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Eclair Case Study

Northern Region CDR

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Executive Summary

New Zealand may have worked out the best way to establish an electronic medical record that is useful for clinicians, beginning with the development of a regional clinical data repository (CDR) to provide easy access to laboratory results for hospital clinicians over a decade ago[1].

Before the appearance of enterprise-wide EMR vendors on the scene, New Zealand embraced a realistic attitude to implementing an electronic system for sharing patient records. Auckland health services were the pioneers, establishing an incremental, solution-based approach to IT adoption among the clinician base, using Sysmex's Eclair CDR. Today the northern region has achieved a regionally shared electronic patient record used by over 3000 clinicians daily, and containing over 3 million patient records.

The use of standards has contributed to the success of the comprehensive patient record - HL7, LOINC and a national health identifier system. There is a strong collaborative environment amongst health services and vendors, which has led to the achievement of a high degree of interoperability across essential clinical IT systems.

The system now integrates over 80 different sources of diagnostic data, building a complete clinical picture stored patient-centrically. Clinicians have secure access to a range of information, regardless of whether the data was collected in hospital or in the community. The response from clinicians has been overwhelmingly positive. A simple, but effective, consent model has been put in place to guard patients' confidentiality rights.

Problem Definition

The northern region of New Zealand's North Island is home to approximately 1.9 million people, over a third of the population of New Zealand. Four separate District Health Boards (DHBs) ensure provision of health and disability services to these people. The DHBs fund 13 large hospitals, five full-service diagnostic laboratories, five radiology clinics as well as numerous outpatient and community facilities.

Geographically, the northern region spreads from the Bombay Hills to Cape Reinga and patients often relocate around the region or are referred to another DHB for specialist services. Before the implementation of a CDR and electronic records, clinicians had to rely on paper records for all diagnostic information which was often untimely and/or incomplete. Laboratory tests and X-ray examinations were being unnecessarily repeated - an expensive and uncomfortable exercise for the DHBs and patients respectively.

Of particular concern were emergency situations where a patient might present at any of the region's facilities requiring rapid location of previous history and relevant diagnostic information - a near impossible task.

