



Using Business Intelligence for Efficient Inter-Facility Patient Transfer

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March 2016



Overview

- Healthcare Infrastructure in Northern BC
- Patient Transfer
- Proposed System
- Key Features
- Future Work



Background

- Collaborative effort between University of Northern British Columbia (UNBC) and the Northern Health Authority (NH)



Patient Transfer

- Inter-facility transfers have been identified as being a suboptimal process
- Communication delays and ineffective documentation lead to slower patient transfers
- In practice today, transfers are often made based on proximity and habit, rather than hospital performance and capability
- Need for data-driven approach



Patient Transfer : Challenges

- Requires knowledge of services and transport options
- Commonly stored in legacy formats
- Data integrity/quality
- Inter-facility communication



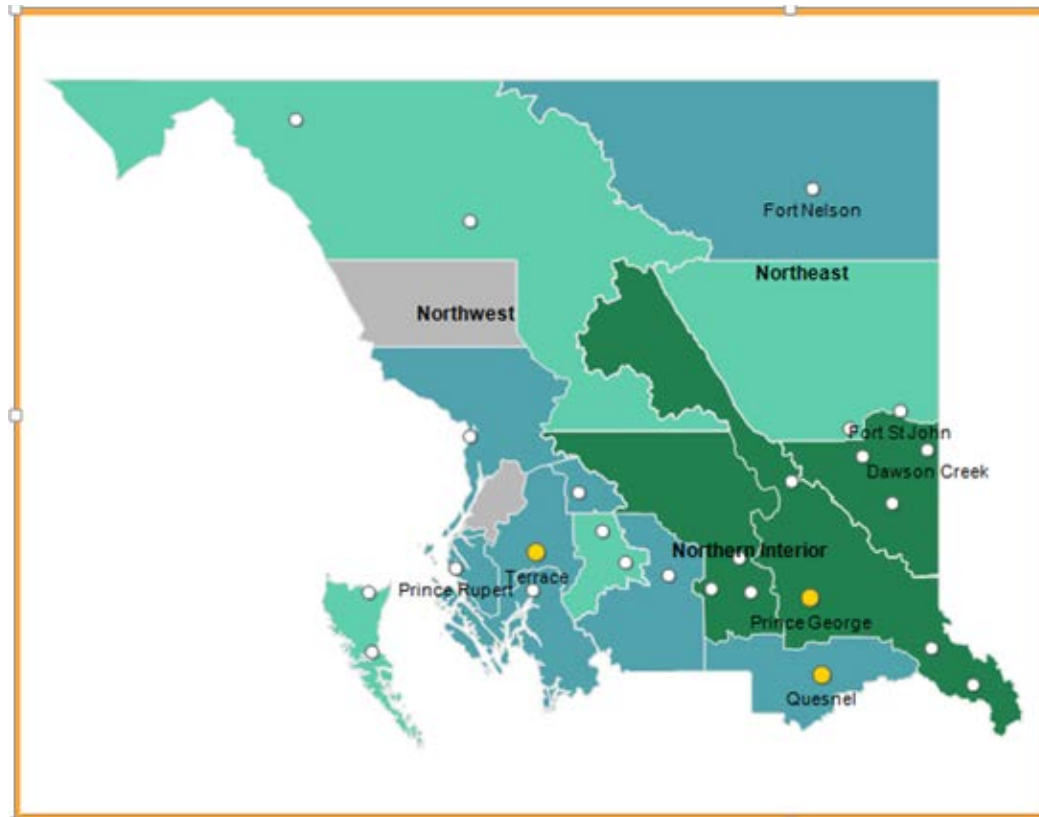
Patient Transfer : The process

1. Identify transferable patients
- 2. Identify a destination**
3. Call the Patient Transfer Network
4. Accomplish the transfer

The focus of the proposed system is optimization of **step 2**

Proposed System

- Built using data collected by Northern Health (NH) from 26 candidate facilities

