Good afternoon.

Before coming on this trip, I didn’t know a huge amount about Russia. I knew you had an amazing national anthem. I knew you were almost as good at hockey as Canada is. But I didn’t know much about how healthcare worked here, though I was pretty sure that we had more in common than the Canada does with our U.S. neighbor. We both have relatively low populations for our size. We both have government funded healthcare plus some private healthcare. And we both have a set of regions with some degree of autonomy.

I’m going to start by providing some background and history about healthcare interoperability in Canada. Then I’m going to share some insights about what Canada’s been doing around FHIR so far and where it seems likely to be going in the near-future. Finally, I’ll talk about some of the other business cases countries have developed around FHIR.

In Canada’s case, while healthcare is mostly funded by the federal government, delivery is managed by each province and territory individually. Some of them further subdivide that responsibility over a set of regional healthcare authorities. Each authority makes the decisions about what IT systems are purchased and what interfaces will be provided. In addition to the varying systems of our 10 provinces and 3 territories, the federal government has responsibility for the healthcare of certain individuals, including indigenous Canadians, the military, RCMP and federal prisoners. So we essentially have 14 independent healthcare systems in the country, with a small amount of supplementation by private healthcare.

About 15 years ago, there was a significant push towards electronic health records. The provinces and territories agreed to divert some of the funding that would normally come to them into a new organization called Canada Health Infoway. The mandate for the organization was to design the architecture and standards for a provincially managed, interoperable electronic health record and then fund provinces and territories to get it up and running.

Obviously FHIR didn’t exist yet. The glowing newcomer at that point was HL7 version 3. And that’s what Infoway promoted. I helped. I was deeply involved in creating many of the national standards, doing training, etc. V3 wasn’t terribly popular with implementers, but the provinces were spending significant money and some of them were using regulation and reimbursement rules to essentially force implementation. Overall, the country spent over $2 billion. (Around 40 billion Rubles.)

Most of that work was completed about 5 years ago, so just as FHIR was starting to be developed. At that point, our environment was a mixture of standards. Hospitals used HL7 v2 internally and sometimes to share lab data. Most of the provinces had HL7 v3 based client registries, imaging repositories. Some of them v3-based e-prescribing systems. A few had patient-accessible portals sharing other information. However, very few of those systems could talk to each other. And we’re now in a place where Canada is one of the few v3 adopters in the world (the Netherlands and the UK are the other big ones) and there is little support any more in terms of tooling or interest in HL7 international.

The jurisdiction that managed to accomplish the least in terms of setting up an electronic health record was our largest province – Ontario. They had numerous political scandals, went through a few different reorganizations and managed to spend tens of millions of dollars without a whole lot to show for it.

Oddly enough that made them one of the first areas in Canada to adopt FHIR. Much of the rest of the country was feeling pretty warn out when it came to standards implementation. Everyone had spent a lot of time and money getting systems into place. And while those systems weren’t necessarily delivering all the interoperability we’d hoped for, they were too new to consider replacing. In Ontario, though, they had the benefit of seeing what had worked – or not – with other provinces implementations. FHIR was attractive because it was easier, and it avoided some of the compatibility issues with v3. Also, unlike v3, implementers actually \*liked\* using FHIR.

Overall, Canada is behind the U.S. and several other countries in terms of FHIR adoption. We’d recently tried the new HL7 ‘thing’ and it hadn’t gone well, so there weren’t a lot of eager early-adopters. That said, FHIR is now starting to grow.

Canadian implementations

In some ways, Canada was an early adopter of FHIR. Of the three initial project leads, we had Grahame from Australia, Ewout from the Netherlands and me from Canada. James Agnew, another Canadian built a new version of HAPI (which previously only supported HL7 v2) to add FHIR capabilities within the first year of FHIR’s creation. However, no implementations of FHIR happened in Canada until about 2 .5 years ago, perhaps triggered by our first FHIR-related Canadian conference – FHIR North

The vast majority of Canadian FHIR implementations thus far are in Ontario. The first implementation I’m aware of – in production for about 2.5 years is in the Immunization space. It includes ability for systems to submit immunization records as well as query for immunization record. It also allows sharing FHIR immunizations on paper using FHIR a JSON encoded 2D barcode. The driver there was a desire for something to work well with mobile applications to be consumer friendly. There was also a desire for something that would work on mobile tablets for public health nurses performing immunizations out in the community.

