

Connect Care

A Data and Analytics Perspective

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AHS' Data and Analytics Landscape

- A home-grown, well-developed, heavily used [Enterprise Data Warehouse](#) and data and analytics eco-system
- Wide [variety of data](#) – clinical, capacity, staffing, financial, social, survey, experience... many data sets external to AHS
- [Many customers](#) for both data and analytics: AHS (all levels), AH, HQCA, PCNs, Universities...
- Workforce: [450 strong, many highly-trained staff](#) – PhD's, Masters, HIMs from all analytic disciplines (Epidemiology, Health Economics, Operations Research, Biostatistics, General statisticians, Computer Science, Engineers, Data Science, Business, Accounting...)
- [Hub and spoke structure](#) – embedded analysts into the business connected to the hub... still not fully optimized, still have legacy unconnected data and analytic teams

Enterprise Data Warehouse (EDW)

- [Oracle Database](#) back end, [Informatica](#) ETL, [Tableau](#) visualization
- Numerous statistical and specialized analytic tools (Operations Research, Statistics, GIS, ...)
- Managed by the Analytics department, with lots of help from IT
- Benefits of the EDW:
 - Increases analytical efficiency – analysts spend more time analyzing, less time looking for and managing data
 - Increases the value of information generated from AHS' data assets by linking data across systems of care
 - Enables report automation
 - HIA requirements – security and auditing (must have)

EDW Data Sets

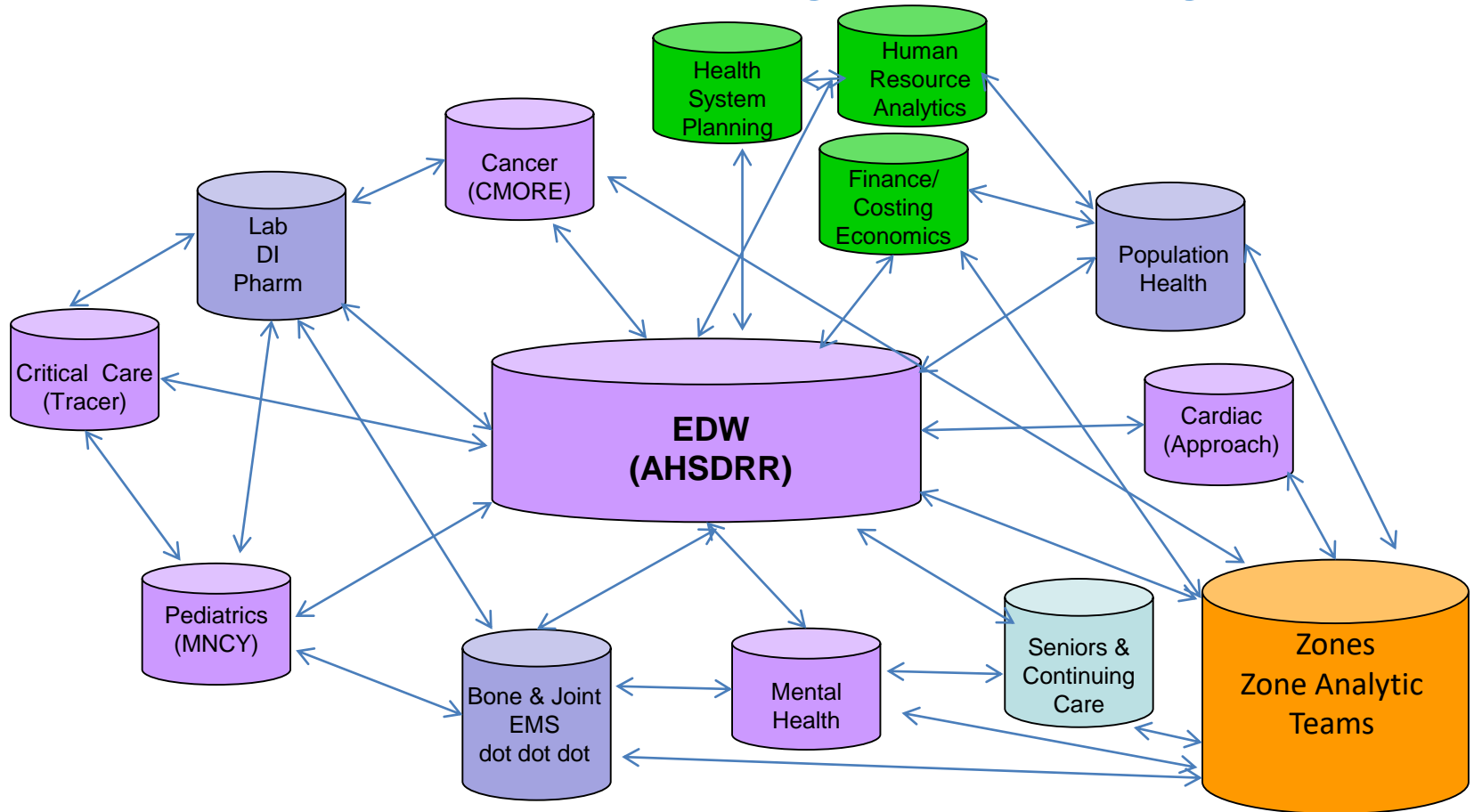
Core

- DAD (provincial inpatient abstracts)
- NACRs (hospital based ambulatory care abstract (ED, Day Surgery, Clinics))
- PIN (Pharmacy Information Network)
- Vital Stats (births, deaths)
- Claims (Physician payment data)
- Alberta Population Registry
- Lab, DI
- ADT
- LTC, SL, HC; RAI – assessment / utilization
- ED – operational data
- Perinatal (moms and babies)
- Canada Census
- Alberta Community Health Survey
- Patient Experience/Satisfaction
- MIS Expenditures

Distributed

- Calgary Sunrise Clinical Manager data and analytics
- Meditech data and analytics
- MIS financial/statistical
- Alberta Waitlist Registry
- E-Critical (Tracer)
- Cancer Registry (CMORE)
- OR (Calg)
- Bed Survey (PP)
- Staffing data
- Rheumatology
- Cardiac (Approach)
- EMS
- Primary Care
- Stoke (Action Plan)
- E- Clinician (Edmonton)
- Scheduling (path to care)
- A-CATS – scheduled surgical services
- Anesthesia
- Many more
- Lab, DI Pharm

AHS's Data and Analytics Ecosystem



- Community of practice
- A centrally-managed core of data sets (EDW)
- Distributed departmental / zone / subject-area data that can link with the core
- Distributed data analysts and environments mostly within the EDW – 'schema'
- Significant autonomy, close to the business, come with data, then add EDW data
- create reports for their domain, in their domain
- Encourage connections without going through the core EDW
- Shared data model program

Data – Philosophy

- **Continuum of data needs** for analytics – from raw untransformed data to highly-defined dimensional cubed data
- Late binding
- Trust the analysts – **allow data access** and judge analytic products, not data access
- **Data is shared** and used to improve the system (Secondary Use Data Policy)
- Embrace the value of **both primary and secondary use** and see them as intimately connected
- Understand what needs to be **real time** or **not**

Brent James – Intermountain Health Care



***‘You manage
what you measure’***

***‘Our business is
clinical medicine’***

***‘Transformation from an
administrative model to a
clinical process management
model’***

Three Systems for Outcomes Improvement

What should we be doing?

SCNs



How are we doing?

Analysts



How do we transform?

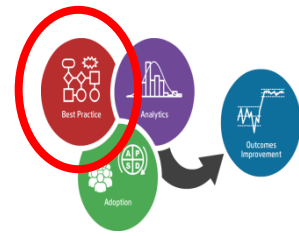
Operations, QI

Courtesy of Health Catalyst

Heart Failure Outcomes Improvement - Example

Background – Why HF?

- **High Cost:** over \$100M annually in Alberta (ranks 4th after births, COPD and rehab procedures)
- **High Volume:** 5th largest inpatient population in Alberta with over 6,300 hospital discharges in FY 2017/18 (>2,200 in Calgary Zone)
- **High Readmissions:** 1 in 5 HF patients is readmitted to hospital within 30 days of discharge
- Care is not **Standardized**

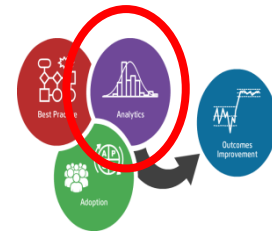


Best Practice – “What Should we be Doing?”

