

# E-health Leads Nova Scotia's Healthcare Transformation

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## Introduction

Nova Scotia's healthcare policy direction seems well-defined and well-established for the foreseeable future. This is the case, despite the recent electoral transition from a Progressive Conservative to a New Democratic Party government for the first time in the province's history; and despite the threat of the province's net direct debt increasing through 2012, after eight years of declining net direct debt as a percentage of the province's gross domestic product. As well, little public consideration is being given to disrupting the current regional healthcare organizational structure by further consolidating the province's nine district health authorities (DHA), as occurred last year in Alberta and New Brunswick. Moreover, the Health Information Technology Services Program of Nova Scotia (HITS-NS), the province's shared IT services or provincial service delivery organization, is steadily expanding the inventory of clinical, financial, and administrative software applications hosted for eight DHAs on a common Meditech Client-Server platform, as well as some applications for Capital Health DHA 9 (CDHA) and IWK Health Centre (IWK), the province's consolidated women's and children's hospital located in Halifax.

The most significant sign of agreement among Nova Scotia's healthcare stakeholders on moving provincial healthcare towards

a paperless clinical e-health environment is the recent appointment of a Chief Information and Health Transformation Officer (CIHTO) within the Department of Health. The new CIHTO, Sandra Cascadden, will oversee the implementation of 103 recommendations for change that emerged from the first-ever Provincial Health Services Operational Review (PHSOR), which was completed in December 2007 by the Corpus Sanchez International Consultancy (PHSOR 2007). Preeminent among 12 priority initiatives for health transformation is the effort to elaborate and implement a new Model of Care Initiative in Nova Scotia (MOCINS). Focusing on the acute care inpatient environment, the MOCINS strategy group has unveiled a "provincial collaborative care model that is patient-centered, high quality, safe, and cost-effective." (Health Transformation Update 2009). Four change levers are being implemented to transform care delivery in 14 showcase units across all nine DHAs and IWK:

- Making best use of people or providers and their talents to secure the highest standards of care delivery;
- Implementing processes that are clear, well-understood and enable team work;
- Accessing information that supports care delivery, research

and academic mandates;

- Utilizing modern technology to provide safe and timely care (Health Transformation Update 2009).

Expansion and integration of Nova Scotia's electronic health-care environment has matured to the point that the transformation envisioned by MOCINS is being implemented through the smooth, on-going functioning of the Nova Scotia Hospital Information System (NSHIS), the three-year-old foundation of a provincial electronic health record (EHR), whose operations are supported by HITS-NS (NSHIS 2009). In addition to hosting a suite of clinical and some financial/administrative applications, HITS-NS has operational oversight of, among other services, the province's Picture Archiving and Communications Systems (PACS), Primary Healthcare Information Management (PHIM) systems and TeleHealth video-conferencing, as well as the patient and client registries of the province's electronic master person index (EMPI), which operates with Initiate Systems' Initiate Identity Hub product.

From its inception, HITS-NS had an advantage over similar service delivery organizations in other provinces (such as the Health Information Solutions Centre in Saskatchewan or Manitoba eHealth), that are also moving towards hosting province-wide clinical applications. Eight of Nova Scotia's nine DHAs had previously adopted Meditech's Client Server suite of clinical applications. Only CDHA had adopted a best of breed approach to clinical solutions that does not include Meditech products. Even IWK operates on a Meditech platform, albeit with Magic products. Given the extensive commonality of vendor solutions among Nova Scotia's DHAs, it is not surprising that HITS-NS has progressed quickly since 2006 to developing the essential components of a province-wide EHR through hosting the ancillary applications of laboratory, pharmacy and radiology, as well as PACS and order entry.

