedented economic factors that are challenging the spend of public monies on healthcare. It is imperative that any investments should not just support better healthcare, but should be leveraged if possible to generate growth and employment across industry.

Of those economies that are working to move the practice of healthcare into the 21st century, several of those have made major strides through the advancement of process improvement methods and information technologies. While these advances have been by no means universal, they do offer a means for healthcare to work smarter rather than harder as the way forward.

Ireland has seen an investment in its healthcare systems since the beginning of the state, though the last decades have seen a steady decline in satisfaction levels with the system, which is now acknowledged to be of variable quality, two-tier in nature and needing radical improvement. Within that context several recent developments in Ireland are underway which aim to challenge the status quo and radically improve the healthcare system.

Most recently a new political administration has made a commitment to improving healthcare as a priority in its Programme for Government, which plans to move the Irish healthcare system towards Universal Health Insurance by 2016. In parallel, while the political change was underway, the key clinically led National Clinical Care Programmes, under development by the HSE and Professional Colleges are now moving into the challenge of implementation.

To deliver on these key programmes related ICT support in the form of an Integrated Electronic Patient Record is now acknowledged as the number one innovative change required by the clinical services. The alignment between the clinical programmes and ICT to provide such integration is acknowledged to be a key opportunity and challenge ahead, hence this analysis and report.

1.2 Terms of Reference

In outlining the findings and recommendations of this assignment, the terms of reference on which the author has been engaged are outlined here;

- Advise on improving the alignment between National Clinical Programmes and the related HSE ICT strategy.
- Propose a related strategic framework that addresses key people, process, information technology and knowledge management elements these health reforms require.
- Strategic engagement with the national clinical programme leads to progress the implementation of the programmes by providing expert advice with regards to key people, process, information, technology, standards options towards delivering best clinical value.
- Challenge if necessary, the thinking on ICT solutions to clinical problems from a strategic and holistic level, exploring an effective balance between national standardisation, effective integration between programmes, along with local flexibility and innovation where appropriate.

1.3 Vision and Goal

The Vision Statement for this initiative is outlined here;

The National Clinical Programmes aim to improve access, quality, safety and cost effectiveness of clinical care in Ireland, with the support of the right information, at the right place at the right time.

This strategic framework is about managing a socio-technical ensemble of people, processes and technology to optimise health service delivery.
People - patients, their families and healthcare providers;
Processes - access to healthcare services, the manner and location of service delivery, and procedures for follow-up/on-going care;
Technology - the application of information and communication technology (ICT) in healthcare practices.

Therefore the Goal of this Strategic Framework is;
-to build clinical engagement,
-work towards agreement on shared process improvement priorities and
-work towards agreement on related information technology required.

1.4 Methodology

As a means towards that goal, the following methods were employed over a 3 month period between August and November 2011.

Documents Reviewed;
Health Information: A National Strategy (DOHC, 2004)
National Clinical Programme: Mission, Vision and Objectives (HSE 2011)
Information & Communications Technology Strategy for Healthcare v 2.5.7 (HSE 2011)
Roadmap for eHealth and National Electronic Health Record for Ireland (HIQA 2011)
Healthcare Industry Group (2009): ICTs Role in Healthcare Transformation: Report

Meetings with members of DOHC, SDU, HSE NCP Clinical Leads, HSE ICT, and HIQA.
Presentation to National Clinical Programme Leads and Clinical Directors.
People, Process, Information, Technology template survey to all NCP clinical leads
Targeted analysis of the NCP clinical programmes requirements for ICT
Analysis of overlap in requirements and related solutions to identify related recommendations

2 Proposal: Strategic Framework

As a means towards an integrated approach between the National Clinical Programmes and ICT elements of the Irish Health Service, this report recommends an initial strategic framework.

While prepared without the broader stakeholder engagement that a broader strategy would require, this brief and focussed approach developed over the course of this 3 month project is not intended to be a finished article but should allow for iterative development via broader engagement and regular review.

2.1 Change: Key Elements of Framework

Any changes of the breadth and depth that both the National Clinical Programmes and the HSE ICT strategy are tackling involve a complex array of elements making up a complex system. By definition therefore, rather than attempting to detail, understand or control all elements of this complex system, we seek those common patterns of change that are seen across these programmes.

Within these and indeed many other organisational change programmes some of the key elements that need to be explored involve:

- People
- Process
- Information
- Knowledge
- Technology
- Standards
- Value for Money

3 People

First and foremost, these changes are aimed at improving patients' journey through the healthcare system, aiming to improve the quality, safety and timeliness of their care. Such changes, now being addressed by the national clinical programmes will require many people to change, as a more integrated approach to healthcare will challenge traditional ways of working. This requires clinical leadership from those with an understanding and ability to influence cultural values and beliefs and those willing to embrace new approaches to multi-disciplinary team working (involving clinical and non clinical staff). Roles and responsibilities within a team can change with the advent of new technologies and innovation is to be encouraged, to ensure value (including quality and safety) is added to the patient's journey.

It is understood from the Programme for Government that there is significant political support for ICT to underpin these changes. At this time the future governance of the ICT agenda within the Irish health service is under active consideration and yet to be determined. This report now highlights the need for early clarity around the leadership and governance of this important agenda, in line with other system changes under review at this formative time.

There is a particularly strong case from the evidence base that that any clinical programme for improvement involving IT should be clinically led. In line with practice internationally, it is understood that the DOH/HSE are now moving towards the appointment of a Chief Medical Information Officer to lead these changes which should be key to success and be welcomed. Furthermore, the important leadership and support of the Irish Medical Royal Colleges, who have been key partners in the active development of the National Clinical Programmes, should be actively sought for this strategic framework and the integration of clinical change with IT.

With the support of those at the highest level in the DOH, HSE and HIQA, the already established NCP Clinical Information Management Group could form the basis of a steering group to explore, improve and refine this strategic framework, aiming to provide oversight of the alignment between NCP and ICT elements of the service. From other arenas and at other levels, engagement should then be sought with the Clinical Directors network, representatives of frontline clinical staff, existing Healthcare ICT networks, Patient Engagement network, Private Healthcare sector, University sector and Industry, all of whom will have some interest/stake in the outcomes of this change.

Certainly as time unfolds, efforts should be made to promote patient/carer responsibility for health promotion and disease management. While such facilities may not be easily available at present, encouraging patients to be the centre of their care with a personal health record could encourage and support them in their own health management.

Clearly the ongoing overarching governance of this change needs to be coordinated between the main national players from the DH/HSE/HIQA, while fostering an ecosystem of interested parties and stakeholders at all levels in the service.

4 Process

As a starting point, it is assumed that there currently exists significant variation in approaches to clinical process between clinical specialties, clinical sites and between clinical colleagues across the Irish healthcare system. Within a system as complex as healthcare, some of that variation is to be expected and indeed accommodated. Yet as the standardisation of good practice to improve the quality and safety of care is central to the National Clinical Programmes, this will demand a new degree of process analysis, improvement and standardisation not attempted within the Irish Healthcare Service at a national level in the past.

Clearly structured methodologies to process improvement (e.g. Lean) are key to the changes required by the NCP. It is acknowledged that there is a real challenge for the National Clinical Programmes in how much to standardise nationally and how much to allow local teams to tailor for local need. Certainly the complexity and variability of clinical process is acknowledged to be a significant challenge in terms of information technology support. Equally the tension between central standardisation and local configurability has been reflected in eHealth programmes elsewhere in the past and needs to influence the choice of related IT platform required.

Within the NCP process improvement efforts, attempts to identify and improve generic processes that cross pathways and programmes (e.g. referrals and discharges) would be of particular benefit. Thankfully "the breakdown of specialty siloes is a key factor in the programmes to date". For this reason we have also sought to identify some of those generic processes that span the programmes, which should influence the design and build of any related IT platform and integrated Electronic Patient Record that will be required by the service.

It should be noted that while within the remit of the HSE some clinical domains currently sit outwith the National Clinical Programmes, it is understood that the aforementioned requirements of process improvement and information technology support apply to other key areas (i.e. primary care, pre-hospital care, child care, public health, cancer, community care, etc).