High Level Solution

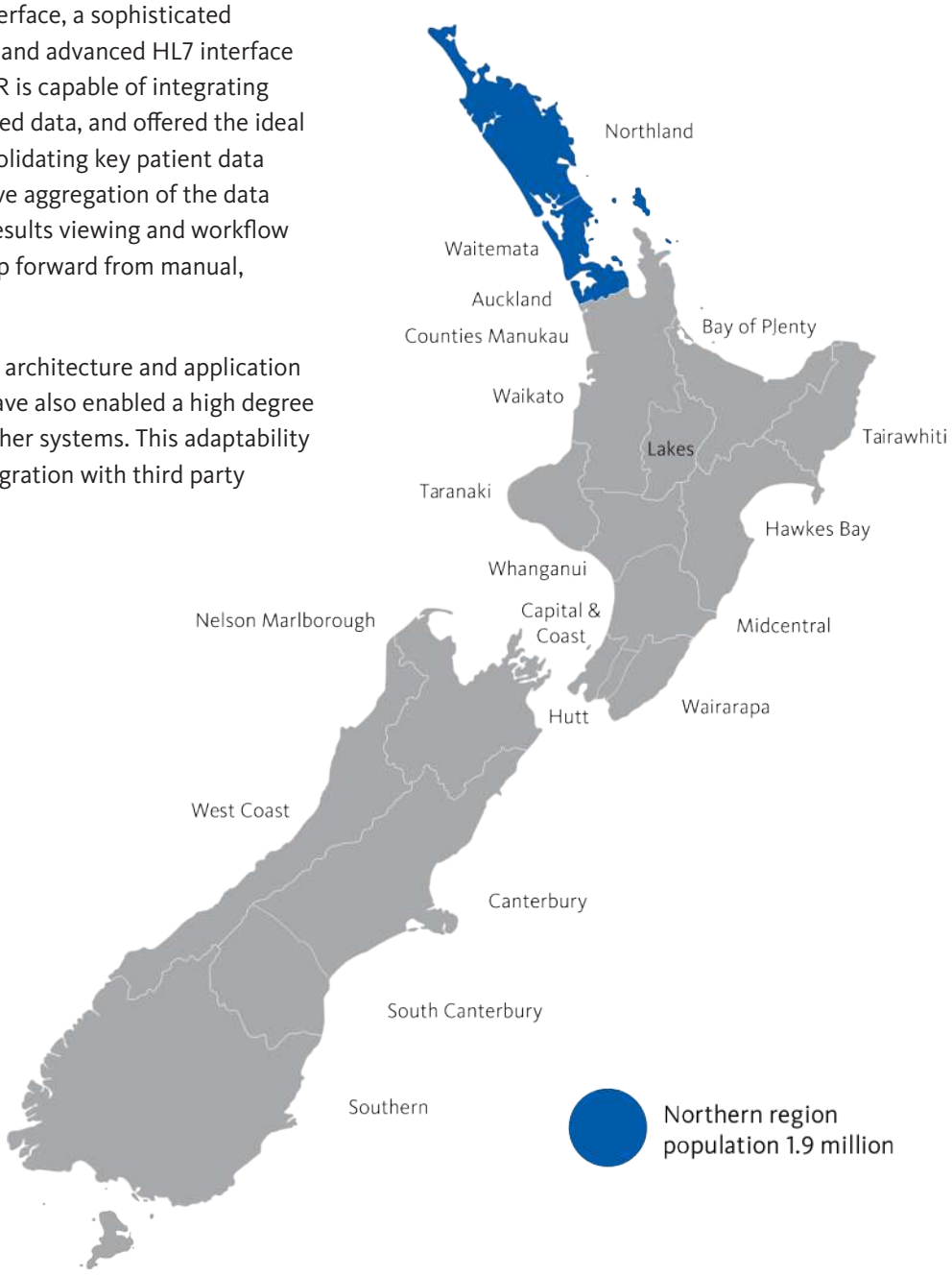
All patients in New Zealand have a unique identifier number, the National Health Index (NHI). Healthcare providers and facilities, whether in primary, secondary or tertiary care, also have a unique identifier known as the Health Practioner Index (HPI). These identifiers, combined with universal health coding systems such as LOINC and SNOMED, provide the basis for a comprehensive diagnostic record.

Additionally, HL7 messaging has been used for the electronic transfer of laboratory results in New Zealand since 1995, making it the ideal messaging standard.

Using these identifiers and coding systems, together with a web-based user interface, a sophisticated high-availability database and advanced HL7 interface capabilities; the Eclair CDR is capable of integrating structured and unstructured data, and offered the ideal way forward to start consolidating key patient data for the region. The effective aggregation of the data together with advanced results viewing and workflow tools was a significant step forward from manual, paper-based methods.

The underlying standards, architecture and application layers of the Eclair CDR have also enabled a high degree of interoperability with other systems. This adaptability has allowed seamless integration with third party systems as needed.

The northern region's Eclair CDR, TestSafe, integrates over 80 different sources of diagnostic data, holds over 3 million patient records and is used by over 3000 clinicians daily.



Solution Details

Many healthcare organisations in today's climate opt for a top-down policy, choosing to deploy a costly enterprise-wide system for patient records. The electronic systems in New Zealand have instead taken a best-of-breed approach, with significant success despite budget limitations. The northern region followed this strategy, implementing their shared Eclair CDR using a staged, clinician-driven, solution-based methodology.