### **Challenges and Promises of E-health in Nova Scotia**

Nova Scotia's journey to a paperless electronic medical record (EMR) acute care environment – or electronic patient record (EPR) in Canadian terms – with its promise of transforming healthcare delivery in accordance with the province's new collaborative care model, is not without its pitfalls. Most of Nova Scotia's E-Health challenges will sound all-too-familiar to healthcare stakeholders across Canada and the United States:

- The high cost of implementing a comprehensive clinical suite – including nursing documentation, bedside medication verification, and computerized physician order entry (CPOE) – required to secure province-wide compliance with evidence-based medicine protocols and point-of-care patient safety processes;

- The lack of sufficient incentives to persuade the physician community that the use of CPOE is worth their investment of time and effort;
- The high cost of time and money to affect the work flow process changes required to realize the patient clinical and safety benefits from more advanced e-health applications beyond the rudimentary use of order entry and ancillary applications (e.g., laboratory, pharmacy, and radiology);
- Nova Scotia healthcare stakeholders continue to be concerned about whether ongoing e-health progress at collecting and sharing patient data will erode patient information privacy protections. This is a particularly sensitive issue in the area of mental health.

In the wake of the current economic downturn and recent provincial election results, the funding issue is extremely critical for Nova Scotia's healthcare future. From 2005 through 2009, provincial healthcare expenses, the largest budget item by more than twice as much as education expenses, have ranged from 37.3% to 38.6% of the provincial budget. But, for 2009–2010, healthcare expenses are estimated to grow to 40 or 41% of the provincial budget (Nova Scotia Finance 2009).

The previous Progressive Conservative government's own estimate of revenues for 2009–2010 falls short of meeting estimated government expenses for the current fiscal year by approximately \$469.2 million (Nova Scotia Finance 2009). Given Ottawa's recent announcement of a greater shortfall in 2009–2010 federal revenues than expected, Nova Scotia cannot expect federal transfer payments to offset any provincial shortfall. A recent review of the province's fiscal picture concluded that, for 2010–2011, approximately \$809 million in expenses would need to be cut in order to achieve a balanced budget (MacDonald 2009). The new NDP government will present a new budget in early October that is expected to largely adhere to the original budget proposed by the out-going Progressive Conservative government, which means that for 2009–2010, the healthcare budget will most likely remain intact. The question is: what happens to the healthcare budget after 2010 if provincial and federal revenues do not rebound?

At the same time, despite the looming threat of deficit budgets, increasing net direct debt, budget expense reductions in healthcare spending, or all of the above, there is good news about long-familiar challenges that, though still powerful in other provinces, no longer seriously impede e-health progress in Nova Scotia:

- Nova Scotia's nurses are generally more amenable to embracing electronic nursing documentation and bedside medication verification solutions than their counterparts in other provinces, given the favourable experience of their nursing colleagues with the Meditech Patient Care System

module already implemented in the Cape Breton DHA 8 and Guysborough Antigonish Strait Health Authority DHA 7.

- Nova Scotia's patients, physicians, and nurses are now able to document how the province's centrally hosted PACS – including 10 PACS modules that are live and operational at the majority of DHAs – has fostered more accurate clinical diagnosis and reduced unnecessary and costly patient transfers. This favourable experience with PACS has persuaded the province's healthcare stakeholders that recent improvements in personal healthcare, which are directly related to the province-wide availability of PACS, is a credible return on investment (ROI) for the province's expenditures in electronic healthcare applications.
- The most recent results of the HIMSS Analytics Information and Communications Technology (ICT) 2008 Short Study of Nova Scotia's nine DHAs, IWK Health Centre and their combined 34 acute care facilities, which produced EMR Adoption Model<sup>SM</sup> (EMRAM) scores ranging, on a scale of 0 to 7, between 3.1320 for eight facilities on the high end and 2.0550 for three facilities on the low end. The mean Nova Scotia EMRAM score for 2008 was approximately 2.3492, compared to the mean score of 1.2137 for all other provinces.<sup>1</sup>

### Nova Scotia and Preliminary HIMSS Analytics' EMR Adoption Model Scores

What is the HIMSS Analytics EMRAM score, and why is it important to organizations seeking to improve their e-health clinical capabilities for the sake of advancing patient health and safety outcomes?