An analysis of the key "People, Process, Information, Technology" survey responses has helped identify patterns of common generic processes across the programmes, which can be usefully interpreted at 3 key levels;

Operational – Patient Self Care or Patient- Clinician interactions
Tactical – involving the synthesis and analysis of information about small groups of patient (e.g. ward level, clinic lists, daily attendances etc. (e.g. audit and local performance management)
Strategic – involving the synthesis and analysis of information on large aggregation of patient information. (e.g. public health, research, performance management, financial analysis etc)

Key Generic Processes in Health Care

Strategic (++ patients) Performance management

Tactical (> 1 patient) Resource management

Operational (1 patient)

Referral in

Assessment

Deliver Care Plan Care

Referral Out
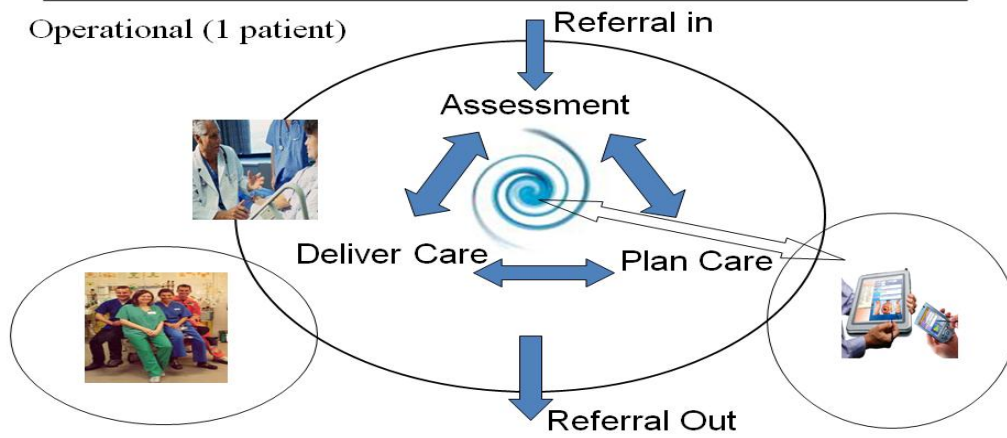
Slide: Common patterns of Generic Processes apply across Healthcare

See Table below for key generic processes identified across the programmes

Key Generic Processes	
Operational	
Patient Registration	
Patient Assessment/Evaluation	
Service Request	e.g Ordering Labs, Radiology, Bed
Diagnosis/Decision Making	e.g. Problem, Diagnosis
Care Planning	e.g. treatments required
Care Delivery	e.g. procedures undertaken
Medication Management	.e.g prescribing
Patient Referral/Discharge	

Key Generic Processes (continued)	
Patient Tracking	
Knowledge Management	
Tactical	
Scheduling	i.e. balancing supply and demand
Strategic	
Audit & Analysis, Research	

While the natural tendency within clinical programmes may be to see their own processes as special and unique, this analysis needs to be facilitated so the generic processes that underpin all programmes are also understood. The commendable work of the National Electronic Generic GP Referral System project on a combined process improvement and information technology project to address the generic process of patient referrals appears to be a good example of how this could be done.

If efforts to seek generic processes across NCP pathways are not made, a risk develops that multiple specialty systems could be deployed to meet individual programme needs that propagate the current difficulties of multiple disconnected legacy systems which are difficult to align. Therefore it is recommended that taking a patient centred approach to generic process analysis will assist in the alignment of the multitude of potential pathways with the key elements of an effective IT platform and Electronic Patient Record.

It should be acknowledged that skills and experience in process analysis and redesign methodologies are not native to healthcare clinical groups. Therefore this key step within the programmes, i.e. clinical process improvement and its alignment with requirements analysis, design, build and testing of related ICT solutions needs to be carefully managed and facilitated by the Programme Management Office (PMO). Those next steps might involve;

     Review of clinical programmes process analysis to date
     Confirmation and agreement on generic processes within (e.g. referrals and discharges)
     Development of common methodology to align process improvement and ICT support

5   Information

"Health is information-intensive, generating huge volumes of data every day. It is estimated that up to 30% of the total health budget may be spent one way or another on handling information, collecting it, looking for it, storing it. It is therefore imperative that information is managed in the most effective way possible in order to ensure a high quality, safe service."
(HIQA, 2011)

It should be noted that key role that information should play within the Irish health care system has been recognised at the highest level for some time (DOHC, 2004) and more recent policy efforts towards a Health Information Bill are ongoing. There exists a challenge for the National Clinical Programmes which now require early IT support, while aiming to align with those key important legislative changes required to facilitate long-term change (e.g. unique health identifiers, digital signatures, etc).

Key then to the success of the National Clinical Programmes will be effective Data, Information and Knowledge Management. While it is acknowledged that the governance of the Information agenda is currently unclear at this time of change, with involvement from DOHC, HSE and HIQA, there has not been significant NCP input to date. Given the high profile and critical nature of the NCP agenda it is suggested that this should now be driving the ICT agenda, therefore by implication this alignment effort should be clinically led.

Briefly data, information and knowledge are explicitly explained here to illustrate key elements of the framework.

Data   i.e. a statement or fact; e.g. Blood pressure is 140/100
Information   i.e. data + context; e.g. Mrs Smith's Blood Pressure is 140/100
Knowledge   i.e. information + advice; e.g. adult blood pressure of 140/100 is considered
              hypertensive and warrants treatment.

We explain this as each of the clinical programmes has been asked to consider and recommend best practice, commending "data driven decisions" as well as guideline, pathway, algorithm, and bundles development, all of which require effective information and knowledge management components. It is useful to separate here the information and knowledge requirements as these require separate technology components.

Information is a key element of clinical care processes. By providing and/or capturing information related to these key processes at the point of care effectively, this supports the patients journey and forms the basis of the Electronic Patient Record. In addition, if patient information is accurately and effectively used at the point of care this could/should be available (as a by-product of the operational clinical care process) to support other tactical and strategic processes such as audit, research, performance management etc as mentioned earlier. Indeed,

whatever health funding mechanism is in place, information captured for high quality and safe care should help inform the financial dimension of healthcare (e.g. patient level costing) as a by-product of capturing either clinical activity (e.g. investigations/procedures etc) or outcomes (e.g. clinical quality/safety metrics or patient reported outcomes).

In the context of current moves towards "Money Follows the Patient" and a broader move to Universal Health Insurance by 2016, such a move towards aligning the clinical and financial information requirements should be helpful for all concerned. It is understood that the current Casemix mechanism which involves the analysis of HIPE, DRG data etc is less than ideal and somewhat removed from the frontline clinical process. These moves towards greater clinical understanding of the clinical care process, in line with related patient level costing should work towards an integrated approach that improves the quality, safety and cost effectiveness of clinical care.

See Table below for key processes and related information requirements seen across programmes

Key Generic Processes	Related Information Requirement example
Patient Registration	Unique Identifiers (Patients, Locations etc) Patient Demographics
Patient Assessment/Evaluation	Access to existing Information Clinical Documentation Clinical Datasets -Problems -Medications -Allergy -Vaccinations -Alerts -Vital signs -Examination Findings Etc
Service Request	Lab Request Lab Result Radiology Request Radiology Results Bed Request Bed Status

Key Generic Processes (continued)	Related Information Requirement example
Diagnosis/Decision Making	Scoring systems, Problem, Diagnosis (SNOMED CT/ICD code etc) MDT record Patient reported Outcomes
Care Planning	e.g. treatments required
Care Delivery	e.g. procedures undertaken
Medication Management	e.g. prescribing
Patient Referral/Discharge	Clinical Dataset
Patient Tracking	Times, Locations
Knowledge Management	Access to Guidelines, Protocols, Pathways
Scheduling	Patient, Location, Staff, Equipment, Procedure SMS/email reminders
Audit & Analysis Research	Aggregate patient data for secondary analysis