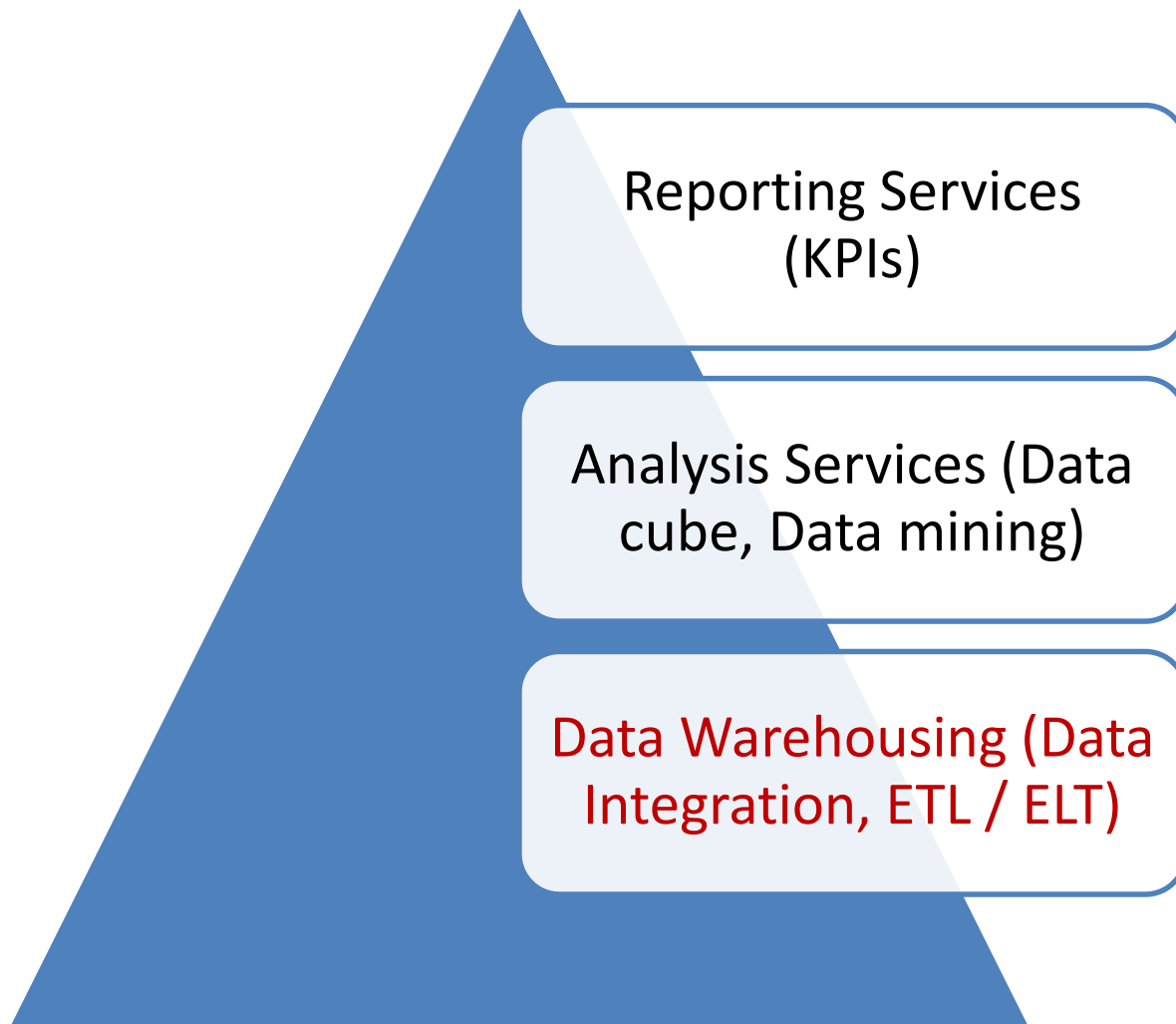




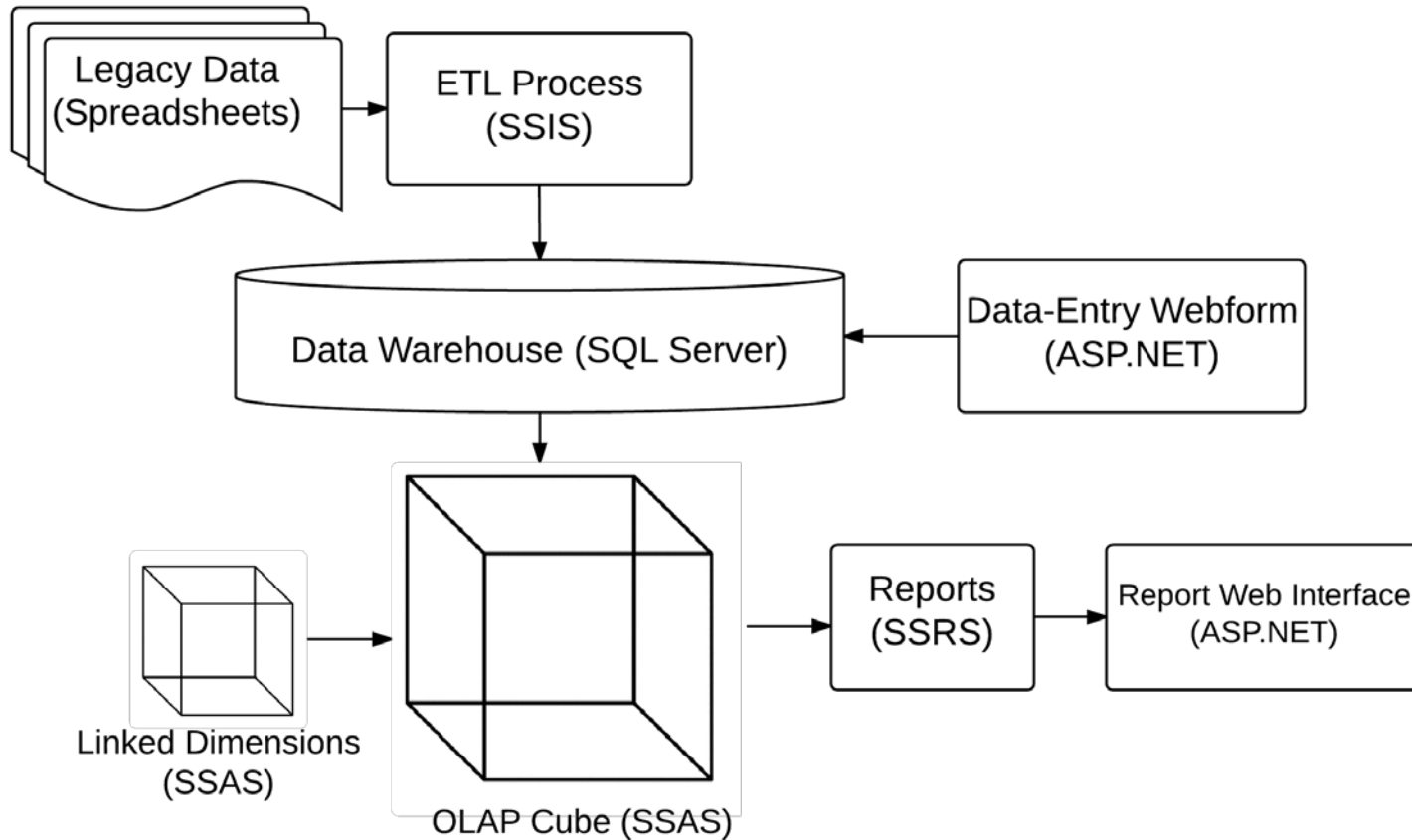
Data Warehousing

- Data extraction and cleansing
- Transformation
- Loading

Conventional BI



Design Summary

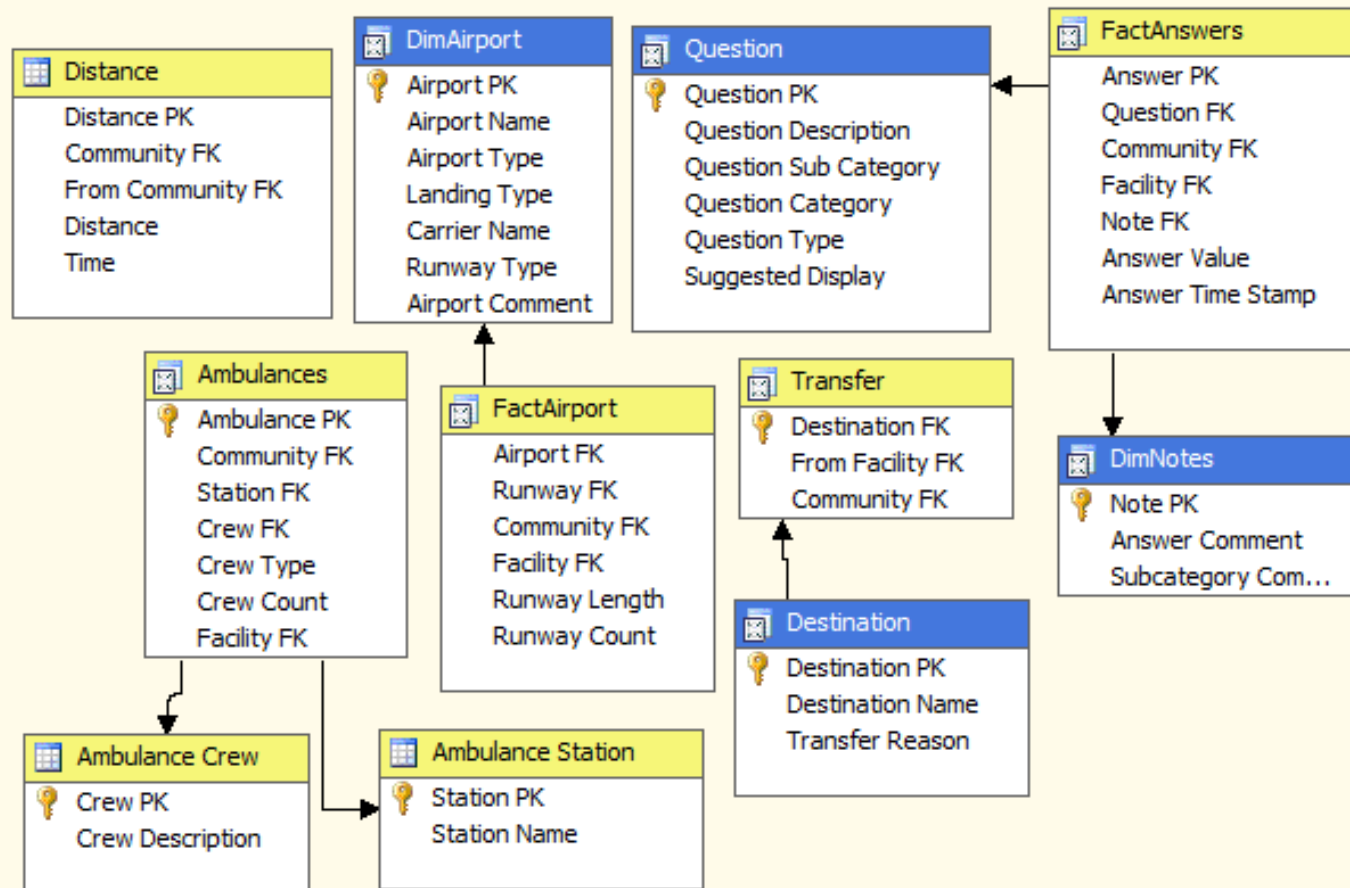




OLAP Cube

- Dimensional Data Model (Kimball Approach)
- 7 fact tables used
- reports render in under 7 seconds
- 4 dimensions and 4 linked-dimensions
- Hierarchies such as Northern Health > HSDA > LHA > Community allow facts to be aggregated when data rolled-up

Analysis Cube Design





Platform

- MS SQL Server
 - SSIS used for integration
 - SSAS used for analysis and query processing
 - SSRS enhanced with maps and custom embedded objects
- ASP.NET wrappers
- Web Forms for remote data entry
- User-triggered cube processing
- Changes pushed to reports instantly

Data Entry Web Form

Welcome: Calado

[Questions?](#) [Contact us here](#)

PATIENT TRANSFER DATA ENTRY

Home

Data Submission

Data

Home >> Data Submission

Airport

[Airports](#)

[Carriers per Airport](#)

[Carriers List](#)

Ambulance

[Ambulances](#)

[Ambulance Crews](#)

[Ambulance Stations](#)

Transfer

[Transfer](#)

[Destinations](#)

Ability to care for high acuity patients

Stabilize and hold greater than 5 days

Yes No

[Add Comment](#)

[Edit Comment](#)

ABORIGINAL LIAISON

Aboriginal Liaison

On-Site

Yes No

[Add Comment](#)

[Edit Comment](#)

Community Health Representativ...