As we noted in an earlier Longwoods ElectronicHealthcare column (Powers 2008), Canadian regional organizations and their hospitals, which complete the annual HIMSS Analytics ICT Study, have easy web-based access to combined 76 benchmarking reports, including 47 at the hospital level and 29 at

#### US EMR Adoption Model<sup>SM</sup> Trends Q1 – Q2 2009

Stage	Cumulative Capacities	Q1 2009	Q2 2009
Stage 7	Medical record fully electronic; HCO able to contribute CCD as byproduct of EMR; data warehousing in use	0.3%	0.3%
Stage 6	Physician documentation (structured templates), full CDSS (variance and compliance), full R-PACS	0.8%	1.0%
Stage 5	Closed loop medication administration	3.6%	4.5%
Stage 4	CPOE, CDSS (clinical protocols)	2.8%	3.6%
Stage 3	Clinical documentation (flow sheets), CDSS (error checking), PACS available outside radiology	37.0%	38.4%
Stage 2	CDR, CMV, CDSS inference engine, may have document imaging	32.1%	31.6%
Stage 1	Ancillaries – lab, rad, pharmacy – all installed	9.0%	7.2%
Stage 0	All three ancillaries not installed	14.5%	13.4%

CCD = Continuity of Care Document; CDR = Clinical Data Repository; CDSS = Clinical Decision Support System; CMV = Controlled Medical Vocabulary; CPOE = computerized practitioner order entry; EMR = electronic medical record; HCO = Health Care Organization; Lab = laboratory; Rad = radiology; R-PACS = Radiology – Picture Archiving and Communications System; Q1 = first quarter.  
Source: Data from HIMSS Analytics<sup>SM</sup> Database. N=5170/5167 © HIMSS Analytics

the regional level. Each of these reports allows them to compare their organization against 10 de-identified peers selected on the basis of 33 hospital or 13 regional factors, including bed size, adjusted patient days, facility type, total operating expense, system installed, location, etc. Benchmarking comparisons include IS department operating statistics such as full-time equivalents, operating budget and salary expense.

The most important benchmarking comparisons are based on a healthcare organization's EMRAM score, which benchmarks its progress at implementing a fully paperless EMR or EPR acute care environment.

The EMRAM Score measures levels of EMR or EPR acute care capabilities ranging from limited ancillary department systems to a fully electronic environment on a continuum of eight stages from zero to seven. The seventh stage is a paperless EMR/EPR environment that supports data sharing, data analysis, and the continuity of electronic patient data between the hospital and emergency department and ambulatory clinic settings. At this stage, clinical information can be readily shared via electronic transactions or exchange of electronic records within a health information exchange, including other healthcare organizations, government entities, and patients in the United States.

<sup>1</sup> For a full description of the EMRAM score, see: HIMSS Analytics <EMR Adoption Model: <[http://www.himssanalytics.org/hc\\_providers/emr\\_adoption.asp](http://www.himssanalytics.org/hc_providers/emr_adoption.asp)>.

The methodology and algorithms of the EMRAM Score, which are currently used to automatically score more than 5,000 hospitals in the US database, are now being employed to score those Canadian acute care facilities participating in the 2008 and 2009 Canada ICT Studies. Of the 76 benchmarking reports mentioned above that are freely available to participating regional healthcare organizations and their hospitals, 33 compare their EMRAM scores to factors such as IS Department Operating Budget, Nurse FTEs, IS Department FTEs, and other hospitals' EMRAM scores.

### **HIMSS Analytics' 2008 EMRAM Scores and DHAs 1-8**

Nova Scotia owes its middle-range 2008 EMRAM scores, which are currently among the highest in Canada, largely to HITS-Nova Scotia's hosting of an extensive Meditech Client Server-based clinical applications suite across eight of nine DHAs comprising 28 of the province's 34 acute care facilities and 1,457 of 2,755 combined inpatient beds. Meditech's laboratory and radiology information systems, and pharmacy management system (as well as laboratory's anatomical pathology, blood bank and microbiology modules) are live and operational at all facilities in the eight DHAs (Stage One).<sup>2</sup>

DHA 1 – South Shore Health (3 hospitals/113 beds)  
 DHA 2 – South West Health (3 hospitals/142 beds)  
 DHA 3 – Annapolis Valley Health (3 hospitals/163 beds)  
 DHA 4 – Colchester East Hants Health Authority  
 (2 hospitals/125 beds)  
 DHA 5 – Cumberland Health Authority  
 (3 hospitals/84 beds)  
 DHA 6 – Pictou County Health Authority  
 (1 hospital/105 beds)  
 DHA 7 – Guysborough Antigonish Strait Health  
 Authority (5 hospitals/116 beds)  
 DHA 8 – Cape Breton District Health Authority  
 (8 hospitals/609 beds)

Source: HIMSS Analytics 2008 ICT Study

As for Stage Two, Meditech's major ancillary systems feed patient data to a clinical data repository (CDR), which provides provider access for retrieving and reviewing results. Some elements of a controlled medical vocabulary (CMV) do exist within the Meditech CDR. Meditech's laboratory and pharmacy modules contain components of CDSS, though it seems that they are not active at most facilities in the eight DHAs.