- Started with a 2009 clinical optimization initiative at FMC which identified several interventions:
 - Admission order set
 - Documenting daily weights
 - Patient education
 - Patient makes appointment with family doctor before discharge
 - Standardized criteria for Cardiac Function Clinic referral
 - Post-discharge surveillance via HF Liaison Nurse (FMC only)

HF Outcomes Improvement at RGH

- **Outcome goals: reduce LOS & readmissions, improve patient QoL**
- RGH outcomes improvement team:
 - Co-chairs: site Cardiology MD Lead (N. Sharma) and Exec Dir (V. Meyer)
 - Others: Hospitalist physician, Hospitalist QI nurse, IM physician, Patient Rep, Unit Managers, QI Consultant, Analyst, Project Manager, SCN rep
- Aligned with the SCN (sponsors J. Howlett, S. Aggarwal)
- Planning began Spring 2017
- Implementation January 2018 (U71/72), spread May 2018 to U93/94
- Analytics developed to monitor outcomes, clinical processes, patient feedback



Aggregate Performance Measures - Process Indicators HF Teaching in Flowsheet

Global Parameters:

Discharges from
7/1/2017

to
8/2/2018

grouped by
Month

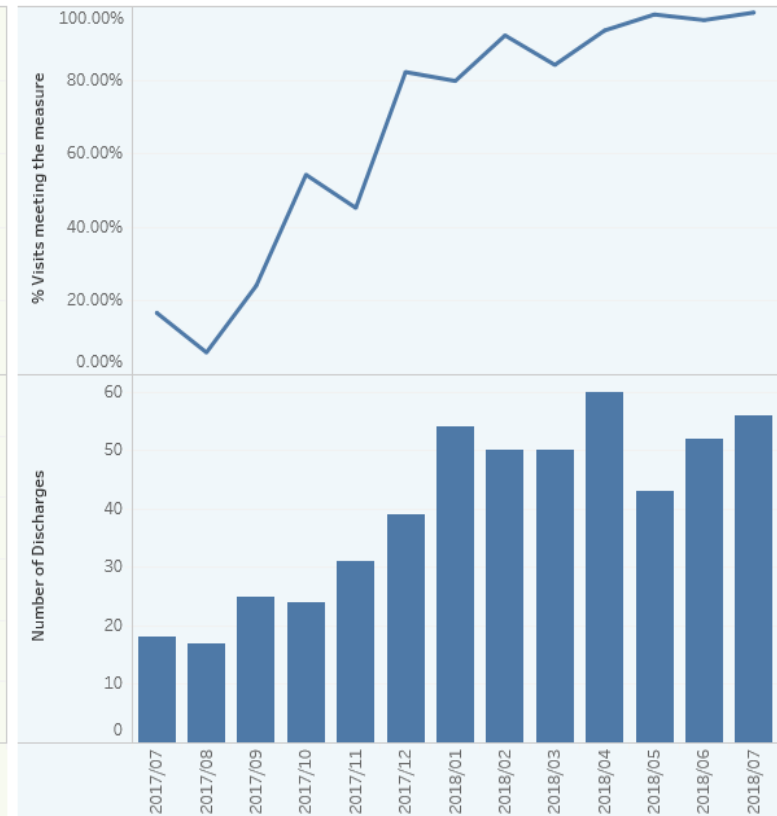
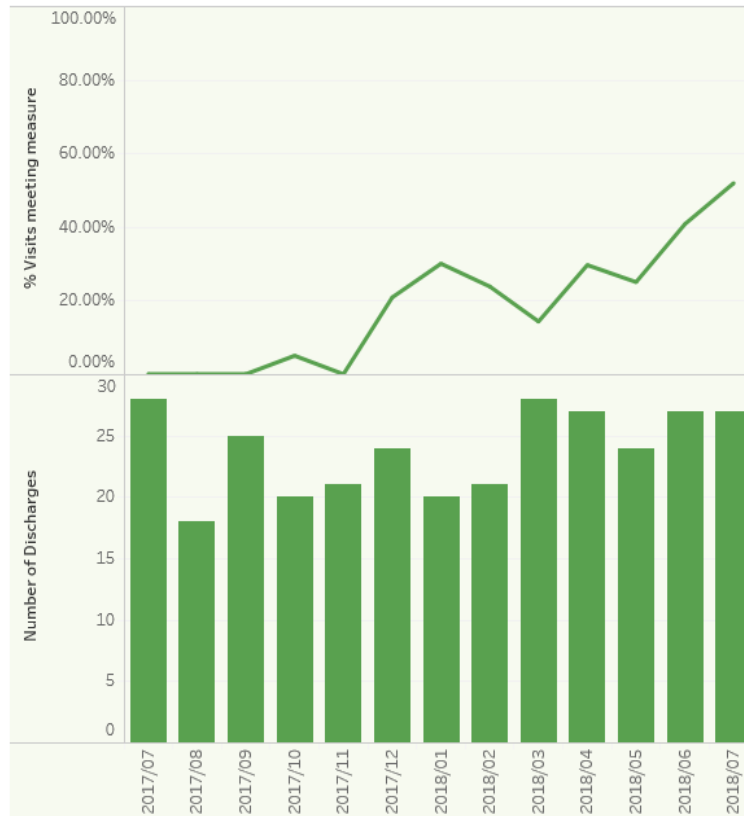
Exclude Patients with Palliative Goals of Care
Yes

Exclude Pediatric Patients (<=18 years)
No

Process Indicator Name
HF Teaching in Flowshe...

Instructions:

- 1) Use the Red Global Parameters Box to select the Time Period, Reporting Interval and Process Indicator.
- 2) Use the Green and Blue Boxes to select the characteristics of the visits to be displayed.
- 3) Hover your mouse over the line chart view the Indicator Definition, Numerator, Denominator, and acutal Performance. The bar chart shows the number of discharges.
- 4) This view contains patients with either HF as the first item on the admitting diagnosis list OR a Bluedot entry in the MPR.



Process Snapshot – CHF Patients in Hospital



Global Parameters:

Site: RGH

Unit: (Multiple values)

Diagnosis Cohort: HF Keyword - 1st Posi...

Exclude Palliative GCD: Yes

Exclude Pediatrics (<19): No

Care Providers:

Admitting Discipline: All Disciplines

Admitting Physician: (All)

Attending Group: (All)

Attending Physician: (All)

Legend

- Completed
- Partially Completed
- Not Completed
- Not Applicable

Demonstration Mode (No Patient ID)

No

Instructions:

- 1) Use the Red Global Parameters Box to select the characteristics of visits you wish to display.
- 2) To view the definition for the indicators, hover your mouse over the question mark.
- 3) To view Ejection Fraction and Medical Therapy, hover your mouse over any of the green or grey boxes associated with that visit.
- 4) While the patient list is updated hourly, the majority of the indicators are updated daily (see timestamp below) with the exception of BNP Ordered.

Patient Name	Admitting Diagnosis	Inpatient Unit	GCD Code	# Days in Hospital	Bluedot Pathway	HF = 1st Admit Dx	CHF Order Set Used	HF Teaching in flowsheet	HF Teaching in MPR	BNP Ordered	Up to Date EF Data	Sodium Restrict Diet Order	Weigh Daily Order	HF Weigh Daily Order	Meeting % days with Daily Weights
	Recurrent GLF; Hyp..	RGH 72	M1	17											
	GLF with insufficie..	RGH 72	M1	8											
	Heart Failure	RGH 71	M1	6											
	1. CHF ..	RGH 72	R1	21											
	CHF, UTI	RGH 72	M2	7											
	Heart Failure	RGH 71	R3	10											
	dCHF, abdo pain NYD	RGH 72	R3	4											
	Heart Failure	RGH 71	R1	5											
	CHF	RGH 71	M1	16											
	osteomyelitis, DM2..	RGH 93	R1	6											
	NSTEMI	RGH 71	M1	13											
	vesicorectal fistula ..	RGH 71	M1	4											
	Rt thigh Neuropath..	RGH 94	R1	2											
	sepsis	RGH 93	R2	27											
	Congestive heart fa..	RGH 72	M1	16											
	SOB NYD, mod R.pl..	RGH 94	M1	2											
	AHF/DCMP,Persist..	RGH 71	R1	7											
	Heart Failure	RGH 94	R1	32											
	Congestive Heart F..	RGH 72	M1	8											
	CHF- New onset	RGH 72	R1	6											
	Pneumonia, dCHF	RGH 71	M1	8											
	Post-op heart failur..	RGH 71	R1	2											
	retention and BPH, ..	RGH 72	R2	20											
	Nause, vomiting	RGH 71	M1	4											
	Bilateral lower limb..	RGH 72	Null	3											
	1 - AKI ..	RGH 71	M1	15											

CHF Visit List: Site-level view



Diagnosis Cohort

HF Keyword - Any Position

Facility

- (All)
- Foothills Medical Centre
- Peter Lougheed Centre
- Rockyview General Hospital
- South Health Campus

Unit

(All)

Attending Group

(All)

Attending Physician

(All)