BLOOD SERVICES

Blood Services

Available

Yes No

[Add Comment](#)

[Add Comment](#)

CRITICAL CARE SERVICES

Critical Care Services

Beds in Formal ICU

0

[Add Comment](#)

[Add Comment](#)

DIABETIC NURSE EDUCATOR

Diabetic Nurse Educator

On-Site

Yes No

[Add Comment](#)

[Add Comment](#)

DIALYSIS UNIT



Access Control

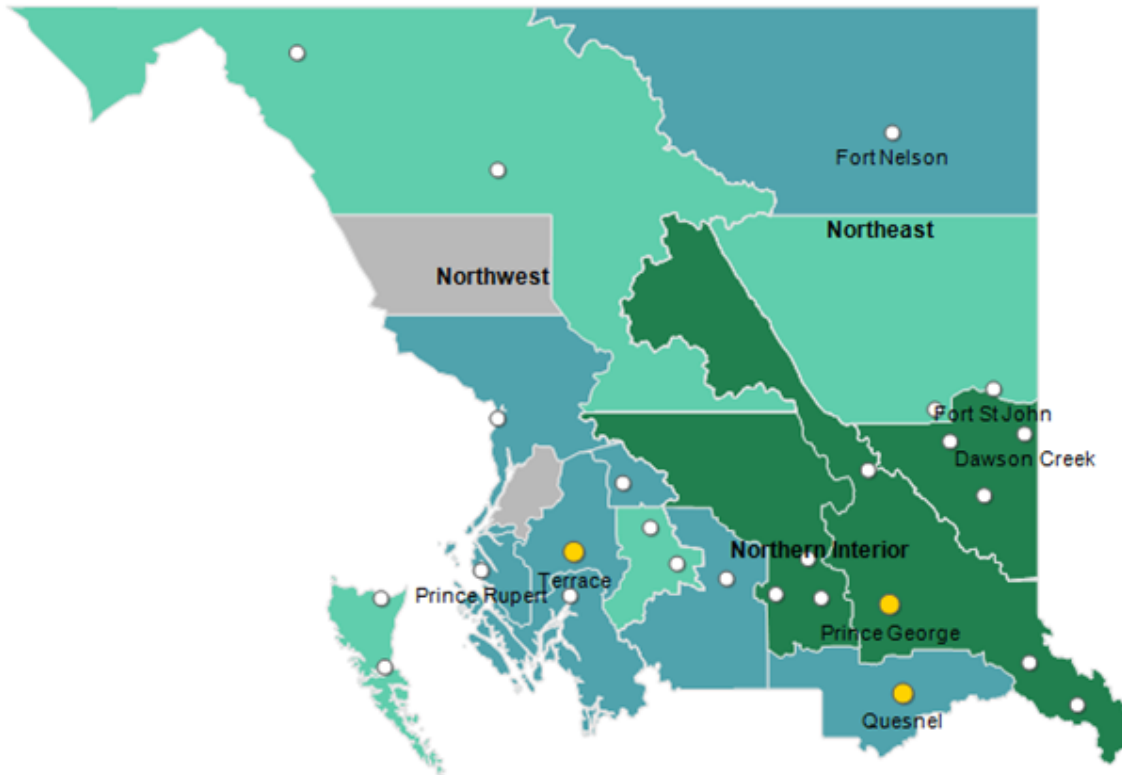
- Designated account access
- Account management is handled using Windows Active Directory
- Web access is controlled using ASP.NET Windows authentication



Reporting Features

- Interactive web-based interface that delivers available services and infrastructure to transfer operators
- An interactive map for navigation
- Detailed summary reports of important facility information
- Facility comparison tool
- Facility mapping tool
- Transportation options

Interactive Map



Urban

University Hospital of Northern British Columbia

Rural

Dawson Creek and District Health Centre

Fort St John Hospital and Health Centre

G.R. Baker Hospital

Mills Memorial Hospital

Prince Rupert Regional Hospital

Small Rural

Bulkley Valley and District Hospital

Chetwynd Hospital and Health Centre

Fort Nelson General Hospital

Kitimat General Hospital and Health Centre

Lakes District Hospital and Health Centre

Mackenzie and District Hospital and Health Centre

McBride and District Hospital

Northern Haida Gwaii Hospital and Health Centre

Queen Charlotte Islands Hospital

St. John Hospital

Stuart Lake Hospital

Wrinch Memorial Hospital

Diagnostic and Treatment

Atlin Health Centre

Fraser Lake Community Health Centre

Houston Health Centre

Hudson's Hope Health Centre

Stewart Health Centre

Stikine Health Centre

Tumbler Ridge Health Centre

Valemount Health Centre



Facility Summary Reports


University Hospital of Northern British Columbia

Facility Classification	Urban
Located in	Prince George
Inpatient Beds	200
Beds(Outside Community)	53
Beds in Formal ICU	10
Hospice / Palliative Care Beds	0
Monitored Stretchers	20
Operating Rooms	7
Total ED Stretchers	20
Oncology Services Capacity	11