Stage Three has not been achieved for most functions by

most Nova Scotia DHAs and their facilities, which requires clinical documentation to be live and operational, CDSS to be employed for error checking; and some level of PACS to be available to physicians outside the radiology department via the DHA's intranet or other secure networks. Physicians in all eight DHAs have access to PACS images via the internet inside, as well as outside, the hospital, if they are accredited at a Nova Scotia acute care facility. Elements of a CDSS are embedded in Meditech's order entry module, which are live and operational at all facilities in the eight DHAs. But, the nursing documentation module of Meditech's Client Server-based Patient Care System is only live and operational at eight of 28 facilities in DHAs 1-8: St. Martha's Regional Hospital in Guysborough Antigonish Straits DHA 7; and seven of eight hospitals in Cape Breton DHA 8. There are currently no plans to bring up Meditech's nursing documentation module at other facilities in DHAs 1-6 due to lack of funding, though some DHAs are actively seeking future implementation of nursing documentation.

Stage Four of the EMRAM Score focuses on the implementation of computerized practitioner/physician order entry (CPOE) above the existing nursing and CDR environment. Because the province does not own Meditech's Physician Care Manager Module, HITS-NS does not currently host a CPOE solution for DHAs 1-8. Additionally, neither DHA 9 nor IWK report that CPOE is live and operational or that they have plans to install this clinical application any time soon.

Stage Five requires adherence to two conditions that maximize point of care patient safety processes for medication administration. First, the organization must implement a closed loop electronic medication administration record (eMAR) environment in at least one patient care service area. Second, the eMAR and auto-identification technology (bar coding, etc.) must be integrated with CPOE and pharmacy. HITS-NS does not host Meditech's Bedside Medication Verification product for the eight Meditech Client Server DHAs. As discussed below, only Capital Health DHA 9 and IWK have an eMAR live and operational as either a self-developed or an internally-hosted Meditech Magic solution, respectively.

Stage Six involves physician documentation through the use of structured templates in at least one patient care service area; and a full complement of PACS systems for radiology services rendered. DHAs 1-8 have come far in implementing a range of radiology PACS modules. However, until the DHAs, or some of their major hospitals, operating on Meditech Client Server products, implement CPOE, or Physician Care Manager in the Meditech environment, most of Nova Scotia healthcare will not progress further through Stages Five and Six to the last Stage Seven of an entirely paperless EMR/EPR environment.

<sup>2</sup> Information and data on DHAs 1-8's clinical software applications is based on the HIMSS Analytics 2008 ICT Study and follow-up communication.

## Capital District Health Authority and IWK Health Centre

Capital District Health Authority in Halifax, which is home to Dalhousie Medical School, is comprised of five acute care facilities including Queen Elizabeth II Health Sciences Center, the province's leading academic medical centre. Unlike the other largely rural DHAs, which preferred a single vendor solution for all clinical applications to accommodate more primary and secondary healthcare needs, early on CDHA adopted a best of breed approach to serving a more complex mix of tertiary and referral care, as well as clinical trials and medical research.

CDHA's clinical solutions showcase many of the leading clinical vendors of the day. McKesson provides the CDR and operating room modules.<sup>3</sup> iSoft supplies the emergency department information system. Cerner contributes intensive care and the laboratory and radiology information systems. GE Healthcare's Centricity is Capital's pharmacy management system product. Agfa Healthcare operates Capital's RIS PACS modules. TomCat Systems provides the cardiology information system, while Philips Healthcare covers various cardiology PACS modules. Finally, CDHA is one of only two Nova Scotia organizations offering a live and operational eMAR (the other being IWK), which is a self-developed product.