**Exclude Visits Admitted >
(Days)**

99

Sort By

General HF Risk

**Exclude Visits with C1 or C2
Goals of Care Designation**

Yes

**Demonstration Mode
(mask names/ID's)**

On

RHRN	Patient Name	# Days Admi..	Age	GOC	Unit	Attending Group	Admit Dx	Risk Points	30-Day Readmit Prob..
<Hidden>	<Hidden>	7	77	R1	RGH-71	RGH Dermatology	AHF/DCMP,Persistant A.Fib.AR.	12	16%
<Hidden>	<Hidden>	8	87	M1	RGH-72	RGH Hospitalist Group	Congestive Heart Failure, AKI	11	39%
<Hidden>	<Hidden>	62	57	R1	RGH-56	RGH Sub Acute Family Med Unit	heart failure	10	22%
<Hidden>	<Hidden>	2	81	R1	RGH-CCU	RGH Dermatology	New AHF + New A.Fib,RVR + AKI +/- Pneumonia.	10	14%
<Hidden>	<Hidden>	22	81	R1	RGH-57	RGH GARP Group	CHF, pleural effusion, pelvic fracture	9	35%
<Hidden>	<Hidden>	1	70	M1	RGH-71	RGH Dermatology	CHF, ?COPD, ? pulm HTN	9	34%
<Hidden>	<Hidden>	0	82	M1	RGH-71	RGH Hospitalist Group	AECHF	9	22%
<Hidden>	<Hidden>	2	50	R1	RGH-71	RGH Dermatology	Post-op heart failure, wound infection	9	17%
<Hidden>	<Hidden>	5	62	R1	RGH-71	RGH Dermatology	Heart Failure	9	16%
<Hidden>	<Hidden>	17	80	M1	RGH-72	RGH Hospitalist Group	Recurrent GLF; Hypoxia-Pneumonia; Hx of CHFpEF	8	56%
<Hidden>	<Hidden>	8	95	M1	RGH-72	RGH Hospitalist Group	GLF with insufficiency fractures, CHF	8	40%
<Hidden>	<Hidden>	42	88	M1	RGH-57	RGH GARP Group	Worsening Heart Failure,ICMP,Recent A.Flutter,...	8	38%
<Hidden>	<Hidden>	16	91	R1	RGH-71	RGH Hospitalist Group	CHF	8	36%
<Hidden>	<Hidden>	16	89	M1	RGH-72	RGH Hospitalist Group	Congestive heart failure	8	29%
<Hidden>	<Hidden>	10	88	R3	RGH-71	RGH Hospitalist Group	Heart Failure	8	22%
<Hidden>	<Hidden>	8	90	M1	RGH-71	RGH Hospitalist Group	Pneumonia, dCHF	8	21%

Monitoring HF Outcomes



Introduction Page | Individual Level Measures | Process Trends | Outcome Trends | HRQoL | Patient Survey



Aggregate Performance Trends - Outcome Indicators

Global Parameters:

Discharges from
1/1/2017

to
7/30/2018

grouped by
Month

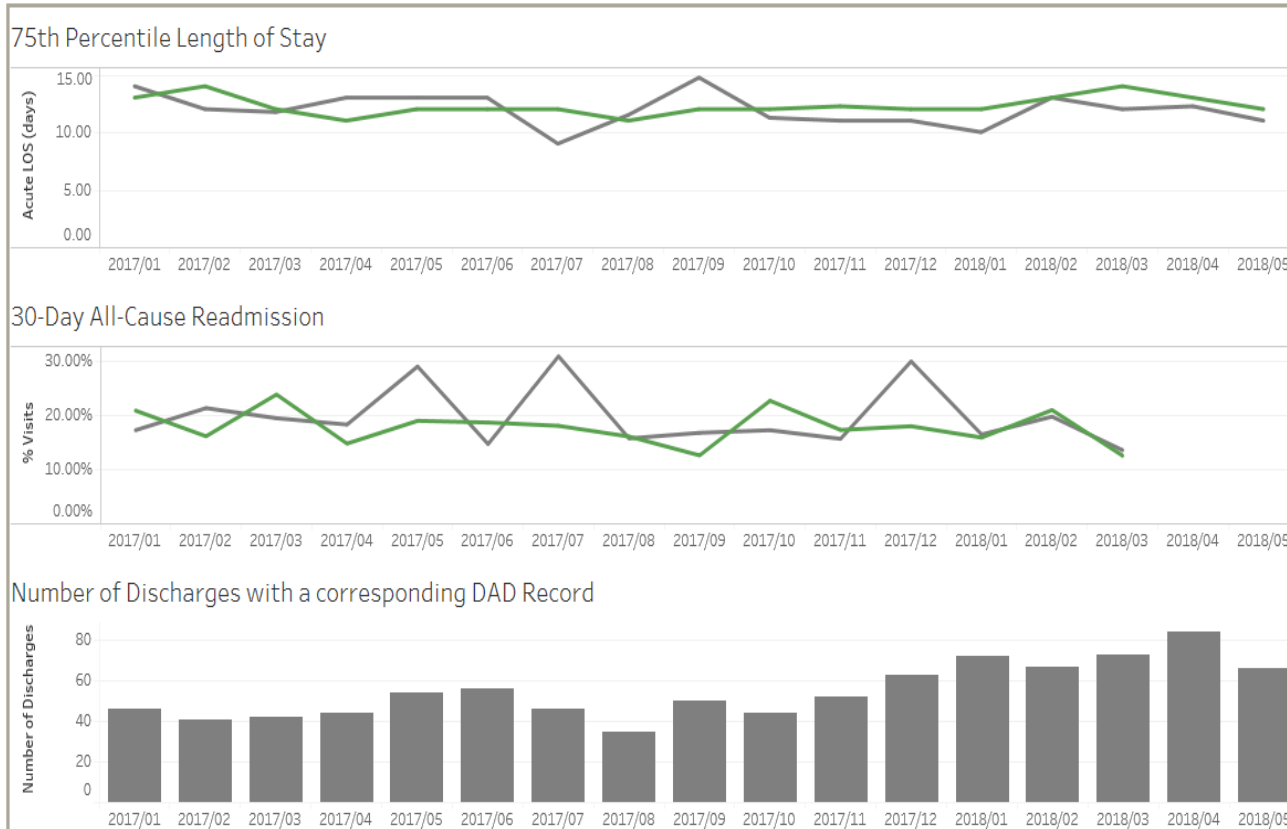
Exclude Patients with Palliative Goals of Care
Yes

Exclude Pediatric Patients (<=18 years)
Yes

Select Site(s)
 (All)
 FMC
 PLC
 RGH
 SHC

Instructions:

- 1) Use the Red Global Parameters Box to select the Time Period, Reporting Interval and Outcome Indicator.
- 2) Hover your mouse over the time period of interest to view the Indicator Definition, Numerator, Denominator, and acutal Performance. The bar graph shows the number of discharges.
- 3) It is important to note that the data comes from Discharge Abstract Database (DAD) and is subject to data delay.
- 4) This view contains patients with a DAD record that corresponds to the visit AND one of: HF as the first item on the admitting diagnosis list OR a Bluedot entry in the MPR

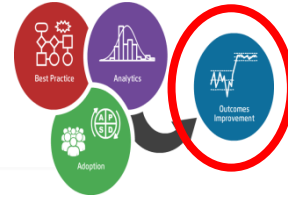


Select Percentile for LOS
0.75

Outcome Indicator Name
30-Day All-Cause Readmi...

- Legend
- All Sites
 - FMC
 - PLC
 - RGH
 - SHC

Patient Feedback



Patient Survey (Self Reported Disease Severity and Resources) - Preliminary Results

Global Parameters:

Site: RGH

Unit where... was Completed: (All)

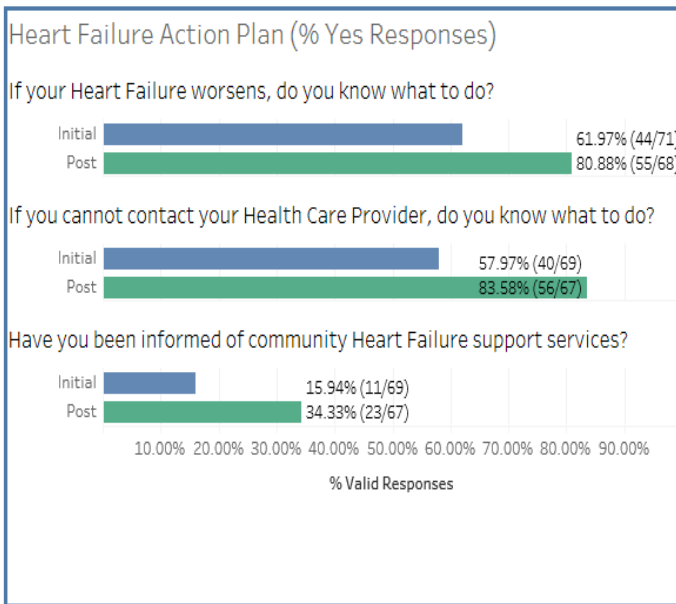
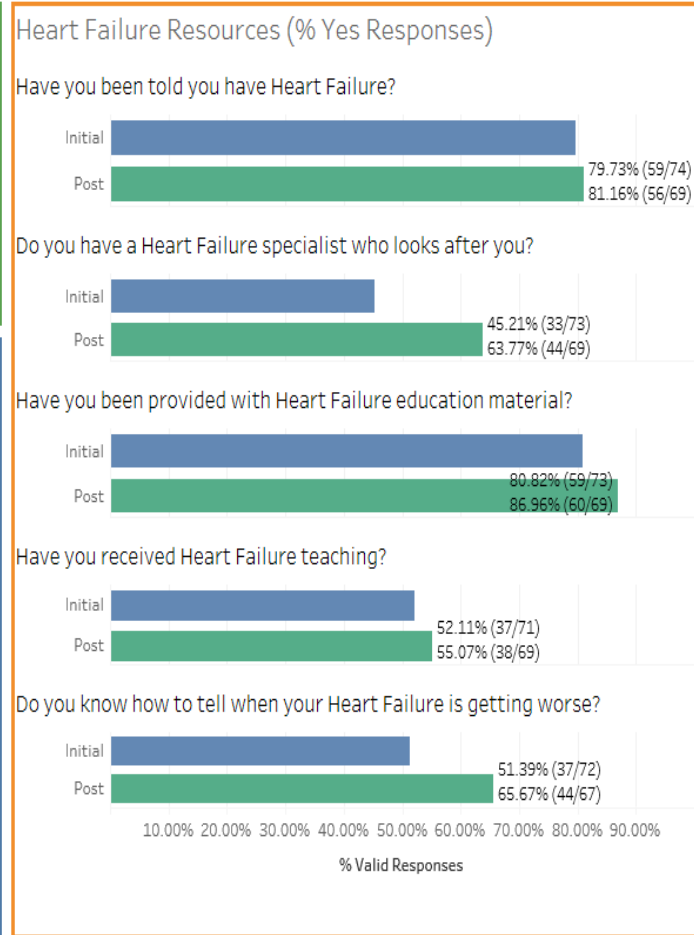
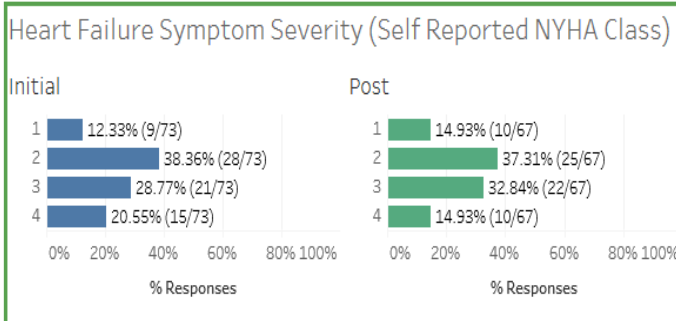
Legend: Initial (Blue), Post (Green)