- + Transportation Options**

- + Transfer Destinations** **Reasons**

- + Ambulance Service**

 Lab/Imaging Access				
	24 hours	Limited hours	Onsite	Note
CT	X	✓	✓	(i)
Lab	✓	X	✓	(i)
MRI	X	✓	✓	(i)
Nuclear Medicine	X	✓	✓	(i)
Radiology	X	✓	✓	
Ultrasound	X	✓	✓	(i)
Xray	X	✓	✓	(i)

Facility Summary Reports



Patient Care Services

Ability to care for high acuity patients		
Stabilize and hold greater than 5 days	✓	
Aboriginal Liaison	✓	
Blood Services	✗	
Diabetic Nurse Educator	✓	
Dialysis Unit	✓	(i)
Outside Community	✓	(i)
Dietician	✓	
Home and Community Care		
Available in Home Community	✓	(i)
Mental Health and Addiction		
Community Services	✓	
De-escalation Room	✗	
Designated Observation Unit	✓	(i)
Inpatient Unit	✓	(i)
Residential Services	✗	
Seclusion Room	✓	
Occupational Therapist	✓	(i)
Perinatal Services	✓	(i)
Pharmacy	✗	
Physiotherapist	✓	(i)
Recreational Therapist	✓	(i)
Respiratory Services	✓	(i)
Social Worker	✓	
Speech and Language Therapist	✓	(i)
Telehealth	✓	
Wound Care/ Ostomy Clinician	✓	(i)



Staff

General Practitioner	129
ER Physician	12
Family Practice	107
GP Anesthetics	10
Oncology Staff	19
GP's in Oncology	3
Medical Oncologist	3 (i)
Nursing Staff	10
Radiation Oncologist	3
Specialist	30
Anesthesiologist	10
Dermatology	0
Emergency	0
IM Diabetes	0
Intensivist	1
Internal Med	0
Internist	1
Nephrologist	2
Neurology	0
Nurse Practitioner	0
Obstetrician	4
Pain Management	1
Pathologist	0
Pediatrician	6
Perinatologist	0
Psychiatry	0
Radiologist	5 (i)
Surgeon	28



Equipment and Rooms

ER
Hospice / Palliative Care
Oncology Services
Residential Care

Facility Comparison Tool



Facilities and Equipment

University Hospital of Northern British Columbia		G.R. Baker Hospital		Prince Rupert Regional Hospital	
Facility	Urban	Facility	Rural	Facility	Rural
# of Beds (Community Hospital Site)	0	# of Beds (Community Hospital Site)	0	# of Beds (Community Hospital Site)	0
# of Beds in Formal ICU	10	# of Beds in Formal ICU	4	# of Beds in Formal ICU	0
# of Hospice / Palliative Care Beds	0	# of Hospice / Palliative Care Beds	3	# of Hospice / Palliative Care Beds	0
# of Inpatient Beds	200	# of Inpatient Beds	32	# of Inpatient Beds	22
# of Residential Care Beds	348	# of Residential Care Beds	117	# of Residential Care Beds	61
<input type="checkbox"/> Blood Services		<input type="checkbox"/> Blood Services		<input type="checkbox"/> Blood Services	
<input type="checkbox"/> ER		<input type="checkbox"/> ER		<input type="checkbox"/> ER	
<input type="checkbox"/> Hospice / Palliative Care		<input type="checkbox"/> Hospice / Palliative Care		<input type="checkbox"/> Hospice / Palliative Care	
<input type="checkbox"/> Mental Health and Addiction		<input type="checkbox"/> Mental Health and Addiction		<input type="checkbox"/> Mental Health and Addiction	
<input type="checkbox"/> Oncology Services		<input type="checkbox"/> Oncology Services		<input type="checkbox"/> Oncology Services	
<input type="checkbox"/> Surgical Services		<input type="checkbox"/> Surgical Services		<input type="checkbox"/> Surgical Services	

