

# Diagnostic Imaging on Demand, Information Management Insights Based on Canadian DI/EHR Strategies

RS Bakalar, DL Whittick

IBM Business Consulting Services, Markham, Canada

## Abstract

*Diagnostics ON DEMAND is a Best Practice clinically focused framework for a digital collaborative jurisdictional infrastructure. It is based on a clinical vision of a cross jurisdictional patient centric longitudinal Diagnostic Imaging Electronic Health Record available to clinicians, on a need to know basis, at the point of patient care. The progression to a cross jurisdictional DI/EHR is a complex process which requires participation from a broad and diverse clinical, technical, administrative and executive stakeholder community. The authors have developed a DI on Demand Maturity framework to facilitate stakeholder collaboration and communication to support the progression towards a truly sustainable DI/EHR and DI on Demand.*

## 1. Introduction

Diagnostics on Demand is a best practice clinically focused framework for a digital collaborative jurisdictional infrastructure. When appropriately implemented, healthcare providers are empowered with actionable, time-sensitive, patient centric decision support capabilities. They can rapidly evaluate inter-departmental patient medical information to better leverage the digital multimedia infrastructure and add value across the entire continuum of care. Typically this integrated electronic collaboration would be implemented across a large public health region or an extended private health system network (i.e. a defined medical jurisdiction or community of practice). The intent is to support a heterogeneous technical environment including integrated Electronic Health Record (EHR) components including medical PACS, departmental Clinical Information System (CIS) and the Hospital Information System (HIS) environments.

Specifically, Diagnostics on Demand is a clinical framework which can support a medical vision of clinicians having secure access to diagnostic images and associated reports, within the context of the patient

Electronic Health Record, at the point of patient care across a defined medical jurisdiction (region, province or country). The foundation of Diagnostics on Demand is a longitudinal Diagnostic Imaging Electronic Health Record (DI/EHR), a patient-centric aggregation of images and reports acquired and reported from any health facility within the jurisdiction. A jurisdictional DI/EHR implies cross enterprise collaboration and information sharing supported by a secure DICOM/HL7 repository which contains DICOM images from hybrid or unique PACS and mini PACS platforms and HL7 interpretive reports from disparate RIS (or a CIS for specialities other than Radiology) and clinical reporting platforms associated with a unique patient identifier. This paper describes a forum to enable clinical, administrative and technical disciplines from enterprises within a jurisdiction to discuss methods, approaches, challenges and architecture to develop a DI/EHR strategy and a tactical migration plan.

## 2. Methods

Our methods include structured data analysis, clinical focus groups, consultation with the DI stakeholder community, including clinicians (radiologists, specialists, general practitioners, nurses, technologists), health care administrators, health records specialists, information management and technology specialists and architects, iterative technical architecture design. Insights from stakeholders from 4 representative Canadian jurisdiction have been reflected in the framework. Our methods also include global environmental scans to apply learnings from other DI/EHR initiatives. Our findings are based on multi-enterprise DI/EHR strategy and planning engagements in 4 Canadian jurisdictions.

## 3. Results

The achievement of a cross jurisdictional DI/EHR is based on a vision of film-less operations and the minimized need for transportable media (cd's and film) across the jurisdiction and enterprises within. It assumes

that access to images and reports will be available to all clinicians within clinical performance requirement parameters at the point of patient care, on a secure need to know basis. This implies that DICOM images and HL7 reports from all facilities who acquire and interpret images will be stored in a secure repository, associated with a unique patient identifier, and made available through a clinical software web viewer at the point of patient care. This necessitates redundant digital storage of images and reports at the enterprise and jurisdiction levels, ideally from DICOM compliant digital modalities.

The DI/EHR is enabled by integration and interoperability of electronic health information including, at minimum, Hospital Information Systems (HIS), Radiology Information Systems (RIS), Picture Archival and Communication System (PACS) and enterprise Master Patient Indexes (e-mpis) or unique patient identification by a composite view demographic cross reference tool. It also requires considerable multi-disciplinary collaboration from enterprises across the jurisdiction to determine requirements for data aggregation, adoption of industry standards and clinical usage guidelines of medical patient information.