Instructions:

- 1) Use the Red Global Parameters Box to select the characteristics of visits you wish to display.
- 2) To view information about each measure, hover your mouse over the measure.
- 3) There is a [3 to 4-month data lag from the time the initial survey was collected](#) as the post survey is completed 3 months after the patient is discharged.

Patients Included

74



What Have We Learned?

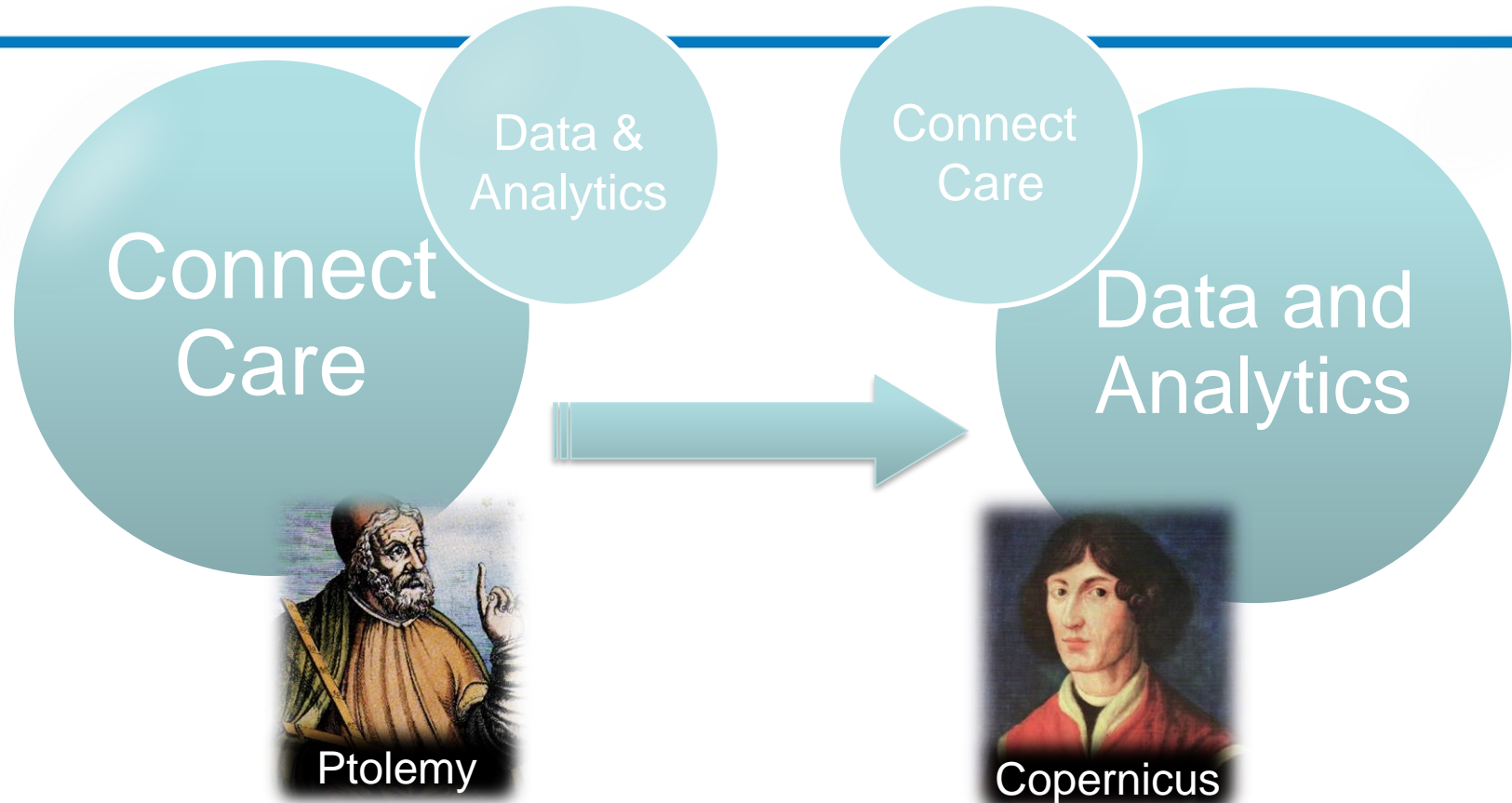
- Frontline operations & physician leaders must own the work
- All care teams that do the work must be involved
- Outcomes improvement work and adopting clinical best practice and reducing variation is not easy
- No formal accountability for outcomes
- Clinicians need to see data on pathway/order set variations and outcomes to understand where the gaps are and focus improvement efforts
- Clinical data is complicated and messy

AHS Data and Analytics Road Map

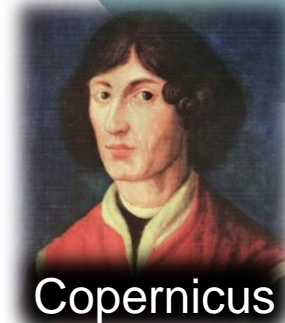
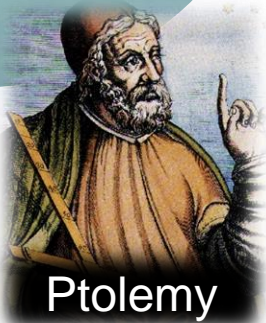
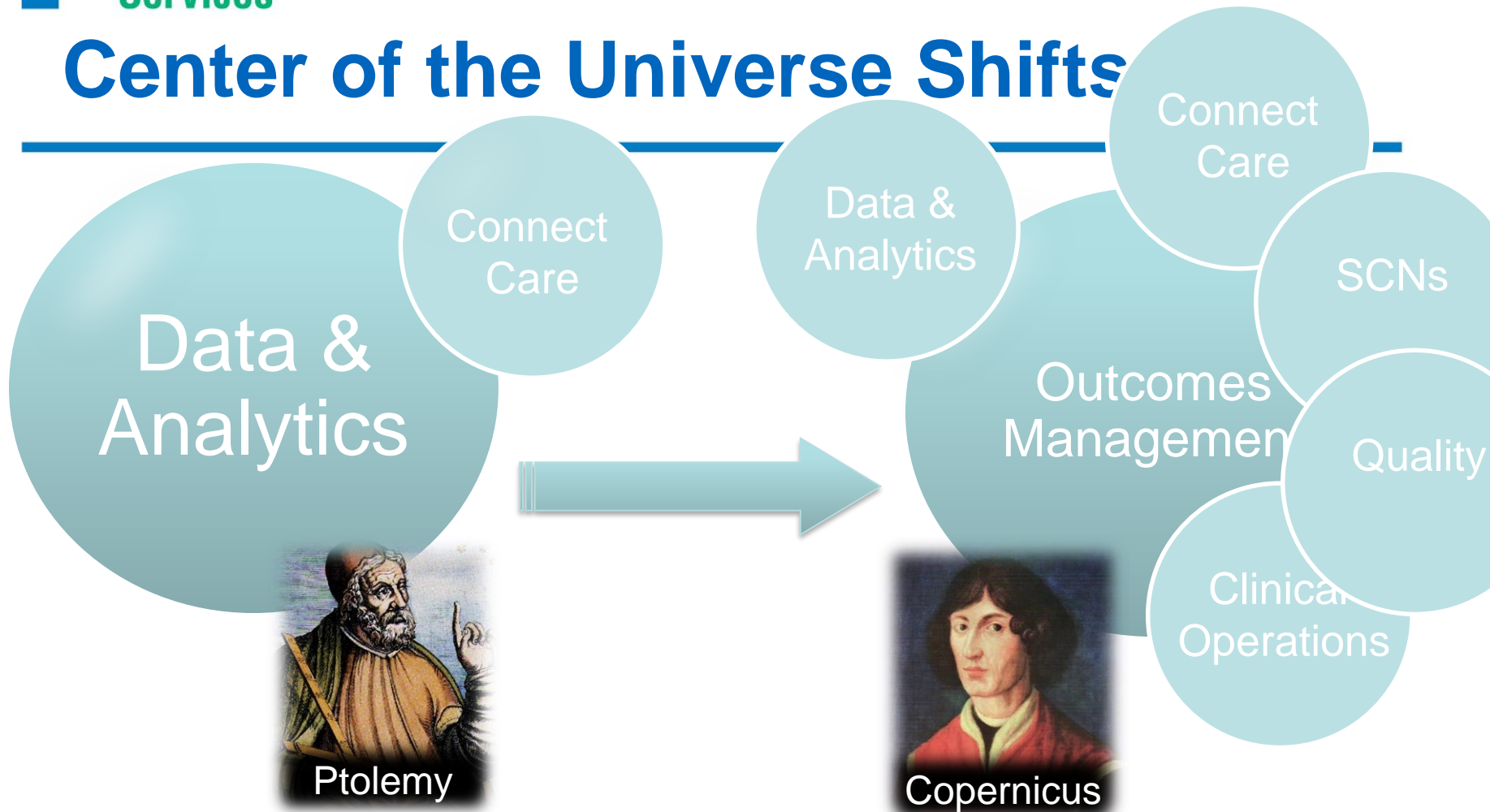
- [Data and Analytics Roadmap](#) approved by Analytics Executive Committee (AEC):
 - [Outcomes Improvement](#) is the priority for data and analytic capacity (IHOT: Improving Health Outcomes Together)
 - Implement the [analytic functions](#) required to become high performing – clinical, operational, and corporate
 - [Strategic data](#) acquisition (Quadruple Aim)
 - [Data literacy](#)
 - [Analyst](#) development
 - [Enterprise Data Warehouse \(EDW\) Roadmap – Modernizing The Environment](#)
 - [Secondary Use Data Policy](#) (data is an organizational asset that should be shared to improve outcomes)