Facility Comparison Tool

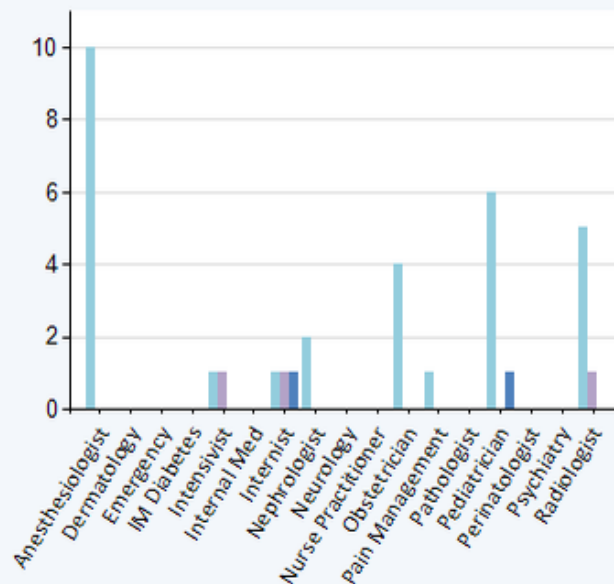
Patient Care Services

	G.R. Baker Hospital	Prince Rupert Regional Hospital	University Hospital of Northern British Columbia
Ability to care for high acuity patients	✗ ⓘ	✗ ⓘ	✓
Aboriginal Liaison	✓	✓ ⓘ	✓
Diabetic Nurse Educator	✓	✓ ⓘ	✓
Dialysis Unit	✗	✗ ⓘ	✓ ⓘ
Dietician	✓	✗	✓
Home and Community Care	✓ ⓘ	✓ ⓘ	✓ ⓘ
Oncology Services	✓ ⓘ	✓ ⓘ	✓ ⓘ
Perinatal Services	✓ ⓘ	✓ ⓘ	✓ ⓘ
Pharmacy	✗	✗	✗
Occupational Therapist	✗	✓ ⓘ	✓ ⓘ
Physiotherapist	✓ ⓘ	✓ ⓘ	✓ ⓘ
Recreational Therapist	✗	✗	✓ ⓘ
Speech and Language Therapist	✓ ⓘ	✓ ⓘ	✓ ⓘ
Residential Care	✓	✓	✓ ⓘ
Respiratory Services	✓ ⓘ	✗	✓ ⓘ
Social Worker	✓	✗	✓
Telehealth	✓	✓	✓
Wound Care/ Ostomy Clinician	✗ ⓘ	✗ ⓘ	✓ ⓘ

Staff

GP
 Oncology Staff
 Specialist
 Surgeon

■ University Hospital of Northern British Columbia
■ G.R. Baker Hospital
■ Prince Rupert Regional Hospital



Facility Comparison Tool



Lab-Imaging Access

	University Hospital of Northern British Columbia				G.R. Baker Hospital				Prince Rupert Regional Hospital			
	24 hours	Limited hours	Onsite	Note	24 hours	Limited hours	Onsite	Note	24 hours	Limited hours	Onsite	Note
CT	X	✓	✓	(i)	X	X	✓		X	✓	✓	(i)
Lab	✓	X	✓	(i)	X	✓	✓	(i)	X	✓	✓	(i)
MRI	X	✓	✓	(i)	X	X	X		X	X	X	
Nuclear Medicine	X	✓	✓	(i)	X	X	X		X	X	X	
Radiology	X	✓	✓		X	✓	✓		X	✓	✓	(i)
Ultrasound	X	✓	✓	(i)	X	✓	✓	(i)	X	✓	✓	(i)
Xray	X	✓	✓	(i)	X	✓	✓	(i)	X	✓	✓	(i)

Facility Mapping Tool

Selected Facility

Prince Rupert Regional Hospital ▼

Patient Care Services

- Critical Care Services
- Diabetic Nurse Educator
- Dietician
- Home and Community Care
- Hospice / Palliative Care
- Oncology Services
- Perinatal Services
- Rehabilitation Services
- Residential Care
- Respiratory Services
- Social Worker
- Surgical Services
- Telehealth
- Wound Care/ Ostomy Clinician