Diagnostic results viewing and signoff

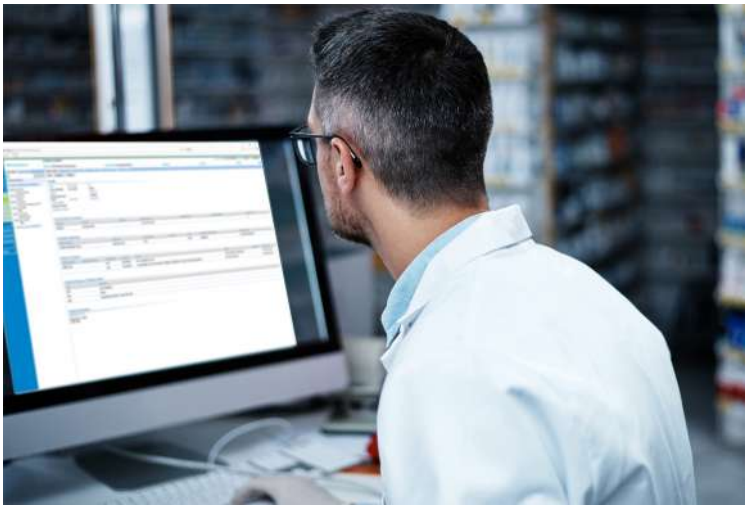
Laboratory data is known to make up a significant proportion of a patient's record and is often of relevance to clinical diagnosis. Starting with the laboratory data at Auckland's Middlemore Hospital, HL7 lab results (ORU) were sent to the CDR, enabling clinicians to easily review results from ward clinical workstations.

The addition of interfaces for HL7 ADT messages from the patient admission systems in each hospital ensured that patient encounter information in the CDR was updated in real-time. This enabled the introduction of electronic signoff of reports in the system, eliminating the need for paper lab report creation and manual delivery to the wards.

Following this initial success, laboratory data feeds from other hospital sites in the greater Auckland region were added to the CDR. The benefits of a consolidated view of laboratory results were clear to clinicians, who called for the addition of community laboratory data to the CDR. The accumulation of this data from different sources across primary and secondary care was enabled by LOINC coding, and created a unified view of a patient's laboratory result history. Variations in report test result reference ranges are supported with visual notification to the user.

The addition of interfaces between the CDR and the radiology information systems used by hospital and private providers allowed HL7 radiology reports to be sent to the CDR. Embedded hyperlinks in the reports allow seamless linking to picture archiving and communication system (PACS) imaging databases to retrieve clinical images associated with the report.

Replacing the paper signoff processes with electronic signout of diagnostic reports in Eclair was highly successful. To help support the signoff process, a Dashboard was developed in Eclair which displays the number of reports awaiting review and enables a 'click through' process for more efficient management of diagnostic report signoff.



Electronic order entry

With HL7 results in place, the next step for the Eclair CDR was the development of messaging interface capabilities to include HL7 order messages (ORM) from the clinical workstation for laboratory and radiology services, providing closed loop diagnostic test management.

The roll out of electronic ordering was first implemented for radiology tests at Auckland Hospital, following a patient safety project to ensure 100% acknowledgement of patient reports. During a review, hospital management teams had found that a number of diagnostic reports were not being reviewed in a timely manner, which, in some cases, had led to missed diagnoses, compromising patient safety. The Eclair eOrder solution included an electronic order entry user interface to capture essential clinical details and assignment of responsible clinician. It was enhanced by an escalation module which electronically reallocates reports for viewing and signoff when the system detects they have not been reviewed within the pre-determined timeframe.

Clinical IT and the hospital management teams were very satisfied with the change in workflow and positive outcomes, and the roll out of electronic ordering for both radiology and laboratory tests has continued in a staged approach across the region.

External laboratories

Frequently lab requests need to be sent away to external reference laboratories for specialist testing, for example molecular genetics, toxicology etc. When complete, the results for these tests can be reported directly to the northern region Eclair via HL7 from the external LIS. Where the lab's LIS does not support this, the laboratory has secure access to Eclair and the results are uploaded directly to the patient record as a PDF report. This eliminates the need for paper based reporting and transcribing results between systems.

Pharmacy dispensing data

The next phase of development for the Eclair CDR introduced HL7 clinical document architecture (CDA) XML standards. This enabled the CDR to receive structured dispensing messages from pharmacy systems; with the CDR now interfaced to nearly 400 pharmacies across the region. Benefits are realised in both inpatient and outpatient scenarios with hospital clinicians and pharmacists readily able to reconcile medications dispensed in the community when a patient is admitted, and community pharmacies becoming more involved in shared care of their patients with better access to the information they need.