Of note, many programmes appreciate the value in datasets, to support both operational clinical care and the tactical and strategic processes of audit and research. The international progress of the archetype standard is an approach that can support this. The archetype paradigm is best understood as a maximal dataset approach which can accommodate multiple requirements from differing parties with differing datasets via its two level modelling approach (i.e.. maximum dataset in the archetype; minimum dataset in the template). This approach has significant potential to help address the difficult challenge of fostering national/international standardisation while accommodating local innovation and flexibility. (openEHR, 2011)

The information exchange involved in the generic processes of referral and discharge are worth specific mention and illustration (see overleaf) here, as they highlight two key datasets that may be most helpful to initially support. By capturing the key elements of any referral from one healthcare provider to another (e.g. Primary Care to Speciality programmes) and then capturing the key elements of the discharge back again, early support for these processes could add

significant early value to key clinical encounters, provide the basis for a shared patient record and as a by-product begin to capture some key information (e.g. problems, investigations, diagnoses, treatments (with related codes)) across the breadth of the clinical programmes.
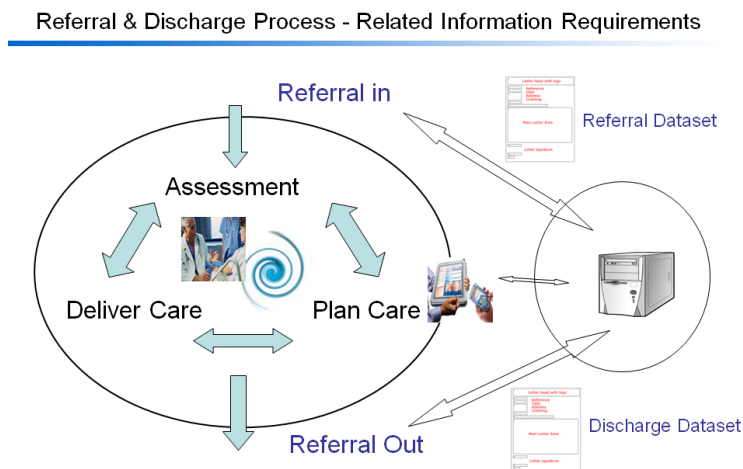
Key processes of referrals and discharge with related information requirements

It is assumed that this information exchange would be done on the basis of information sharing agreements between clinicians and their patients, with either implied or explicit consent. While such information sharing has raised challenges in some other jurisdictions, it is understood that by proactively engaging with patient representatives that the majority of patients are keen such information is shared, in the best interest of their care.

6 Knowledge

Alongside accessing and capturing information about individual patients as they are cared for, access to knowledge, i.e. real-time advice about the "right thing to do" is a key requirement for the clinical programmes.

In the past clinical knowledge was absorbed via medical school training, further speciality training and experience, so while explicit knowledge was available in international textbooks and journals, real time access to local "tacit" knowledge was kept by individual expert clinicians in their heads.

While this had advantages it has become impossible for clinicians to keep apace of the ongoing rapid developments in any one single field of medical knowledge, let alone across several fields. At the same time, the evidence that emerges from any field often remains subject to some interpretation and debate. Therefore to address this challenging gap from "bench to bedside", the healthcare field is increasingly turning to guidelines and protocols, which are often developed by groups of multiple expert authors in the field. The recently launched National Clinical Effectiveness Committee (NCEC) in Ireland is now well placed to oversee such clinical guidelines and clinical audit development.

Indeed one of the tasks of the NCP is to agree, deliver and support such knowledge management at the point of care to nationalise good practice.

To do so there are several options;

Firstly paper based guidelines and protocols can be made quickly available and are used widely, e.g. the WHO Safe Site Surgery checklist.

Secondly access to electronic guidelines and protocols in real time, now allows for distributed authoring and ease of rapid, low cost distribution with a Content Management System, which can be described as passive Decision Support. Given the importance of this element and the relative ease with which to make available at the point of care and alongside the development of the Electronic Patient Record, this is worthy of early effort by the NCP.

Thirdly, integrating such guidance with an Electronic Patient Record is known as Active Decision Support and is a much more challenging solution to deliver technically. Of note as the related standards to underpin this approach remain relatively immature, this should be constrained to areas that offer proven benefit over cost (e.g. Medication Management – Drug-Drug interactions).

7 Technology

To deliver on the full potential that the NCP offers will require significant information and knowledge management and technology to support and enable these changes. It is understood that in the way that water and electricity services became public works for the common good of modern societies, so too a reliable and secure information technology infrastructure is needed to bring Irish Healthcare into the 21st Century. (Protti, 2006)

Of note the current Programme for Government sets out an ambition towards "a major upgrade in the IT capabilities of the health system". The results of a HSE survey of national clinical programmes leads priorities highlighted that an "Integrated Electronic Patient Record" was their number 1 clinical services support need from 2012.

Several of the key elements of the IT solutions required have already been outlined within the HSE ICT Strategy (HSE ICT, 2011), while many of the key challenges related to the rollout of an Electronic Patient Record are documented within the HIQA roadmap for an eHealth platform and national EHR. (HIQA, 2011). However an exploration of the fit between the National Clinical Programmes ICT needs and related options for such support has not been done to date, which is now explored.

As technical discussions can be challenging for the clinical community the approach taken here will be deliberately high-level, yet will illustrate some of the key choices and challenges for aligning the NCP with an effective ICT strategy.

Firstly this Table highlights those shared top requirements seen across the programmes.

Information Requirement example	Related Technology Support
Unique Identifiers	Service Directory
	Master Patient Index
Patient Demographics	Patient Administration System (PAS)
Access to existing Information	Portal and Integration Engine
Clinical Documentation	Clinical Documentation Tools
Clinical Datasets	
-Problems	
-Medications	
-Allergy	
-Vaccinations	
-Alerts	
-Vital signs	
-Examination Findings Etc	

Information Requirement example (cont'd)	Related Technology Support (cont'd)
Lab Request Lab Result Imaging Request Imaging Results Bed Request Bed Status	Order Entry- to Lab System Results Reporting- from Lab System Order Entry- to RIS Results Reporting- RIS report & PACS film Bed Request Bed State
Scoring systems, Problem, Diagnosis (SNOMED CT/ICD code etc) MDT record Patient reported Outcomes	Clinical Documentation Tools
Treatment required Procedures undertaken	Clinical Documentation Tools
Prescriptions	Medication Management systems
Patient Tracking	Patient Tracking Board
Access to Guidelines, Protocols, Pathways	Content Management System
Patient, Location, Staff, Equipment, Procedure SMS/email reminders	Scheduling Software
Aggregate patient data for secondary analysis	Data Warehouse

Again it is assumed that these generic solutions would add value across the service, to those services within and outwith the NCP. (e.g. Cancer Programme etc).

Next we state some key assumptions on the technical platform required to support such requirements.

An e-Health platform needs to primarily support those key shared generic processes and related requirements that are shared across the healthcare service, as well as cater for more specialised requirements.

An e-Health platform needs to be able to cater for requirements from national efforts such as the national clinical programmes, as well as local requirements at the clinical coalface, where healthcare innovation and improvement needs to be fostered.

An e-Health platform should aim to support best international practice in informatics, so the Irish service can reuse what is made available globally, while allowing for useful Irish contributions and international collaboration in this field.

A solid, robust and reliable eHealth infrastructure to enable a platform with minimum levels of security built in as standard to ensure effective Information Governance can be easily achieved (e.g. strong authentication, role based access, audit of access etc).

At this point it is worth a simple look at options for such a platform, to inform important choices about the way forward.