Within a jurisdiction, many member health care enterprises may have substantial pre-existing investments in compliant digital modalities, HIS, RIS, PACS applications and supporting technical infrastructure. . Some of these member enterprises have a technical understanding of the many business practices of film-less operations and the challenges associated with migrating from film based to film-less operations at a departmental and enterprise level. Concurrently other member enterprises within the same jurisdiction may not have transitioned from film to film-less operations and therefore have less appreciation for the challenges ahead. Regardless of their film or film-less status, all enterprises within the jurisdiction who provide or request DI services on behalf of their patients need to collaborate, develop trust among service partners, standardize and develop an actionable business plan to create a sustainable DI/EHR. To facilitate consensus amongst clinical, technology, administrative and health care resources across jurisdictional enterprises a DI/EHR Maturity Spectrum framework has been created as a graphical representation of current state and progress.

The framework is based on a progressive intervallic scale of film to film-less stages which culminate, at the right end of the spectrum, in the jurisdictional DI/EHR as illustrated in Figure 1 DI/EHR Maturity Spectrum.

The spectrum modulates the departmental, enterprise, multi-enterprise and jurisdictional migration from transportable media to jurisdictional shared non-transportable media, accessible at the point of patient care, essentially enabling clinical Diagnostics on

Demand.

There are many considerations, however, which are paramount to migrating towards a jurisdictional longitudinal patient based DI/EHR. The relative film-less maturity of a department or enterprise will contribute significantly to its understanding of the opportunities and barriers to the DI/EHR migration. To provide a common forum for enterprises within the jurisdiction to develop a common DI/EHR strategy and plan the most significant transformation domains have been identified within the context of the spectrum, resulting in a DI/EHR strategy and planning framework, as illustrated in Figure 2, DI/EHR Maturity Spectrum with associated attribute domains. The attribute domains include Image Acquisition, Collaborative Framework (governance), Data Accountability, Service Level Agreements, DI Workflow and Presentation, HIS/RIS/PACS, e-health info-structure, patient identification, networks, infrastructure and redundancy. This framework is used to identify challenges and barriers at critical intersection points, in each domain, often illustrating the need for cross organization collaboration, integration and interoperability. It also helps stakeholders identify where Jurisdictional standards, guidelines, architecture and recommendations are required within each of domain to progress towards a truly sustainable DI/EHR.

The spectrum is used to highlight the considerations within and amongst enterprises for progressing through intervals to the right end of the spectrum, the DI/EHR. The purpose of the spectrum is to promote multi disciplinary, multi enterprise understanding and collaboration across a jurisdiction. Should an enterprise be positioned at the left end of the spectrum (mini-PACS or departmental PACS) and another enterprise be positioned towards the right end of the spectrum at collaborative DI, it is possible to quickly identify the points at which enterprises will intersect on many levels concurrently, including clinical, technical, administrative, health records and information management solutions. Each domain has specific considerations

#### **4. Discussion and conclusions**

This maturity spectrum has successfully been used in many capacities to facilitate jurisdictional DI/EHR strategy, a time-stamped frame of reference and tactical planning exercises. It has been used to plot the relative maturity of an enterprise and to identify intersection points, challenges and barriers. More importantly it has provided a forum to develop a common understanding of priorities and challenges associated with moving from a departmental or enterprise film-less state to a collaborative jurisdictional DI/EHR.

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Address for correspondence

DL Whittick

3600 Steeles Avenue, Markham, Ontario, Canada

[dwhittic@ca.ibm.com](mailto:dwhittic@ca.ibm.com)

Figure 1 – DI Maturity Spectrum

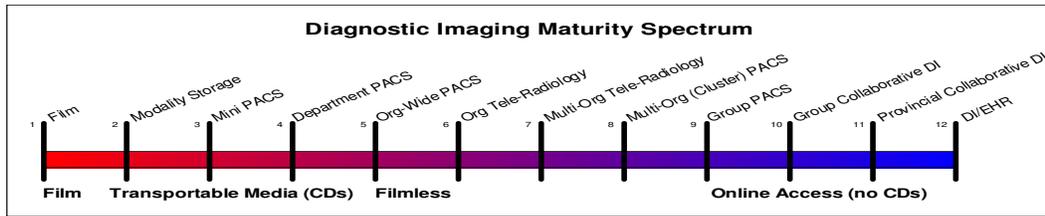


Figure 2 – DI Maturity Spectrum Domains