Clinical documents

A wide range of unstructured clinical documents are sent to the CDR using encapsulated binary data via HL7. The clinical documents are from a range of sources including cardiology, gastroenterology, respiratory, urology, as well as discharge summaries, clinical letters and surgical documents from the region's secondary care facilities. These are stored and viewed as PDFs.

Clinical forms

The northern region DHBs have made extensive use of Eclair's Clinical Forms functionality, which enables a range of patient information and clinical data to be added directly to the record in Eclair. The use of Clinical Forms in Eclair has significantly reduced the need to capture and file this information in paper records. Examples include pre-admission assessment forms, point-of-care observations, nutrition assessment forms, community wound care as well as algorithms such as surgical risk and PE Wells DVT score.

Mobility

One of the next steps for the northern region CDR will be the implementation of Eclair Touch, which will provide mobile access to patient information stored in the regional CDR, assisting clinicians at the point-of-care and on the move.

eGrowth charts

Sysmex is also working with the northern region DHBs to implement electronic growth charts. These interactive, dynamic charts will allow healthcare providers such as paediatricians, physiologists, dieticians, midwives and neonatal nurse specialists to record patient growth data electronically and compare it against recognised WHO standards as well as the Tanis Fenton data set for premature neonates. The charts will be stored in the Eclair CDR forming part of a patient's medical record.

Cardiology request management and triaging

Request management for other diagnostic services such as cardiology is also underway. This will be supported by a Triaging module, which enables the receiving service to managing the request and prioritise the work appropriately while feeding back to the clinicians on the expected time frame for a patient's procedure.

Interoperability with third party systems

The underlying standards, architecture and application layers of the Eclair CDR have also enabled a high degree of interoperability with other systems. This adaptability has allowed the northern region to take a best-of-breed approach, integrating the regional CDR with third party systems as needed.

Examples of Eclair integration to third party systems (in the northern region and across other Eclair sites) include shared care planning (Whanau Tahi); primary care practice management systems (Houston, MedTech, MyPractice); clinical portals (Healthviews, Concerto); specialty systems, e.g. intensive care, and emergency.

A Community Perspective

Community based, registered healthcare providers in the northern region have access to the region's shared Eclair CDR via a secure web portal. Depending on who they are, community healthcare professionals with approved access can view either all, or a subset of the data contained in the CDR.[2]

GPs are the main group of community users. GP patient management systems, MedTech, MyPractice and Houston, all have inbuilt integration to the Eclair CDR. The implementation of single sign-on authentication through My Practice and MedTech has allowed GPs to view their patients' medical records in the Eclair CDR simply by clicking an icon within their PMS, without the need to log-in a second time.

Community pharmacists are another group that find considerable value in having access to the regional CDR. The ability to see what medications have been dispensed to a patient (in hospital or the community), in conjunction with relevant lab results and hospital discharge summaries, empowers pharmacists to provide patients with more comprehensive advice on their healthcare plan. It has also helped to prevent instances of prescription fraud.

Pharmacists can also add and view the results of any point-of-care-testing (POCT) they conduct. For example, some pharmacies now offer INR tests for patients on anti-coagulation medication. Pharmacists can upload the INR results via a direct interface to the Eclair CDR from the POCT device. This has enabled pharmacists to be closely involved in the patients' care, medication adherence and dosage management.

Private hospitals also access the shared CDR, providing them with a more complete medical history for their elective surgery patients.

The community user base has continued to expand, and now includes many ancillary care services such as school nurses, midwives, specialists, hospices, paramedics and rest homes. Giving rest homes access means visiting GPs can easily view the medical records of patients at the rest home, even if they are not within the GP's usual practice.

Throughout the community, the regional CDR has facilitated the sharing of patient information giving healthcare providers a more complete picture of their patients.

Benefits Outside the Regions

The shared regional CDR not only benefits patients who live in the northern region, but also patients from other parts of the country. Healthcare providers outside the region can be given access to view the medical records of their patients who have received care in the northern region, such as children who have travelled to Auckland for specialist treatment at Starship Children's Hospital.