The simplest way to explain the technical options for such a platform can be explained simply as Option A, Option B and Option C.
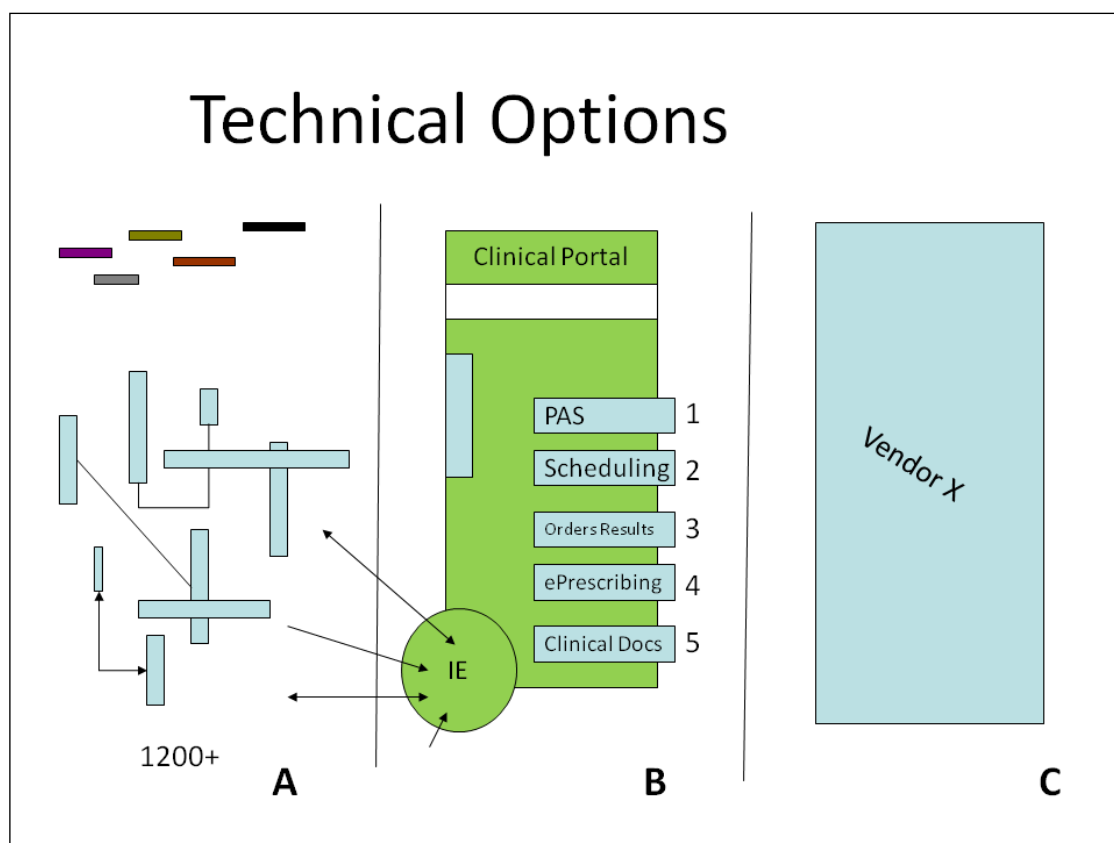
Slide of Technical "Options" A, B and C

Option A – Development of Independent clinical systems

Over many years, the steady growth of independent clinical systems became common place in healthcare and has led us to where we are today. To date it should be acknowledged and indeed needs to be highlighted that there are over 1200 healthcare information systems currently in use across the HSE estate with little or no connection between these.

While these numbers may be surprising this is not unusual when surveying "legacy" healthcare information systems across health economies. Indeed this situation has arisen due to the complexity of healthcare and a mix of independent clinical teams, with independent views of their own clinical process has resulted in the development of a myriad of independent proprietary technologies that cannot interoperate and so perpetuate a siloed approach to healthcare delivery. Such is the current difficult state of eHealth internationally.

Alignment of process improvement efforts with multiple isolated technical systems is particularly difficult, as the cognitive load on users makes for poor usability, a common problem in eHealth. The key difficulty of deploying "standalone" systems surrounds the challenge of integration. If one imagines that to join up patient journeys and clinical teams across such a

landscape, one needs to get the systems to integrate (i.e. talk to each other) then the maths of any "peer to peer" direct connections quickly illustrates the challenge.

Imagine that if only 5 such systems exist and one wishes to create independent connections between each other part, the number of connections required may be up to 10 (based on Reeds Law n(n-1)/2 (Wikipedia 2011). If the number of systems involved is 10, the number of possible connections rises to 45, so one quickly faces a "combinatorial explosion". One can quickly deduce that if seeking an integrated landscape of people, process and information technology, then independent development and peer to peer connections quickly becomes an unsustainable approach, especially if scalability and maintainability are considered.

Option B- Portal & Integration: Service Oriented Architecture (SOA)

Within the range of healthcare IT platform options lies a middle ground;
Historically known as "Best of Breed", this approach usually exhibits a few key features;
-leveraging data from key existing systems.
-portal approach (i.e a common user interface (CUI) to multiple sources of data)
-integration of multiple systems via a hub (e.g. integration engine/enterprise service bus)
-support for service oriented architecture (allowing several vendors to offer services)
-alignment of key generic processes with this service orientation (e.g "clinical 5")
-support for patient centred record rather than departmental oriented record
-ability to underpin with clinical data repository for aggregate analysis and reporting

Option C- Enterprise Wide Health Information System

One major alternative is to take a "rip and replace" approach to legacy systems and try to replace them all with a single system, from a single supplier. This radical "rip and replace" approach has been tried by healthcare providers elsewhere in the past, however at a national level the transformation involved would be huge, demand very hard effort and be high risk.

Evidence of success with this option is limited in the main and indeed recent experience for the NHS National Programme for IT in the English NHS has highlighted the real risks and potential for expensive failure in such an approach. The lesson from the NHS (which was at the time the largest civil IT programme in the world) was that no one provider was deemed suitable to take on the whole service, and even with multiple £12 billion programme budget, the leading established marketplace vendors were not well suited to the complexity and diversity of the entire national healthcare system, especially within the complex acute hospital sector.

In exploring these options, given the current "brownfield" of legacy data and systems and the early nature of e-health provision across the programmes and service, neither the status quo (Option A) nor a rip and replace approach towards a single Enterprise Wide Solution (Option C) can be commended at this point. The middle ground approach of Option B, i.e. a move toward integration of key legacy systems, move towards SOA and support for the key 5 or 10 clinical requirements via a common portal platform is worth early consideration and effort.

In clinical domains such as primary care where effective information systems exist and already support those core clinical processes outlined, these can be integrated within this approach. Many of the key elements of this approach are outlined within the existing HSE ICT strategy, while without explicit reference to the means to integrate solutions and offer an effective common frontend, which should be proven in an early development phase. To build on the existing good work in this field already underway within Ireland consideration should be given to how established efforts (e.g. Healthlink, Integrated Services Framework) can contribute to this form of solution. Technical support for those key generic processes of referral and discharge appear to be suitable candidates for early support with such an approach.

The principles behind such an integration & SOA oriented approach can be applied at multiple levels within a healthcare system (for personal/hospital/local health community/regional or national records). If such a platform was to be made available nationally, an exploration of the merit in devolution of such an approach to support local innovation and improvement should be undertaken. Internationally, some pioneers of this approach have been leading the field for some time. (Halamka 1999, Feied 2004), so now Health Information Exchanges (HIE) are key elements of the US Health IT programme, while closer to home the Scottish Clinical Portal and Welsh Clinical Portal are more recent initiatives of this type.(NHS Scotland eHealth 2011, NHS Wales 2011)

Of note, in terms of best practice, perhaps the most important current international development in eHealth is being led by the Veterans Administration and Department of Defence in the US, who are jointly funding and developing their iEHR along these "standards based, modular architecture" principles, while openly inviting reuse, involvement and participation from interested parties elsewhere. (ACT, 2010; OS EHR A, 2011; VA 2011). Of note, the culture of peer review, publication and sharing of healthcare advances has much in common with the commendable methodology this open source development involves. (Reynolds, 2011) To avail of and contribute to these key international developments in this field, awareness of the efforts of these players, such as NHIN Connect, Open Health Tools, the OS EHR A community and the openEHR Foundation needs to be raised.

While varying style of programme and project management are available to programmes of change, the evidence suggests that an iterative improvement approach to these technology developments, done over regular cycles is much preferred over large-scale waterfall (big bang) style releases. This point is explored further under Integration of Key Elements.