Connect Care

Center of the Universe Shifts



Center of the Universe Shifts



Gaps that Connect Care Will Fill!

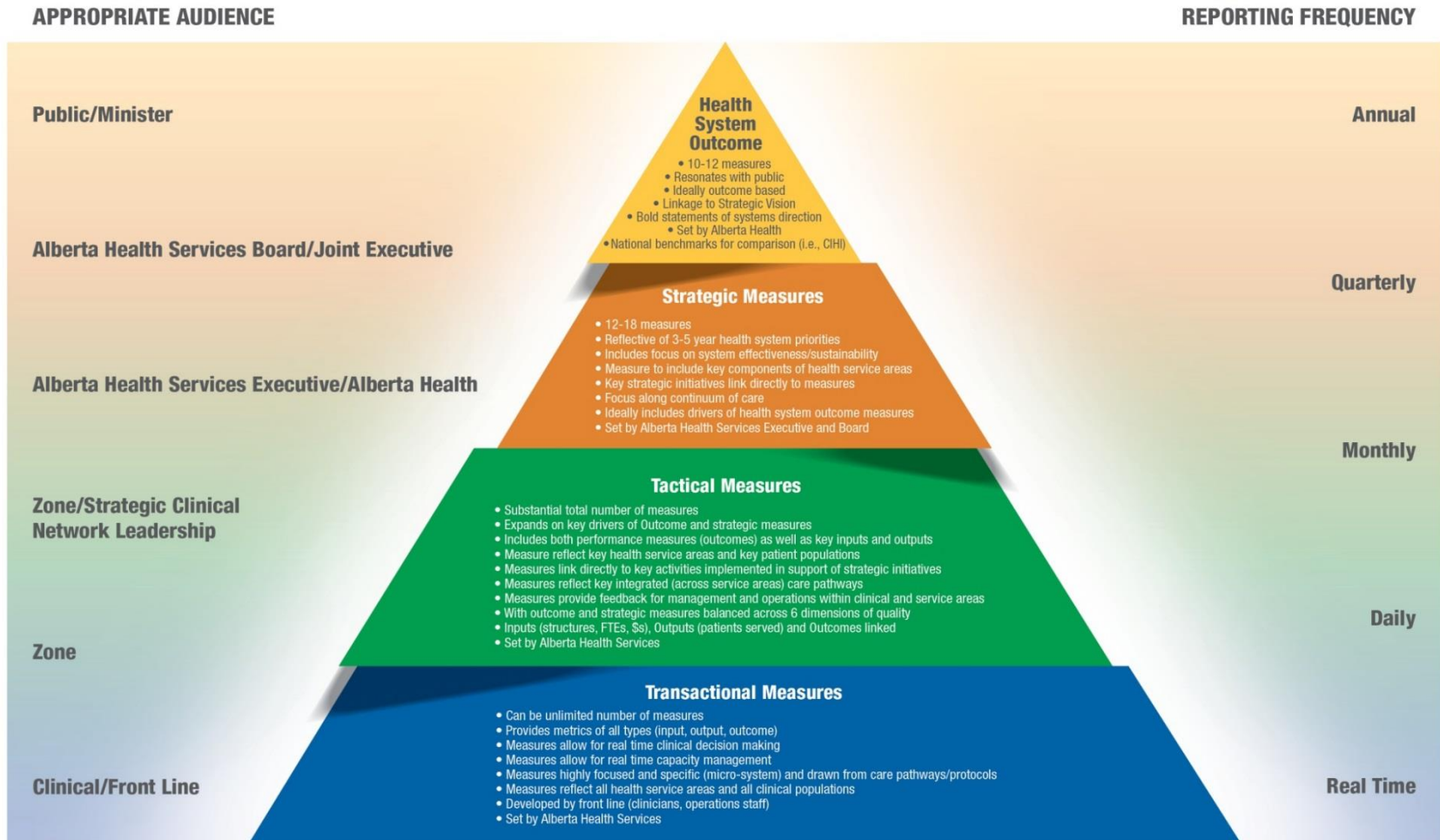
- **CLINICAL DATA IS CURRENTLY OUR MOST IMPORTANT DATA NEED!**
- **Connect Care will deliver the clinical process, clinical outcome, and operational data needed to help improve health outcomes**
- **Real time in-system operational and clinical reporting**

Connect Care - Analytics - How We See It

- Connect Care will create substantial data
- Implementation will 'break' many data streams and data will need to be conformed to meet provincial reporting requirements
- Data streams will become broader - across service domains and geography over time as Connect Care rolls out
- Eventually, EPIC CIS data will be the dominant source
- Reduced AHS analytics resources used to integrate data across disparate systems, and the need to understand multiple IT systems
- Over time, in-system data and analytics to grow and out-of-system will contract
- Epic tools complement the existing EDW and reporting and analytic tools
- Shifting data and analytic support to front line clinical operations to help improve outcomes – rely on EPIC for automated pathway activation, and support clinical workflows and real time decision support at the point of care

Building Our Measurement Systems from the Bottom up

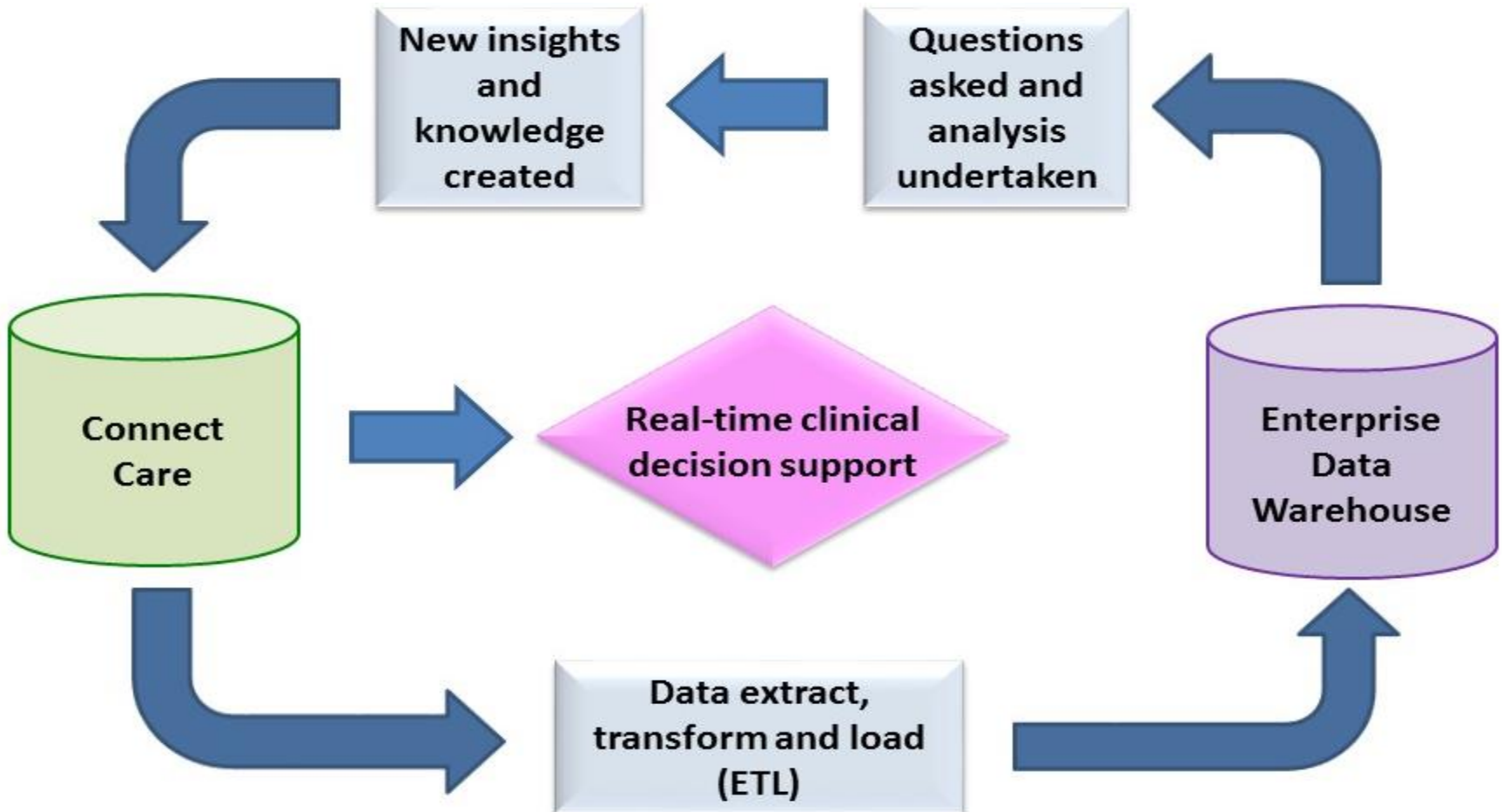
CASCADING ACCOUNTABILITIES FOR ANALYTICS