Business Benefits

The journey to where the northern region Eclair CDR is today has seen a number of milestones achieved including:

HL7 reporting of lab and radiology results to the CDR across primary and seconday care

Clinical documents, discharge summaries and scanned records

Electronic report signoff and escalation with complete audit trail

Closed loop diagnostic test management for radiology and laboratory

Robust confidentiality model that allows patients to opt-off data types being sent to the CDR or restrict provider viewing

Primary care and community pharmacy access to patient records

Dispensing medication data from nearly 400 community pharmacies

Interfacing to 4 PAS across the northern region, updating the patient record in real-time

Key outcomes of the northern region Eclair CDR include:

Full HL7 electronic reporting and signoff

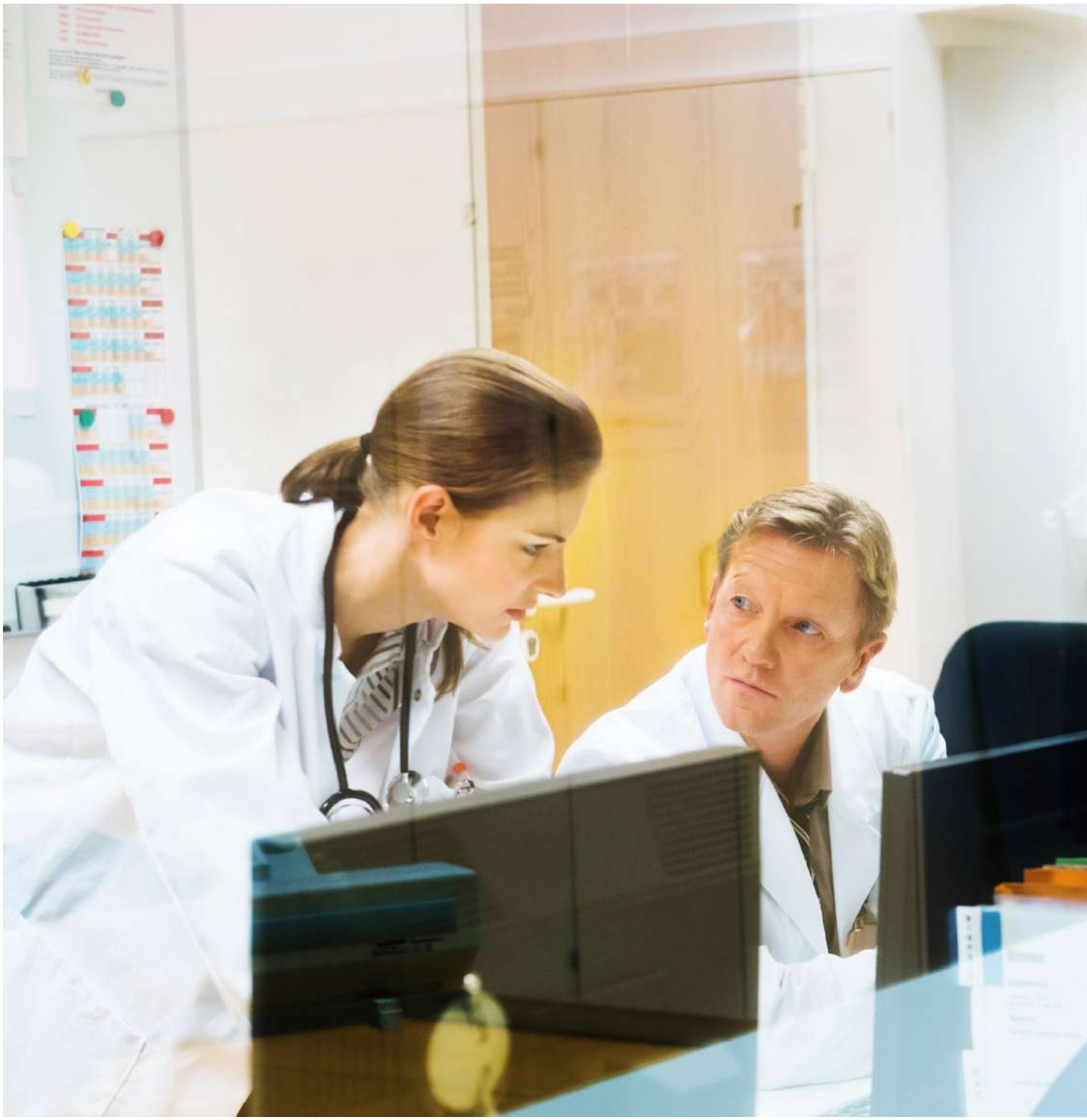
Over 80 sources of diagnostic data, making up a complete clinical picture