It should be acknowledged that the HSE has a very low level of health ICT skill base relative to its overall workforce. Though an expansion in the capability and capacity of the informatics workforce is likely to be of benefit to both the Irish Health Service and its aspirations towards the knowledge economy (Healthcare Industry Group 2009, IHSC 2011)- in real terms that expansion is more likely to be slow and steady rather than exponential in nature. In conjunction with the recommendations of this strategic framework, it is advised that a related assessment of current Informatics capacity and capability within the service can ensure this scarce resource is deployed to maximal effect. This should help in identifying and progressing the most effective blend of established local and international developments that are required to deliver related benefit across all programmes.

8 Standards

The work of the National Clinical Programmes is by design working towards a greater degree of standardisation of workforce, process and pathways alongside related metrics within the Irish Health Service. Indeed the great potential of a standards based approach is that standards can be key to a greater consistency in the quality and safety of care nationally, while allowing for local innovation and improvement to meet those standards. To fulfil the complete potential of the National Clinical Programmes, they will over time require an integrated combination of clinical, information and technical standards, which can support high quality safe clinical care, the related information required with the right technical stack to underpin.

As discussed earlier, the clinical standards process usually now involves a team based approach to agree good/best practice in clinical process and outcomes via guidelines, pathways and protocol definition. The related measures or metrics should be easy to capture at the bedside to enable concurrent performance measurement. As examples, the good standards work done by the Irish National Generic GP Referral project and the Academy of Medical Royal Colleges (which includes the Irish Royal Colleges) on Medical Record Keeping standards for Admission, Handover and Discharge can offer value across the NCPs.

To then support these clinical standards with an e-health platform requires a complex mix of information and knowledge management standards, particularly if this is to be done at a national scale. The HSE Integrated Services Framework Programme is in the early phases of tackling this complexity. The translation of clinical standards into related technical standards is a non trivial exercise and usually requires the help of those small numbers of clinical informatics experts who are versed in this science. Of note, it is acknowledged that the international health IT standards landscape is overcomplicated and can be a daunting field to comprehend. (HL7 v2.x, v3 etc, IHTSDO SNOMED CT, WHO ICD 10, IHE XDS, CEN/ISO en13606, openEHR, Contsys etc etc).

Amidst this complexity, while most parties bring key elements to the table, no one of the international eHealth standards bodies yet offers an accessible standards-based platform for eHealth. Therefore there is a difficult gap between the current approach to standards development seeking the holy grail of "semantic interoperability" and those seeking to innovate and improve healthcare processes at the clinical frontline. To address this gap several eHealth jurisdictions have moved towards supporting an international movement for open source tooling in eHealth (e.g. Open Health Tools.org). This usefully aligns with aforementioned developments by the US VA and DOD towards an "open source, open standards based, modular architecture" of their emerging joint iEHR platform. While Ireland has had limited experience and involvement in the eHealth standards efforts to date with very limited resources in this area, so it is assumed that the key players involved (HIQA, HSE, DOH) will all be keen to leverage internationally useful material from elsewhere and so should actively explore engagement with these key efforts.

9 Value for Money

The key driver for the national clinical programmes is to improve healthcare in Ireland. Attempts to measure improvements in healthcare are not always easy but can be considered in terms of 4 key elements, Quality, Safety, Timeliness (e.g. Access Time) and Cost. Those 4 elements when considered together and blended to good effect, can be defined as value, i.e. they each add value to the patient's journey. Each of these 4 measures of value are to be considered by the NCP as they define their pathways and define their own balanced scorecards.

In these straightened economic times any public expenditure can be expected to be under significant scrutiny, while equally given the scale of the changes to the healthcare system that the national clinical programmes require, related investment will be required to see them to fruition.

On the ICT spend, as a consequence of the HSE PPARS programme, there has been a natural caution towards investment in any large-scale healthcare ICT in recent years. The resulting underinvestment has been identified as a priority to address by the incoming health administration as has been detailed in the latest Programme for Government.

As it is understood that there are efforts towards a "Money follows the Patient" model, on the important road towards Universal Health Insurance in Ireland, any such reform will require investment in healthcare ICT as a necessary foundation.

This table outlines technology investments and anticipated benefits in terms of quality, safety, time and cost improvements.

Technology Support	Related Value/Benefit
Master Patient Index Patient Administration System (PAS)	
Portal and Integration Engine Clinical Documentation Tools	Timeliness, Quality. Safety
Order Entry Results Reporting Labs Systems Radiology & PACS Bed Request System	Quality, Safety
Medication Management systems	Safety

Technology Support	Related Value/Benefit
Patient Tracking Board	Timeliness
Content Management System	Quality & Safety
Scheduling Software	Timeliness
Data Warehouse	Quality & Safety & Cost

It should be noted that the evidence base in terms of return on investment on eHealth projects is somewhat mixed, certainly there is evidence of quality (guideline adherence) and safety (e-prescribing) improvements, with mixed results of cost savings and the added time involved by eHealth solutions is a known factor. Interestingly those places that have documented most improvement have largely been those places with strong clinical leadership and an iterative approach to process improvement, often with in-house eHealth development capability. In more recent years the evidence behind whole systems improvement from eHealth have made for more compelling arguments. (Liang 2010, Longman 2010,) Though not cheap, some describe it as a paradox, in that one needs to invest in the early stages to generate longer term return. (Bauer, Hagland 2008)

As a dedicated Health ICT fund is detailed in the programme for government it is understood that this offers the basis for this investment. Furthermore aside from the upfront investment required for such developments, it should be acknowledged that an opportunity exists for Ireland to development its healthcare and information technology industries, combining to focus on opportunity offers by informatics job creation. Of note the Irish Healthcare Service Centre (IHSC development aims at the opportunity Ireland has to become a leader in this emerging international field, as this particularly fits with Irelands stated ambitions towards building its Smart/Knowledge Economy.

10 Integration of Key Elements

In order to explain this strategic framework, we have identified those key elements within the complex challenge ahead.

They are
> People
> Process
> Information
> Knowledge
> Technology
> Standards
> Value for Money

Clearly there is a need to integrate these key elements into a cohesive whole. We now explore options for further development and implementation of this approach, explained as a range between a "waterfall" and "agile" models.

The traditional approach to large programme implementation can be understood as the waterfall method. This approach might involve;
-establishing an national Irish eHealth agency,
-recruiting a large multidisciplinary team
-detailed process analysis across the entire health spectrum, seeking detailed clinical requirements
-long sequential phases over several months of procurement, design, build then testing of an eHealth platform.
-Related efforts to agree all those related information & knowledge management technical standards required to underpin interoperability across such a platform
-Implementation to the frontline as a big bang implementation, with a rolling programme to address all clinical programmes and all regional areas over a predefined time period.
-Large upfront costs and resource.

Such a method can work for some projects at some scale and are based on sound engineering principles, yet when combining those key elements of people, process and technology has to be acknowledged as a high risk approach.

At the other end of the spectrum, lies agile/iterative/spiral project methods.
Here the approach may involve;
-Small team or teams keen on change self organise.
-High level process analysis seeking quick wins rather than detail

-Rapid phases of design, build, test of eHealth platform seeking results over days/weeks
-Pragmatic approach to standards developed or utilised.
-Implementation in small, iterative changes, seeking organic growth as conditions permit.
-Smaller upfront cost and resource.

Naturally this exploration of these different approaches is intended to illustrate a spectrum of options with a range in between. Certainly within the recognised capacity and capability constraints of the current system, a hybrid approach may be warranted to support and deliver this integration. The key elements of such an approach may be;

- Aligned with the overarching governance and strategy for ICT by the DOH/HSE, establish clear leadership (e.g. CMIO) and related steering group with key stakeholders (e.g. NCP, Colleges, ICT, HIQA etc) to oversee and progress this strategic development.
- Agree key generic processes that cross programmes (e.g. referral and discharge) and work to align NCP process improvement methodology with ICT development approach.
- Rapid agile prototyping of key information, knowledge and technology required to support (e.g. open source Option B- clinical portal & integration stack) at national/regional/local health community level.
- Use established standards i.e. both clinical & technical to support basic EPR development.
- Resource with small but flexible fund for first year
- Trial and showcase within "Model Communities" at 3-5 local sites within year 1.

Such an integrated approach that quickly pulls these key elements together should learn key lessons early on and steer direction of this strategic framework, aligning NCP and ICT towards a more coherent and cohesive approach to change across the Irish healthcare system in the medium to long term.