This was the “proof of concept” project for Ontario. The speed with which they were able to develop the specification, implement the provincial side of things and get other implementers to adopt drove the initiation of numerous other provincial projects

https://www.ehealthontario.on.ca/en/standards/view/digital-health-immunization-repository-specification-fhir

A commercially-developed FHIR messaging ePrescribing effort went live about 1.5 years ago. This was the first non-government-initiated project The driver there was to find something that would be easy enough to implement that pharmacy and physician vendors would actually implement. Many jurisdictions had rolled out v3 pharmacy implementations to track prescriptions and dispensing, but they got very limited uptake except in jurisdictions that mandated adoption (and for political reasons, that was difficult to do in Ontario). The product subsequently got adopted in a second province and may be picked up in others.

Other initiatives have merged legacy technologies with FHIR. Ontario lab results are still delivered to clinical systems using HL7 v2. However, they’re available to registered consumer applications using FHIR. Health reports and birth registry information are delivered to provider systems as CDA documents over XDS, but the data is made available to consumer apps as DocumentReference instances and PDFs using FHIR.

On the registry side of things, Ontario has designed and tested FHIR interfaces for both their provider and client registries, but has not put them into production, in part because it’s not yet sure what client systems will want to make use of them.

Systems for patient-based OAuth services, consent and eReferrals are also in development.

On a national basis, the government agency responsible for capturing healthcare statistics has begun rolling out a Questionnaire-based interface for gathering discharge, adverse event and other information.

Other jurisdictions are starting to take notice and some have been exploring FHIR-based documents as well as participating in FHIR-based calls

We now have 5 different working groups having calls ever 2 weeks on different topics including tooling, architecture, SMART & CDS Hooks, registries and eReferrals. Each has active participation and are trying to lay the groundwork for greater FHIR use in Canada.

We’ve also held yearly 1-day conferences about FHIR in an attempt to spread the word, provide training and give implementers a chance to try it out – much the same as FHIR Starter is doing here. FHIR North has grown significantly over time and we’re looking at moving to having two conferences a year.

So, what are some of the lessons we can learn about “Why FHIR?” from the Canadian experience?

One of the main attractive features of FHIR is its friendliness to mobile solutions. REST and JSON are a natural fit for interfaces designed for the web or for mobile devices. The resources themselves are relatively light-weight. There’s no need to package up large collections in order to be able to share. We also have APIs for Swift and Java that get implementers up and running quickly and documentation that’s more aligned with how mobile developers expect things to work.

Another appealing aspect of FHIR is that it’s easy to get solutions up and running. A key part of that is that the interfaces themselves are generic. There’s no need to define what the operations are or how they work, merely a need to choose which operations you want to support. It also means that a single interface can be used for multiple purposes. The interface used to expose information to clinicians might later also be used to expose relevant information to insurers. All you need to do is define the authorization rules for what that user is allowed to see.

Almost all of the Canadian implementations are taking advantage of the profiling and implementation guide capabilities FHIR offers. Several of them are using the reference implementation validation capabilities as part of their runtime processes to check that inbound content meets their business rules. The ability to validate examples and generate a rendered specification that exactly matches internal validation rules is very helpful. And the tools to support authoring profiles and implementation guides continue to get better.

Canada has moderate implementation of CDA. Several jurisdictions are looking at FHIR documents as a more implementer-friendly way of sharing documents. The data structures are easier to understand and the software APIs to manipulate resources make it easier for implementers to get started. It’s also attractive to know that the data structures used for document interfaces can also be used with other messaging and RESTful interfaces.

Canada is also looking to the possibility of being able to leverage SMART on FHIR and CDS Hooks – capabilities that allow other systems to plug into EHR interfaces and workflows. Canada relies on many of the same hospital information systems as are used in the US – Epic, Cerner, etc. and those already have support for these technologies. To be used in Canada, there are several steps we need to take which we’re working our way through:

* Increasing interest and awareness of these technologies for Canadian EHR systems
* Creating a Canadian Core equivalent for the US Core profiles that SMART and CDS Hooks currently leverage. (This means small changes in extensions and vocabulary bindings)
* Working with SMART and CDS Hooks to add “country” as part of the context for invoking those technologies so systems know what profiles apply

An area that hasn’t seen much interest in Canada yet, but which I expect we’ll get to eventually is “bulk data”. This is the ability for systems to extract large quantities of data from EHR and other systems for research, analysis, payment or other reasons.

For me, one of the strongest reasons to use FHIR is the strength of its community. We have a global community that has a culture of interaction and support. That community has built tools, brought ideas, proposed enhancements and generally made FHIR better. That community is available to support implementers – and that support is what really results in interoperability.

FHIR has been slower to penetrate in Canada, in large part due to the HL7 v3 hangover we’re experiencing from earlier implementation experiences. However, FHIR is definitely catching on and is starting to spread. We expect it will continue to grow, though it will be running in parallel with legacy technologies for a long time.