Analytics Requirements From EPIC

1. **Clear documentation** on the back end data models (EPIC Clarity)
2. Access to, and the ability to move, Clarity data into the EDW, **go-live**
3. **Closed Loop Analytics** - Integrate analytic content from AHS EDW to EPIC CIS at the point of care, real and near real time
4. **Collecting data** during the clinical care process, that is **NOT** captured as a by-product of care delivery (PROMs, PREMs)... (from patients and providers)
5. **Training** developing in-system data and analytic tools – Reporting Workbench, Radar

Closed Loop Analytics Lifecycle



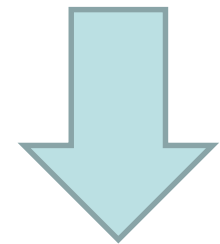
Quadruple Aim

Major Data Acquisition Strategies to Support the Quadruple Aim:

- Clinical CIS data
- Financials
- Clinical and Patient Reported Outcomes
- Patient Experience
- Staff Experience/engagement

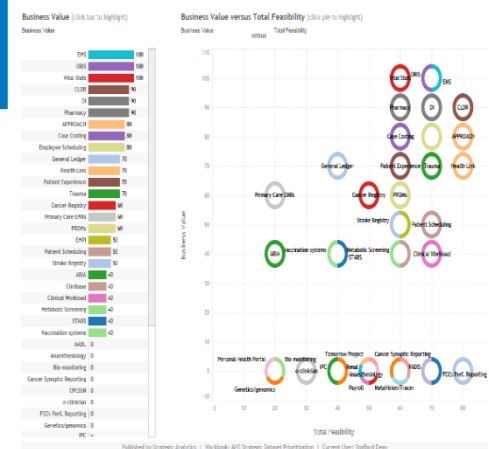


Prioritized Strategic Data Acquisition



AHS Strategic Dataset Prioritization (December, 2015)

Ranking the next group of data sets that should be made broadly available to analysts within the AHS Data Repository for Reporting (2015/2016)



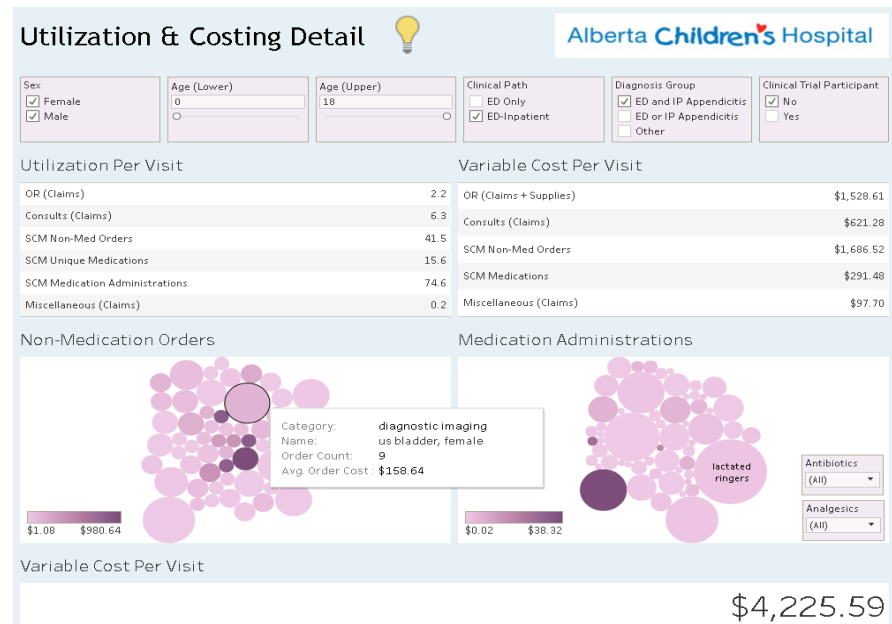
Patient Reported Outcomes

- APERSU (Alberta PROMs and EQ-5D Research and Support Unit)
- EQ5D
- Connect Care – Patient Portal (MyChart) and integrated into the CIS



Clinical Activity Based Costing

- ACH Demonstration
- Connect Care – clinical costing development outside of the CIS working with Finance



ACH Demonstration – Appendicitis Pathway

Alberta Children’s Hospital was an ideal site for a demo project because:

- An appendectomy pathway was in place
- SCM fully implemented across all service areas
- Clinical and operational leadership very keen and engaged

Clinical Costing – SCM Example

$$\sum \text{Clinical Activities} \times \text{Estimated Cost} = \text{Patient Cost}$$