11 Summary of Recommendations

People: Appointment of Chief Medical Information Officer. Aligned with the overarching governance and strategy for ICT by the DOH/HSE, establish clear leadership (e.g CMIO) and related steering group of key stakeholders to oversee development and implementation of this Strategic Framework.

Process: Process improvement efforts by the NCP which attempt to identify and improve generic processes that cross pathways and programmes should be the main drivers of the ICT agenda. A consistent process improvement methodology should be developed that allows for the alignment of process improvements with related ICT requirements.

Information Process related Information requirements should be further explored and agreed. Methodology for dataset development should be explored, considering maximal and minimum dataset approaches.

Knowledge Knowledge in the form of electronic guidelines and protocols should be developed using collaborative content management system.

Technology: Key Information requirements should confirm related technology components required. Exploration of local and international developments in portal, integration and service oriented architecture approaches used successfully elsewhere in healthcare as key to platform required.

Standards: Establish links with key international developments in this field, esp. those working towards standards based toolkit, e.g. Open Health Tools, the OSEHRA community and the openEHR Foundation.

Value: Secure funding based on the upgrade in health IT investment plan detailed by government and plans for UHI. Connect to local Irish industry with interest in informatics job creation.

Integration of Approach:
- Given current constraints, establish small team with clear leadership (e.g. CMIO), support of key bodies (DH, HSE, HIQA, RCP) and a steering group with key stakeholders (i.e. NCP and ICT)
- Agree key generic processes that cross programmes (i.e. referrals and discharges)
- Rapid prototype key information, knowledge in technology stack required to support (e.g. open source Option B- clinical portal and integration stack).
- Use established standards i.e. clinical & technical to support basic EPR.
- Resource with small but flexible fund for first year
- Trial and showcase within "Model Communities" at 3-5 local sites within year 1

12 Glossary of Terms

DOH   Department of Health

DRG   Diagnosis Related Groups

HIPE   Hospital In-Patient Enquiry scheme

HIQA   Health Information & Quality Authority

HSE   Health Service Executive

ICT   Information & Communication Technology

NCP   National Clinical Programmes

PACS   Picture Archiving and Communication System

RIS   Radiology Information System

SOA Service Oriented Architecture: An architectural style that supports service orientation. Service orientation is a way of thinking in terms of services and service-based development and the outcomes of services.
(Open Group, 2011 Available from http://www.opengroup.org/soa/soa/def.htm)

UHI   Universal Health Insurance

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14 Appendices

Excerpts from National Clinical Programmes: Mission and Objectives (HSE, 2011)

Excerpts from HSE ICT Strategy 2011

Excerpt from "Towards a roadmap for eHealth and a national electronic health record for Ireland" HIQA 2011

Excerpt from "Healthcare Industry Group (2009): ICTs Role in Healthcare Transformation: Report "

Blank People, Process, Information, Technology template distributed to NCP teams

Response to People, Process, Information, Technology analysis – Emergency Medicine

Response to People, Process, Information, Technology analysis- Epilepsy

14.1 Excerpts from National Clinical Programmes: Mission and Objectives (HSE, 2011)

The programmes mission are to "Deliver better care through better use of resources"

Every programme has a set of **objectives** grouped under three headings
-Improve Quality e.g. reduce incidence of stroke, heart failure, blindness due to diabetes, etc
-Improve Patient Access e.g. reduce outpatient wait time, reduce time to see senior doctor in an emergency dept.
-Reduce Cost e.g. reduce average length of stay , reduce bed utilisation.

Building on the success of the National Cancer Control Programme model, the following were identified as key success factors in achieving programme objectives:

1. Clinically led multidisciplinary team: The programmes are led by clinicians selected by their peers through their respective training colleges. Each programme has a multidisciplinary team made up of doctors, nurses (selected by the Directors of Nursing), GPs (selected by the ICGP) and allied health professionals (selected by their professional bodies), public health doctors and service planners. Where a change process is clinically led it is more likely to succeed than when clinicians engage in the change process only.

2. Structured approach from design to implementation: A structured programmatic approach was developed setting out the steps a programme needed to complete to take an improvement idea from inception through to implementation. The mantra of the programmes has been you get 5% of the marks for the solution design, 45% for its implementation and 50% of the marks for implementing the solution in a way that delivers sustained benefits.

3. Engage patients: The value of engaging patients early in any change process is well recognised. A patient reference group was established, through the HSE Advocacy function, to support the programmes. Patient review of all programme solutions is required prior to final sign off.

4. Nationalise existing best practice : The programmes are seeking to standardise care against existing Irish best practice. The National Clinical Programme Leads selected are recognised by their peers as having established good local models of care. The role of the programmes is to package these local models of care, get national input and buy-in to them and seek to standardise care nationally around them. The programmes are not seeking to re-invent the wheel.

5. Make data driven decisions: Once a programme has developed a solution it is required to provide data that demonstrates that the solution will deliver Quality, Access and Cost benefits.

The National Clinical Programmes listed in the HSE National Service Plan 2011 have completed business cases with validated data.

6. Local ownership: The programmes will only succeed if there is local buy-in and leadership for the implementation of their solutions. Many of the programmes have consulted extensively to get local input into the design of their solutions. The key role in implementation is that of the local Clinical Programme Lead, which some programmes have identified already.

7. Align stakeholders: The key success of the programmes in 2010 was aligning multiple stakeholders e.g. HSE management, nursing, colleges, DOHC, patient advocates, etc to a common approach for working collaboratively to deliver on a shared vision of integrated care.

There are multiple programmes but they are working to a **common vision**. There are two aspects to this vision:

(1) Design standardised models for the delivery of integrated clinical care
The National Clinical Programmes will contribute to the design and implementation of a standardised and integrated patient journey. This journey can be complex and is illustrated on page four. Each of the National Clinical Programmes are contributing solutions to the key points on this patient journey. As the programmes are working together these solutions are developed in consultation with each other. This breaking down of speciality silos has been a key factor of the programmes to date. Many of the programmes have dependencies on each other.

(2) The embedding of sustained clinical operational management of the integrated pathway
he programmes vision is not just to implement stroke units, COPD out reach, Acute Medicine Units etc, but to implement solutions that delivers sustained benefits and continuous improvements to the patient. This can be achieved by embedding operational management at a clinical level. There are six key steps:

(1) Agree the measurable Quality, Access and Cost metrics you want to achieve.

(2) Ensure there is a documented standardised pathway in place, which is supported by standard clinical decision making.

(3) Ensure that all parties involved in the pathway have total clarity of their roles, responsibilities and governance arrangements.

(4) Ensure there is a balanced set of metrics in place to track the performance of the pathway.

(5) Ensure there is an effective meeting held regularly, where those who are managing the pathway identify variance in its operational performance and log actions to be taken to improve the outcome for the patient.

(6) Where the reason for the variance is unclear or the action to address variance is significant then ideally there should be some skilled local project and process improvement resource available to guide the clinicians through the change process..

If steps (1) to (4) are only implemented, there may be a risk that documentation has been agreed and implemented without full performance improvement being achieved. Therefore step (5) is essential in the continual performance improvement of the service implementation. With positive tension and clear working together by all involved the unit and pathway for the patient will be optimised.

14.2 Excerpts from HSE ICT Strategy 2011

The Current ICT Vision for the Health Service Executive is defined as:

To deliver sustainable improvements in health and social care for patients and clients, via the deployment of cost effective, standards based, secure technology and applications, that provide access to meaningful, timely, and relevant information, when and where it is required.

The following strategic goals are identified

Strategic Goal #1:
ICT will enable integrated, person centric, service delivery.

Strategic Goal #2:
ICT will increase the effectiveness, efficiency and economy of operations within the HSE.

Strategic Goal #3:
ICT will act as a catalyst for change, providing innovative, technical solutions that will transform the business.