DHA 9 – Capital District Health Authority  
(5 hospitals/1,010 beds)  
IWK Health Centre (1 hospital/288 beds)

Source: HIMSS Analytics 2008 ICT Study

Despite, or because of, its diverse clinical solutions, CDHA's EMRAM score is just above Stage Two. Neither order entry, including order communications and results reporting, nor CDSS are yet live and operational. Nor are CPOE and nursing documentation live and operational at CDHA. Until order entry is live and operational, and the first level of clinician decision support is implemented to conduct error checking with order entry, not to mention clinical documentation installed and integrated with the CDR for at least one service in the hospital, Capital Health is stalled in its efforts to advance to Stage Three on the way to the paperless EMR environment of Stage Seven.

IWK Health Centre's approach to clinical information applications is akin to that of DHAs 1–8, as it has largely adopted a Meditech platform for the Women's & Children's

Hospital.<sup>4</sup> Unlike the DHAs, however, IWK hosts most of its own applications. The exceptions are IWK's radiology information system, radiology and cardiology PACS and EMPI, which are hosted by HITS-NS. EMRAM-relevant applications that are live and operational at IWK, which are all Meditech Magic products, include the laboratory and radiology information systems, pharmacy management system, CDR, order entry and eMAR. As well, IWK has implemented a self-developed nursing documentation and staffing/scheduling system. Siemens Healthcare provides IWK with radiology and cardiology PACS, as well as its cardiology information system. To date, CDSS and CPOE are not automated. IWK's mixture of live and operational with not automated clinical applications accounts for its 2008 EMRAM score of 2.1460. IWK has moved beyond Stage Two with its ancillary clinical systems and CDR fully installed and entered Stage Three with clinical documentation via a self-developed nursing documentation system. There are even elements of Stage Five in place, with the eMAR capabilities of Meditech's Bedside Medication Verification product and use of auto-identification technology, such as bar coding. But the challenge facing IWK is to implement CDSS, which, in tandem with CPOE, allows for error checking and relies on evidence-based medicine protocols (Stage Four).

## Conclusion

Nova Scotia is ahead of many other provinces on the journey to an integrated paperless EMR/EPR acute care environment within and across all regional health authorities and their acute care facilities. By virtue of extensive Meditech implementations, nine DHAs and IWK have implemented laboratory, pharmacy, and radiology information systems. CDHA also has its own suite of ancillary applications in place. A largely common suite of PACS is also live and operational at all acute care facilities in all 10 healthcare entities. Electronic order entry is in place in eight DHAs and IWK, with its implementation projected for DHA 9. Some rudimentary elements of CDSS are operational in eight DHAs.

Going forward, three major challenges face Nova Scotia's efforts to realize a greater ROI for electronic healthcare. First, CDHA – the province's largest healthcare market with more than 30% of its population, 50% of its acute care bed capacity and its leading academic medical centre – has much work ahead to expand and integrate its electronic clinical capabilities in order entry, CDSS and nursing documentation. Second, as Nova Scotia's leading healthcare organization, CDHA's clinical systems must eventually be well-interfaced with those of the other DHAs and IWK, before the province can move effectively

<sup>3</sup> Information and data on CDHA's clinical software applications is based on the HIMSS Analytics 2008 ICT Study and follow-up communication.

<sup>4</sup> Information and data on IWK Health Centre's clinical software applications is based on the HIMSS Analytics 2008 ICT Study and follow-up communication.

towards its goal of transforming healthcare by implementing a provincial collaborative care model for the acute environment that relies on an interoperable EHR. Finally, since Nova Scotia's Model of Care Initiative is clearly centred on the patient and the family, a top e-health priority has to be investment in those clinical systems that work in tandem to promote patient health and protect patient safety. Sooner or later, Nova Scotia will have to move to implementing CPOE, which is a major clinical step towards advancing patient health and safety. Just as the right mix of incentives previously persuaded the province's nurses that the ROI of using nursing documentation was worth their effort, so too Nova Scotia will have to find the right incentives persuading physicians to transform their clinical work processes by embracing CPOE for the sake of Nova Scotia's patients and their families. **EH**

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