Utility

- Dialysis Unit
- ER
- Mental Health and Addiction

Imaging

- CT
- Lab
- MRI
- Nuclear Medicine
- Radiology
- Ultrasound
- Xray

Staff

- General Surgeon
- Specialist Oncology

- Dental
- ENT
- General
- Gynecology
- Ophthalmology
- Orthopedic
- Plastic
- Urology
- Vascular

Reload Page On Check

Facilities meeting Specified Criteria:

<input checked="" type="checkbox"/> Mills Memorial Hospital				1 hr 52 mins
Dialysis Unit				
On-Site				✓ ⓘ
ER				
Monitored Stretchers				6
Stroke Protocol				✓ ⓘ
Total ED Stretchers				11
Social Worker				
On-Site				✓
Surgeon				
General				3
Access Details				
	24 hours	Limited hours	Onsite	
Lab	✗	✓	✓	ⓘ
<input checked="" type="checkbox"/> University Hospital of Northern British Columbia				9 hrs 19 mins
Dialysis Unit				
On-Site				✓ ⓘ
ER				
Monitored Stretchers				20
Stroke Protocol				✓ ⓘ
Total ED Stretchers				20
Social Worker				
On-Site				✓
Surgeon				
General				1
Access Details				
	24 hours	Limited hours	Onsite	
Lab	✓	✗	✓	ⓘ
<input checked="" type="checkbox"/> Fort St John Hospital and Health Centre				14 hrs 51 mins

Facility Mapping Tool

Selected Facility

St. John Hospital ▼

Patient Care Services

- Critical Care Services
- Diabetic Nurse Educator
- Dietician
- Home and Community Care
- Hospice / Palliative Care
- Oncology Services
- Perinatal Services
- Rehabilitation Services
- Residential Care
- Respiratory Services
- Social Worker
- Surgical Services
- Telehealth
- Wound Care/ Ostomy Clinician

Utility

- Dialysis Unit
- ER
- Mental Health and Addiction



Facilities meeting Specified Criteria:


Expand All

<input type="checkbox"/> St. John Hospital	
ER	
Monitored Stretchers	0
Stroke Protocol	X ⓘ
Total ED Stretchers	7
<input type="checkbox"/> Stuart Lake Hospital	48 mins
ER	
Monitored Stretchers	0
Stroke Protocol	X ⓘ
Total ED Stretchers	3
<input type="checkbox"/> Fraser Lake Community Health Centre	53 mins
ER	
Monitored Stretchers	0
Stroke Protocol	X ⓘ
Total ED Stretchers	5
<input checked="" type="checkbox"/> University Hospital of Northern British Columbia	1 hr 22 mins
<input checked="" type="checkbox"/> Lakes District Hospital and Health Centre	1 hr 41 mins
<input checked="" type="checkbox"/> Houston Health Centre	2 hrs 46 mins
<input checked="" type="checkbox"/> G.R. Baker Hospital	2 hrs 53 mins
<input checked="" type="checkbox"/> Bulkley Valley and District Hospital	3 hrs 35 mins
<input checked="" type="checkbox"/> Mackenzie and District Hospital and Health Centre	3 hrs 40 mins
<input checked="" type="checkbox"/> McBride and District Hospital	4 hrs 3 mins

Transportation Options



Airport

Airport Name	Airport Type	Runway Type	Carrier Name
Hospital Helipad	Hospital Helipad	N/A	No Carrier
 Prince Rupert Airport– Digby Island	Commercial Airport	1829 - Asphalt	Air Canada
			Hawkair
Prince Rupert/Digby Island Water Aerodrome	Non-commercial Airport	N/A	No Carrier
Prince Rupert/Seal Cove Water Aerodrome	Commercial Airport	N/A	Inland Air Charters
Seal Cove Seaplane Base	Community Helipad	N/A	No Carrier



Ambulance

Station Name	Crew Count	Crew Description
#684	0	24/7
		On Call Only



Future Work

- Extend to the entire province of BC
- Coverage will include:
 - >5 Health Authority regions
 - >300 healthcare facilities
 - Service over 4 million BC residents
- Challenges:
 - Standardizing medical terms
 - Creating a unified set of data fields to store facility services information

Patient Transfer Dashboard Link

1. Click on the link and it will take you to the NH Service Inventory dashboard
2. In the upper Right hand corner click on the Patient Transfer link

<http://servicesdashboard.northernhealth.ca/Services.aspx>



**QUESTIONS
ANSWERS**