The following are identified as strands to be delivered under the HSE ICT strategy

- Rationalisation of ICT Technical Infrastructure
- Rationalisation of Existing/ Legacy applications
- Implementation of Core Hospital Systems
- Integration of Primary Care
- Expansion of Corporate and Operational Support Systems
- ICT support for the National Clinical Care Programmes
- Pre Hospital Emergency Care Systems
- National Child Care Systems
- Public Health Systems
- Quality, Risk & Safety Systems
- National Cancer Control Programme Systems
- Demand Led Schemes (PCRS)
- Community and Continuing Care Systems
- The Electronic Health Record

14.3 Excerpt from "Towards a roadmap for eHealth and a national electronic health record for Ireland" HIQA 2011

EHR diffusion projects: 12 critical success factors (Protti)

1. Leadership – political, organisational, clinical, technical.
2. Clinical involvement.
3. Information governance.
4. Commitment to standards.
5. Unique identifiers.
6. EHR Model.
7. Reliable, rapid and secure infrastructure.
8. Strong project management.
9. Performance measurement and transparency.
10. Appreciation of increasing patient involvement.
11. Governance.
12. Business case and benefits realisation.

Suggested list of common services/key enablers for action;

1. A set of standards including communication, coding and terminology, which is based on widely available and implemented international standards .

2. A system of unique identification for individuals, organisations and health professionals

3. A secure and easy-to-use system of digital signatures for health professionals.

4. A robust, reliable, secure network which connects all healthcare professionals and organisations.

5. Appropriate governance arrangements to ensure the privacy and confidentiality of patient data.

6. Clinical and patient engagement.

7. Appropriate skills and resources.

14.4 Excerpt from *Healthcare Industry Group (2009): "ICTs Role in Healthcare Transformation":*

Recommendations

In order to prepare for this journey we make the following nine recommendations:

• The commitment to and resourcing of a **modern IT-enabled healthcare system becomes a national priority for government**, with leadership coming from the Minister for Health and Children.

• The **CEO and board of the HSE accepts leadership responsibility for the effective execution of the ICT programme** and the related process reengineering, as essential elements in building a world-class, affordable health care service.

• The **HSE triples its expenditure on Healthcare IT** over the next 3 years, from 0.75% to 2.25% of total budget, this being the level of expenditure required to bring Ireland into a median position of healthcare IT capability in the delivery of patient care.

• The **HSE's capacity to implement IT systems is enhanced by a long term partnership with the Irish ICT industry** to leverage the expertise, capability and resources available.

• As part of the move towards a smart economy, **the government directs Enterprise Ireland to establish a healthcare technology cluster**. The government should also ensure that the public procurement process encourages R&D, experience-building and knowledge-sharing within SMEs, for example by supporting "lighthouse" applications in selected areas.

• **A Unique Health Identifier and a national Electronic Health Record system** spanning primary and acute care is implemented **within 3 years**. These systems offer major benefit in terms of patient safety, healthcare quality, chronic disease management and financial effectiveness. They are the essential building blocks for future healthcare ICT systems.

• **Open standards are utilised** to ensure interoperability into the future between different healthcare ICT systems.

• A **major focus is placed on developing IT skills and knowledge within the HSE**. This should include widespread IT familiarisation programmes for management, clinicians and administrators, supported by education and training from the ICT industry.

• The **HSE board establishes a high level advisory group**, comprising internal executives and external experts from the medical, academic and business communities to provide ongoing advice on the exploitation potential of Healthcare IT.

The ICT industry in Ireland is willing to rise to the challenge of supporting the HSE in its goal of transforming healthcare for the benefit of our citizens. As we succeed together in this mission, we will also begin to position Ireland as a world class supplier of healthcare services and healthcare ICT systems for the global market. In this way we will establish valuable assets for the new smart economy.

14.5 People, Process, Information, Technology, Benefit analysis- Blank Template

Please complete the following table with your care programme in mind... outlining..
1) Who you expect to be involved
2) Which process you are seeking to improve
3) What information you need to support that process
4) What technology you might ideally have to support that process
5) What benefit you expect from such information/technology support
6) Which of these you would prioritise

People	Process	Information	Technology	Benefit	Priority

Please identify which clinical programme you represent
Please identify who is completing this analysis:
Please identify your role within the programme
Please provide your contact details   email   phone

14.6 People, Process, Information, Technology, Benefit analysis- Emergency Medicine Programme

People	Process	Technology	Data
All	Non Functional	• Ability to show data or screens from different systems (diagnostics results, prescribing, decision tools etc.) on a single screen view in EDIS i.e. using 'portal' type functionality;	View from other system
All	Non Functional	• Ability to have single sign-on to applications for clinicians and automated sign-off (possibly using identity cards) across multiple terminals;	Log on details
All	Non Functional	• Access rights to different levels of data depending on user log-in credentials or Role Based Access Control (RBAC);	Log on details
All	Non Functional	• Ability to receive and send data to other systems within the Emergency Care Network;	Patient details
All	Non Functional	• Remote access to application and or Web-based access;	
All	Non Functional	• Ability to adapt to a Major Emergency scenario;	All data
All	Non Functional	• Implementation/adaptation for use in Acute Medicine (AMU/AMAU/MAU) setting;	All data
All	Non Functional	• Ability for remote viewing within Emergency Care Network linked units;	All data
All	Non Functional	• Support national clinical registries for Emergency Care (e.g. trauma, resuscitation registries);	Clinical notes and diagnoses data
All	Non Functional	• Seamless implementation within Clinical Decision Units;	Patient registration data
All	Non Functional	• Ability to access digital images e.g. ECGs.	PACs
Administration	Registration	• Ability to automatically interface with Primary Care systems to upload electronic referral data in ED system;	Patient details, GP diagnoses
Administration	Registration	• Ability to scan and store paper GP referral letters where presented;	GP referral letter
Paramedic	Registration	• Ability to capture pre-registration data on mobile devices while patient en-route (ambulance, helicopter, doctor);	Patient details, patient notes

Administration	Registration	• Data for registration and pre-registration will consist of basic patient demographics and clinical information. Need a solution where fields to input data can be created and modified on a configuration basis and not through upgrade releases of the software (list of registration fields available in a separate document);	Registration and mini registration data set
Administration	Registration	• Ability to capture registration data on mobile devices through patient point-of-care registration (mobile within ED);	Patient details
Patient	Registration	• Self-registration at booths in ED waiting area.	Patient details
Clinical	Patient Tracking	• Ability to track patient whereabouts within the ED and environs of the hospital using RFID or barcoding;	Patient location
Clinical	Patient Tracking	• Electronic Whiteboard providing real time information concerning condition and location of patients, replacing need for manual white boards;	Patient details and location
Clinical	Patient Tracking	• Data captured and shown on whiteboard where appropriate for confidentiality should include number of patients waiting, waiting times, bed requests, diagnostics status, patient location, tracking time between steps in process;	Patient details and location
Clinical	Patient Tracking	• Alerts on tracking system to notify care givers when user-defined allocated time for phases of care are expiring;	Patient details and location
Clinical	Electronic Charts	• Ability to capture all aspects of clinical documentation across patient journey such as assessment, admission notes, allergies and discharge disposition including requirements for the following:	Clinical notes
Clinical	Electronic Charts	o Clinical Nursing Notes;	
Doctors	Electronic Charts	o Doctor's Notes;	
Therapists	Electronic Charts	o Therapy Notes;	
Nurses	Electronic Charts	o Triage and Advanced Triage: Ability to handle Manchester Triage Scale, national Paediatric Triage tool (in consultation) and other national triage tools as developed.	
Clinical	Electronic Charts	• Data input should allow for voice recognition and handheld devices such as PDAs, notebooks, etc;	Clinical Notes
Clinical	Electronic Charts	• Screens should be customisable without vendor intervention including pick lists and customised templates;	All
Clinical	Electronic Charts	• Ability to call up electronic patient records from other systems within the hospital or elsewhere;	All
Clinical	Electronic Charts	• Ability to easily send data from one application to another across the network;	All