CHART_NO	ULI	Item_ID	Item_date	Clinical Activity	Clinical Category	Estimated Cost
xxxxxx	#####	9.024172	3/31/2014 5:54:00.000000 PM	Family Practitioner/General Practitioner	Attending MD	\$70.00
xxxxxx	#####	9.024175	3/31/2014 11:30:00.000000 PM	Obstetrics and Gynecology	Attending MD	\$870.83
xxxxxx	#####	9.099386	3/31/2014 6:17:00.000000 PM	Complete Blood Count (CBC)	Laboratory	\$20.00
xxxxxx	#####	9.099386	3/31/2014 6:17:00.000000 PM	Type and Screen	Laboratory	\$28.00
xxxxxx	#####	9.099401	3/31/2014 11:30:00.000000 PM	Rescreening Syphilis	Laboratory	\$11.00
xxxxxx	#####	9.099405	4/1/2014 5:30:00.000000 AM	Rescreening Syphilis	Laboratory	\$11.00
xxxxxx	#####	9.099401	4/1/2014 6:00:00.000000 AM	Complete Blood Count (CBC)	Laboratory	\$20.00
xxxxxx	#####	9.001043	4/3/2014 9:10:00.000000 PM	REGULAR	Location/Nursing Charge	\$1,568.00
xxxxxx	#####	9.016349	3/31/2014 6:10:00.000000 PM	lactated ringers infusion	Medications	\$43.78
xxxxxx	#####	9.016349	3/31/2014 9:41:00.000000 PM	fantanyl EPIDURAL 2 microgram/mL	Medications	\$76.89
xxxxxx	#####	9.016349	3/31/2014 9:50:00.000000 PM	oxytocin infusion	Medications	\$9.89
xxxxxx	#####	9.016349	4/1/2014 12:10:00.000000 AM	metoclopramide inj	Medications	\$2.52
xxxxxx	#####	9.016350	4/1/2014 1:40:00.000000 AM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016350	4/1/2014 4:30:00.000000 AM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016350	4/1/2014 6:00:00.000000 AM	dalteparin inj	Medications	\$196.50
xxxxxx	#####	9.016350	4/1/2014 6:30:00.000000 AM	ceFAZolin inj	Medications	\$5.50
xxxxxx	#####	9.016350	4/1/2014 8:09:00.000000 AM	docusate sodium cap	Medications	\$18.98
xxxxxx	#####	9.016350	4/1/2014 8:10:00.000000 AM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016353	4/1/2014 10:17:00.000000 AM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016354	4/1/2014 12:50:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016354	4/1/2014 2:25:00.000000 PM	ceFAZolin inj	Medications	\$5.50
xxxxxx	#####	9.016355	4/1/2014 4:00:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016353	4/1/2014 4:00:00.000000 PM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016356	4/1/2014 8:55:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016350	4/1/2014 11:19:00.000000 PM	docusate sodium cap	Medications	\$18.98
xxxxxx	#####	9.016353	4/1/2014 11:19:00.000000 PM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016358	4/2/2014 1:00:00.000000 AM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016359	4/2/2014 5:12:00.000000 AM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016354	4/2/2014 6:45:00.000000 AM	dalteparin inj	Medications	\$196.50
xxxxxx	#####	9.016353	4/2/2014 6:45:00.000000 AM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016363	4/2/2014 7:33:00.000000 AM	sodium chloride 0.9% flush/lock inj	Medications	\$4.35
xxxxxx	#####	9.016350	4/2/2014 8:11:00.000000 AM	docusate sodium cap	Medications	\$18.98
xxxxxx	#####	9.016353	4/2/2014 10:25:00.000000 AM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016356	4/2/2014 12:03:00.000000 PM	aluminum / magnesium hydroxides liquid	Medications	\$22.22
xxxxxx	#####	9.016362	4/2/2014 1:04:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016353	4/2/2014 4:32:00.000000 PM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016364	4/2/2014 4:40:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016363	4/2/2014 5:45:00.000000 PM	sodium chloride 0.9% flush/lock inj	Medications	\$4.35
xxxxxx	#####	9.016350	4/2/2014 9:52:00.000000 PM	docusate sodium cap	Medications	\$18.98
xxxxxx	#####	9.016365	4/2/2014 9:52:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016353	4/2/2014 9:52:00.000000 PM	ketorolac inj	Medications	\$2.42
xxxxxx	#####	9.016366	4/3/2014 2:04:00.000000 AM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016350	4/3/2014 2:04:00.000000 AM	ibuprofen tab	Medications	\$0.35
xxxxxx	#####	9.016359	4/3/2014 6:12:00.000000 AM	dalteparin inj	Medications	\$196.50
xxxxxx	#####	9.016367	4/3/2014 6:12:00.000000 AM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016367	4/3/2014 6:12:00.000000 AM	ibuprofen tab	Medications	\$0.35
xxxxxx	#####	9.016360	4/3/2014 8:00:00.000000 AM	docusate sodium cap	Medications	\$18.98
xxxxxx	#####	9.016371	4/3/2014 10:45:00.000000 AM	ibuprofen tab	Medications	\$0.35
xxxxxx	#####	9.016371	4/3/2014 1:02:00.000000 PM	oxycodone/acetaminophen 5 mg/325 mg tab	Medications	\$7.69
xxxxxx	#####	9.016372	4/3/2014 4:17:00.000000 PM	domperidone tab	Medications	\$1.44
xxxxxx	#####	9.016372	4/3/2014 4:19:00.000000 PM	ibuprofen tab	Medications	\$0.35
xxxxxx	#####	9.016373	4/3/2014 8:05:00.000000 PM	ibuprofen tab	Medications	\$0.35
xxxxxx	#####	9.016350	4/3/2014 8:06:00.000000 PM	acetaminophen tab	Medications	\$2.20
xxxxxx	#####	9.099393	3/31/2014 8:38:00.000000 PM	Notify	Patient Care	\$1.22
xxxxxx	#####	9.099393	3/31/2014 8:38:00.000000 PM	Clinical Communication	Patient Care	\$8.09
xxxxxx	#####	9.099393	3/31/2014 8:38:00.000000 PM	Activity as Tolerated	Patient Care	\$8.62
xxxxxx	#####	9.099393	3/31/2014 8:38:00.000000 PM	Fetal Monitoring	Patient Care	\$10.03
xxxxxx	#####	9.099396	3/31/2014 9:41:00.000000 PM	Invasive Anesthetic Technique Performed	Patient Care	\$89.90
xxxxxx	#####	9.099396	3/31/2014 9:41:00.000000 PM	Notify	Patient Care	\$1.22

$$\text{Patient Cost} = \sum \text{Patient Activities} = \$4,027$$

Utilization & Costing Detail



Sex

Female

Male

Age (Lower)

0

0

Age (Upper)

18

0

Clinical Path

ED Only

ED-Inpatient

Diagnosis Group

ED and IP Appendicitis

ED or IP Appendicitis

Other

Clinical Trial Participant

No

Yes

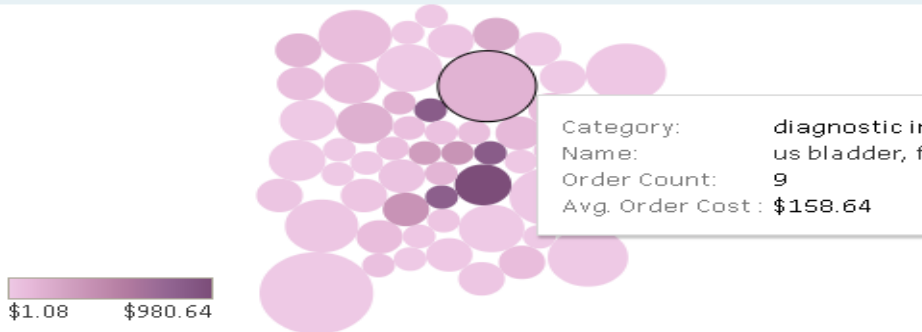
Utilization Per Visit

OR (Claims)	2.2
Consults (Claims)	6.3
SCM Non-Med Orders	41.5
SCM Unique Medications	15.6
SCM Medication Administrations	74.6
Miscellaneous (Claims)	0.2

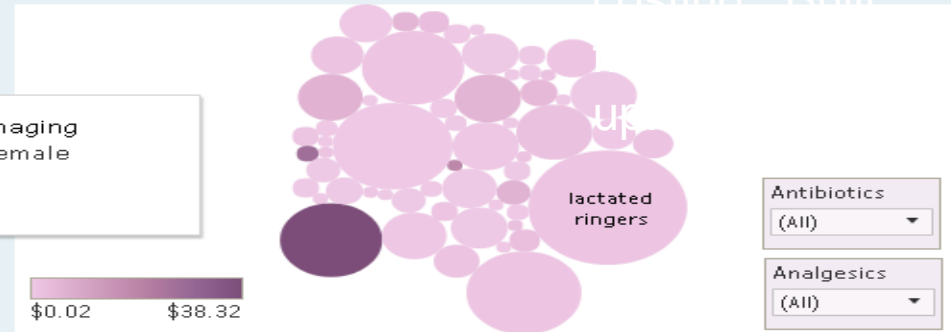
Variable Cost Per Visit

OR (Claims + Supplies)	\$1,528.61
Consults (Claims)	\$621.28
SCM Non-Med Orders	\$1,686.52
SCM Medications	\$291.48
Miscellaneous (Claims)	\$97.70

Non-Medication Orders



Medication Administrations



Patient Clinical Activity drives costing. Built

Variable Cost Per Visit

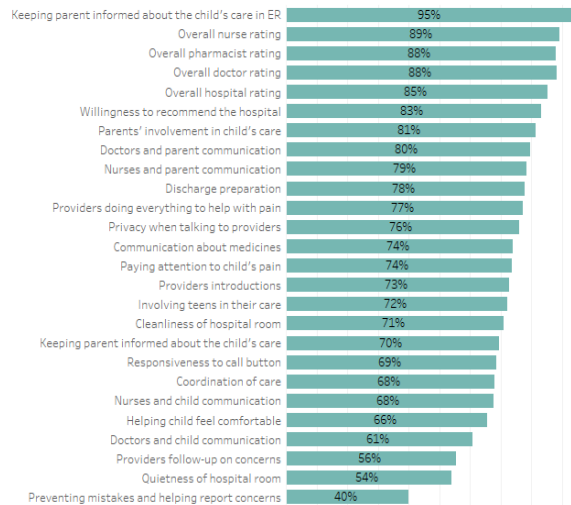
\$4,225.59


Experience

- Broader capture of experience across the continuum
- Connect Care – out-of-system near real time feedback

Child Inpatient Survey: Composite Scores for Province

Composite scores are aggregates of questions contained within each measure. Averages of question responses are taken and weights are applied.



Select Domain 

- Attention to Safe..
- Communication ..
- Communication ..
- Global Rating
- Hospital Environ..


Select Time Period
Fiscal Year

Time Period

- 2015/16
- 2016/17
- 2017/18
- 2018/19

Response Options

- Top Box



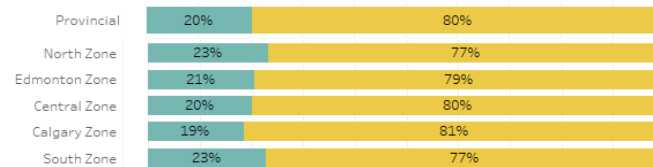
Composite Measures: Adult Inpatient

This dashboard compares the provincial scores to the individual zone scores. Hovering over each zone score displays the scores for each site. Composite scores are aggregates of questions contained within each domain. Averages of top box responses are taken.



Hovering over zone scores produces a pop up with site scores for each zone.

Composite Scores for All



Select a Domain
Global Rating

Top Box
 Middle and Bottom Box
 Top Box

Select a Time Period
Quarter

Time Period
All

Global Rating

How would you rate the quality of care you most recently received at the hospital?

Using any number from 0 (worst hospital possible) to 10 (best hospital possible), what is your overall rating of your stay in the hospital?