Audit reports and follow up of unacknowledged patient results

Current use levels across the region are reflected by 3000 unique clinical users accessing the system at peak time

Reduction on repeat testing and procedures between primary and secondary care and referrals within secondary care settings

Fig 1. Eclair data integration feeds and healthcare provider access across Northern Region



Summary

Sysmex has collaborated closely over the past ten years with the northern region of New Zealand to achieve a regional electronic clinical system shared amongst four DHBs and 13 hospitals, servicing a population of 1.9 million. The points outlined below are key to the success of the system, all of which have been achieved at a fraction of a cost of an enterprise-wide vendor.

CDR at the foundation

Underpinning the success of the regional electronic patient record is the use of industry standards and the Eclair CDR which was designed from the outset to readily integrate structured and unstructured data in a patient-centric manner.

Single patient record

Providing a single source of patient data improves communication across multiple providers and enables each organisation to rapidly respond to changes, deliver new clinical workflows and collaborate with other healthcare providers on shared patients.

Interoperability

The architecture of Eclair allows for a high degree of interoperability which has supported a best-of-breed approach integrating to existing third party systems, removing any need and associated expense of system 'pull and replace'.

Incremental approach

Instead of choosing to implement a system across the entire northern region to achieve a region-wide EMR through a top-down approach, the achievements have come about incrementally, building on each success.

Solution-based strategy

Each of the steps that were implemented in the roll-out and expansion of the Eclair system has come about as a solution to a real problem in manual and paper-based systems. Working closely with the healthcare organisations to gather requirements and design and test working solutions, verified the solution and enabled it to be replicated across other sites throughout the northern region and other health regions in New Zealand.

Patient confidentiality

A simple and pragmatic consent model has been put in place to guard patients' confidentiality rights using an opt-off model. Patients can choose to opt-off their entire record or restrict access to certain parts of their record by information type or provider. Under 1% have opted off.

Future Initiatives for Eclair

Sysmex is continuing to develop Eclair in response to clinical needs and advances in technology, guided by the New Zealand Ministry of Health's digital health strategy.

This strategy includes a focus on the introduction of electronic health records for all New Zealanders, the promotion of digital hospitals, as well as a move towards a regional approach to health information access - areas where the northern region Eclair CDR is already setting the standard.

With its electronic ordering capabilities, Eclair is helping hospitals to move away from paper-based test ordering processes towards closed loop diagnostic request and result management. The roll-out of eOrders continues to be a focus for the northern region and other Eclair sites around the country.

Demand for mobile healthcare applications is increasing, and Sysmex is expanding the Eclair Touch portfolio to incorporate new applications and further core Eclair functionality for results management, laboratory orders, clinical forms and collection management.

The future development of Eclair is underpinned by FHIR, which provides greater capabilities for interoperability between different clinical systems, facilitating the sharing of key health data. This will help ensure that Eclair can interoperate with third party systems as required to provide seamless access to patient information in alignment with the NZ Ministry of Health digital health strategy.

SNOMED CT diagnostic coding standards will be implemented in conjunction with the adoption framework set by the Ministry of Health.

The successful model set by the shared CDR in the northern region has become a template for roll-out in an additional two regions in New Zealand, with Sysmex's Eclair forming a key component of three out of four regional clinical systems across all of New Zealand.

References

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Eclair is not a medical device as it does not have a therapeutic purpose.