Clinical	Electronic Charts	• Capture of physiological data from patient monitors;	Physiological
Clinical	Electronic Charts	• Input of point-of-care testing data;	Testing data
Clinical	Electronic Charts	• Ability to develop full EPR;	All
Clinical	Electronic Charts	• Ability to draw clinical pictures in patient record;	Clinical Notes
Clinical	Electronic Charts	• Data input through voice recognition, key board or hand held;	Clinical Notes
Clinical	Electronic Charts	• Diagnostic Coding – Case Mix Capture;	Clinical Notes
Clinical	Electronic Charts	• Generation of discharge and referral information.	Clinical Notes
Clinical	Order Entry	• Fast order entry for all ED required orders including laboratory tests, diagnostic imaging, nursing interventions, procedures, requests for intervention by other specialties etc;	Orders
Clinical	Order Entry	• Customisable order sets for rapid order entry;	Orders
Clinical	Order Entry	• Link to protocols and pathways for best practise ordering practices;	documents
	Order Entry	• Real time status of results including wireless alerts for laboratory results.	results
Clinical	Prescribing	• Electronic closed loop medication management	Electronic prescriptions
Clinical	Patient Discharge	• Facilitation of transfer of patient data to and from different care units (including AMUs);	Patient details
Clinical	Patient Discharge	• Prescription recording and transcription;	Diagnosis details
Clinical	Patient Discharge	• After care instructions / patient information sheets;	Discharge notes
Clinical	Patient Discharge	• Bed requests;	Discharge notes
Clinical	Patient Discharge	• Inter-network unit transfer request;	Discharge notes
Clinical	Patient Discharge	• Discharge letters transmissible through Healthlink for GP referrals.	Discharge notes
Clinical	Time Tracking Reporting	• Real time analysis and reporting of patient journey information;	Reporting data
Clinical	Time Tracking Reporting	• Data entry for time tracking of patient journey through manual fields;	Reporting data

Clinical	Time Tracking Reporting	• Data entry for time tracking of patient journey through barcode scanner or RFID;	Reporting data
Clinical	Time Tracking Reporting	• ED arrival to triage time;	Reporting data
Clinical	Time Tracking Reporting	• Ambulance Handover Time;	Reporting data
Clinical	Time Tracking Reporting	• Arrival to time seen by treating clinician triage;	Reporting data
Clinical	Time Tracking Reporting	• Arrival to time seen by treating clinician triage 1; • Arrival to time seen by treating clinician triage 2; • Arrival to time seen by treating clinician triage 3;	Reporting data
Clinical	Time Tracking Reporting	• Arrival to time seen by treating clinician triage 4; • Arrival to time seen by treating clinician triage 5;	Reporting data
Clinical	Time Tracking Reporting	• Time seen by treating clinical to disposition decision;	Reporting data
Clinical	Time Tracking Reporting	• Disposition decision to time seen by admitting/consulting team;	Reporting data
Clinical	Time Tracking Reporting	• Disposition decision to departure;	Reporting data
Clinical	Time Tracking Reporting	• Time seen by admitting/consulting team;	Reporting data
Clinical	Time Tracking Reporting	• CDU Length of Stay;	Reporting data
Clinical	Time Tracking Reporting	• Disposition decision to departure – AMU referrals.	Reporting data
Clinical	Dimension Reporting for Tracking	• New Attendances;	Reporting data
		• Arrived by Ambulance;	Reporting data
		• Triage Categories 1- 5;	Reporting data
		• Type of Patient – Paediatric, Older patients;	Reporting data
		• Returns – Scheduled, Unscheduled;	Reporting data
		• AMU GP Referrals;	Reporting data
		• AMU referrals from ED;	Reporting data
		• Referrals for admission/consultation;	Reporting data
		• Admissions through ED;	Reporting data

		• Clinical Decision Unit Admission;	Reporting data
		• Patients Referred but not Admitted;	Reporting data
		• Outcome – Discharged from ED, admitted CDU, admitted other hospital bed, transfer other hospital, died in ED, left before completion of treatment, discharged from ED.	Reporting data

Please identify which clinical programme you represent   Emergency Medicine

Please identify who is completing this analysis   Sinead O'Connor

14.7 People, Process, Information, Technology, Benefit analysis- Epilepsy Programme

Please complete the following table with your care programme in mind... outlining..
   1) Who you expect to be involved
   2) Which process you are seeking to improve
   3) What information you need to support that process
   4) What technology you might ideally have to support that process
   5) What benefit you expect from such information/technology support
   6) Which of these you would prioritise

People	Process	Information	Technology	Benefit	Priority
All	Access to IT	Log on details	Secure web-based Electronic Patient Record (EPR) to support the National Epilepsy Programme. Role-based access and audit trails to record who has accessed the EPR and what changes they have made to the record.	Improve quality, reduce risk; standardised documentation; standardised care; minimise geographic inequities in care; Save time, support business intelligence; efficient use of available and scarce health service resources – All of these benefits apply throughout the processes described in this table.	2
Administrative	Patient Registration on EPR	Patient Demographics	EPR interface to relevant patient administration system and/or alternative registration mechanism to EPR	Save time, reduce risk / improve quality	1
Clinical	Central referral to National Epilepsy Service	Standardised epilepsy relevant referral data	Web-based referral system –e.g. Neurolink/Healthlink system interfaced with epilepsy EPR	Save time, reduce risk / improve quality	4

Clinical	Clinical Encounters e.g. Outreach clinics such as Intellectual disability clinics and in primary care setting; out-patient service; in-patient services; VNS clinic; rapid access clinic;telephone advice line;	Current: Problems - Current care providers - Epilepsy Hx: semiology, classification; syndrome;aetiology - medications: current and past meds; sz response; side effects; reason for discontinuing; - allergies - Social history - Investigation results - Previous care: previous clinical encounters; surgery; previous emergency care; recent acute discharges - VNS history	Populate EPR with patients' key retrospective data. Capture data prospectively in EPR. Electronic messaging between EPR and primary care;	Save time, reduce risk / improve quality, capture data for key performance indicators.	3
Clinical	Support multi-disciplinary team meeting e.g. Epilepsy Surgery Review meeting	- Review & discuss patient Hx with aid of EPR - create surgical plan and add to EPR - MDT verify & save plan - Communicate information to relevant clinicians and to patient: document available from EPR	Relevant functionality in EPR	Improved documentation & recording of MDT; Improved quality of process; ready availability of information for MDT and subsequent communication to relevant clinicians and patients	5
Clinical	Diagnostics	Previous Results Create order Review order status	Electronic order entry Electronic results reporting Interface with EPR where possible and relevant	Save time; improved quality of care;	6

Clinical/Administrative	Communication with referring clinician	e.g. communicate care plan to GP with advice on on-going monitoring; discharge letters	EPR – functionality to generate message based on data updated in EPR during clinical encounter. Interface with electronic messaging system (e.g. Healthlink) to send care plan to GP.	Save time; more efficient use of available resources; support shared care.	7

Senior Clinicians/ Managers	Business intelligence: performance management and evaluation	efficient interrogation of data for population of epilepsy patients. Generate reports e.g. ➢ which patients have a particular epilepsy classification/syndrome ➢ which patients are on particular anti epilepsy drugs (AEDs) or a combination of AEDs ➢ what is the seizure response to particular AEDs for this population of patients ➢ which patients have experienced side effects associated with their AED therapy ➢ what side effects are experienced for given AEDs ➢ what is the range of epilepsy aetiologies for this population of patients ➢ what clinical investigations have been conducted for this population ➢ how long have patients been waiting for investigation (e.g. MRI) ➢ what is the ratio of new to return patients attending the out-patient clinic	EPR reporting and analysis tool	Perfomance monitoring; identify opportunity for improvement	1

All	Dashboard to support clinical workflow	Information to show if all tasks in a workflow have been completed by individual/groups of clinicians;	Relevant dashboard functionality in EPR	Improved quality; support to check completion of clinical tasks in relation to a patient care	1
Patient	Access to information to support self-management	Provide timely access to information such as investigation results, prescription renewal, reminders of upcoming appointments and access to other health related information	Patient relevant interface to EPR	Self-management programmes have been shown to improve patient outcomes in epilepsy	7

Please identify which clinical programme you represent   **EPILEPSY**

Please identify who is completing this analysis   **MARY FITZSIMONS – Beaumont Hospital**