We want to know overall, do you feel you were helped by your hospital stay? Please answer on a scale where 0 is 'not helped at all' and 10 is 'helped a great deal'.

We want to know your overall experience with your hospital stay. Please answer on a scale where 0 is 'I had a very poor experience' and 10 is 'I had a very good experience'.

Research

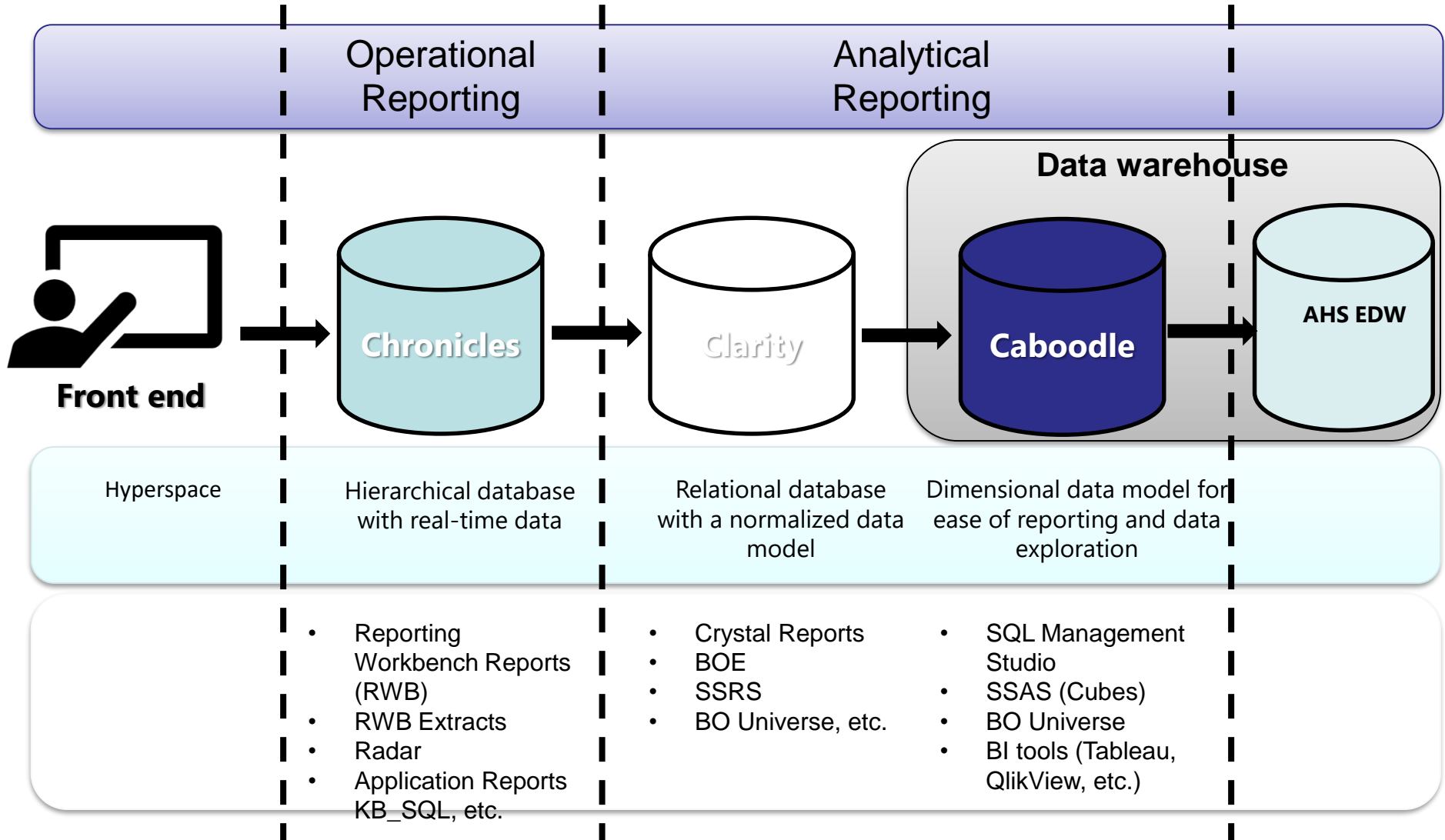
- Embraced the value of research
- Leverage the data environment we have for SPOR
- Standardized friendly consistent research support process



Connect Care Wave 1 Sites -

- Wave one sites will be the data and analytics development sites
- Focus on OpTime OR Epic Module
- Clinical Activity Based Costing
- PROMs
- OR operational reporting
- Near real time patient experience capture
- OR triggers and other safety management data

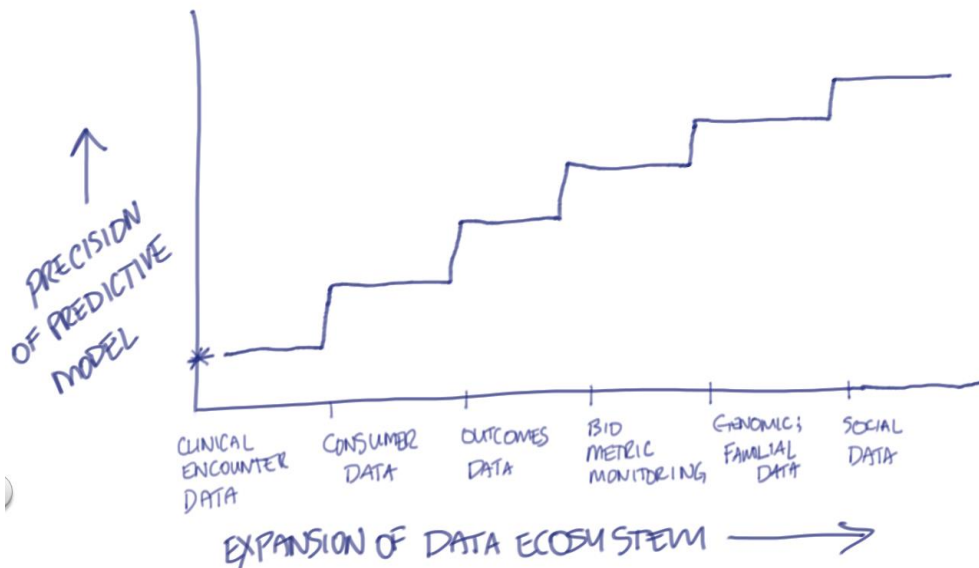
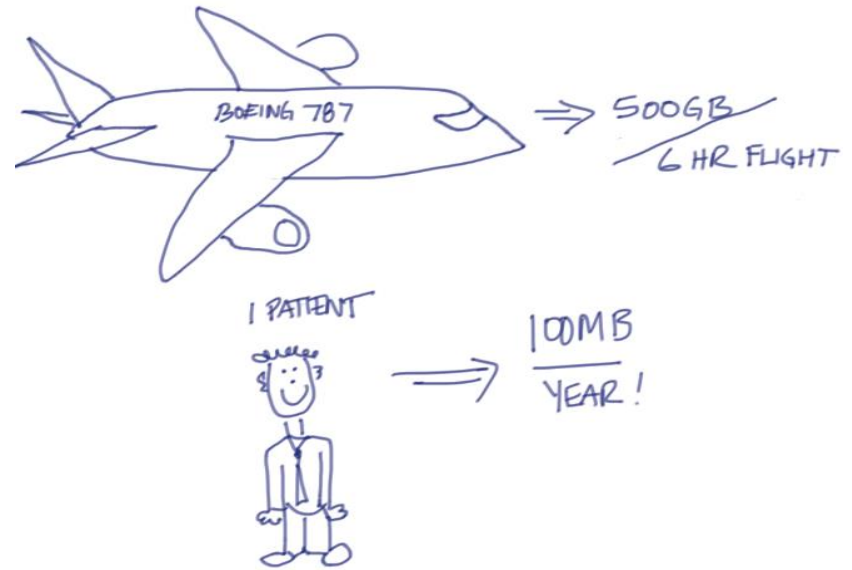
Flow of Data



Provincial Perspectives

- AHS is only part of the system – EPIC is largely a hospital EMR
- Need to integrate across other parts (primary care, community specialty care, community diagnostics)
- One data system to serve them all – AH, AHS, HQCA, AMA, PCNs, College, Universities...
- Health and Non-health data
- Unique opportunity
- Data lab – 4.2M individuals
- **Data can be Alberta's next big asset!**

The Human Data Ecosystem



Dale Sanders – HAS 2017

AI/ML Buzz

- AI
- ML
- NLP
- Streaming analytics
- Video analytics



Challenges

- Need use cases
- Complexity of data
- Quality of data
- Outcomes improvement is hard work
- How to support access for AI and ML applications

Imagine If:

- Between a clinician and their patient you could say:
-
- "I can make a **health optimization recommendation** for you, informed not only by the **latest clinical trials**, but also by **local and regional data** about **patients like you**; the real-world **health outcomes** over time of every **patient like you**; and the **level of your interest** and **ability to engage** in your own care. In turn, I can tell you within a **specified range of confidence**, which **treatment** or health management plan is **best suited** for a patient specifically **like you** and how much that **will cost.**"*

This statement embodies outcomes and cost data, predictive analytics, machine learning, social determinants data, recommendation engines, personalized medicine

*—Inspired by the Learning Health Community – Dale Sanders