VANDERBILT UNIVERSITY School of Medicine

Using Data to Improve Care In The NORA Setting

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Disclosures

No financial relationships with the manufacturers of health care products.

- Currently serving on
  - AQI Data Definitions Committee
  - AQI Data Use Committee
  - AQI Registry Operations Committee

- Prior support from
  - Support from NIH R01 EB020666-01A1 (Identification, Extraction and Display of Clinical Data Patterns with Application to Anesthesia Workflows)
  - Support from NSF 1526014 (Analysis and Tools for Auditing)
  - Funding from IBM as part of the

CMS Artificial Intelligence Health Outcomes Challenge

FAER
Foundation for Anesthesia Education and Research

Learning Objectives

- Describe how data can be extracted from the electronic health care record
- Understand the role of 3rd party systems in generating data for quality
- Review results from analyses of large NORA data sets

Our Data Conundrum

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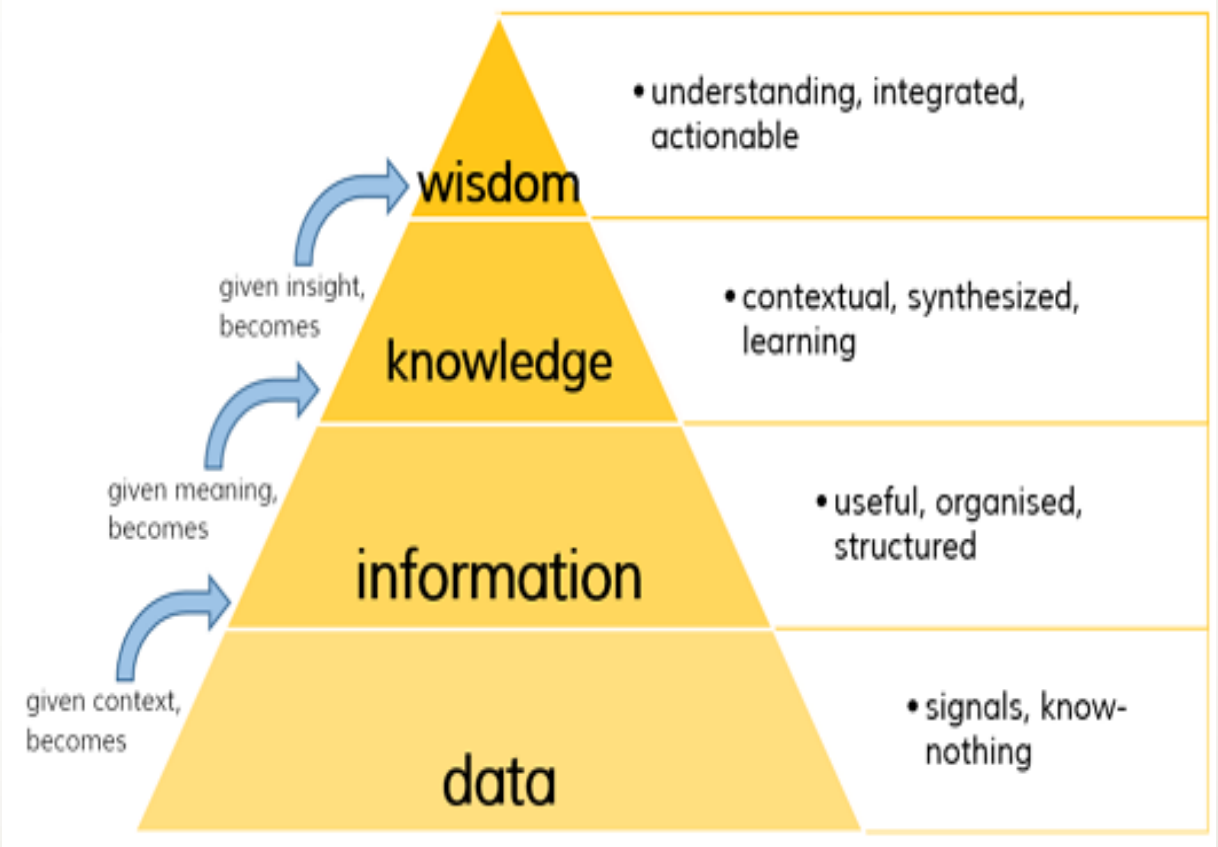
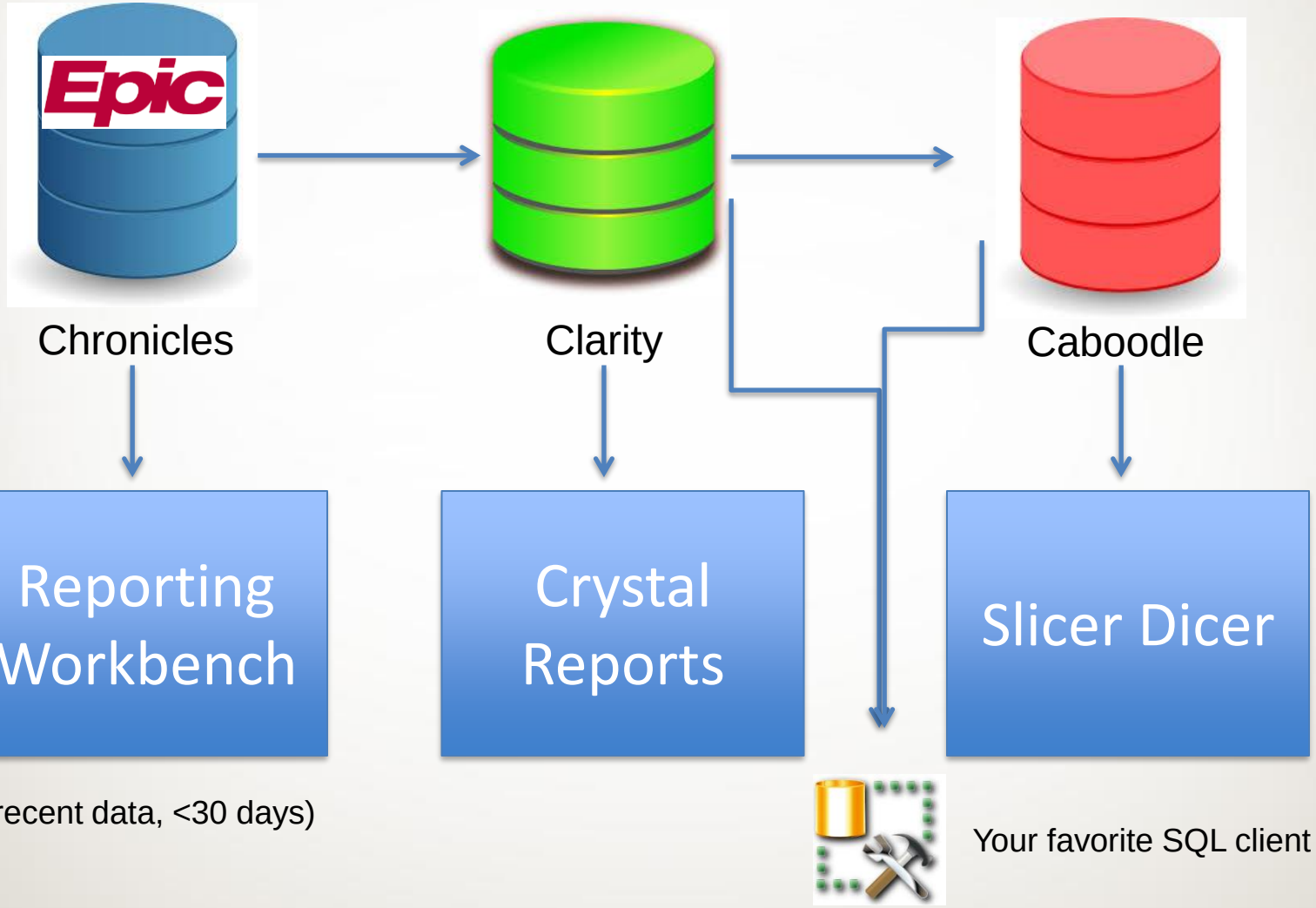


…how can we make our data more useful?

Build a Data Model

- VUMC Perioperative Data Warehouse Model
  - VPIMS + Clarity + Caboodle
  - Singular representation of cases from 2000 – today
    - Patient: Demographics, comorbidities
    - Case: Times, meds, fluids, staff, etc
    - Outcomes: PONV, AKI, etc
    - Admission: Length of stay, mortality
  - Requires a lot of mapping and validation
- Other models: MPOG, NACOR, Caboodle

Reporting Platforms

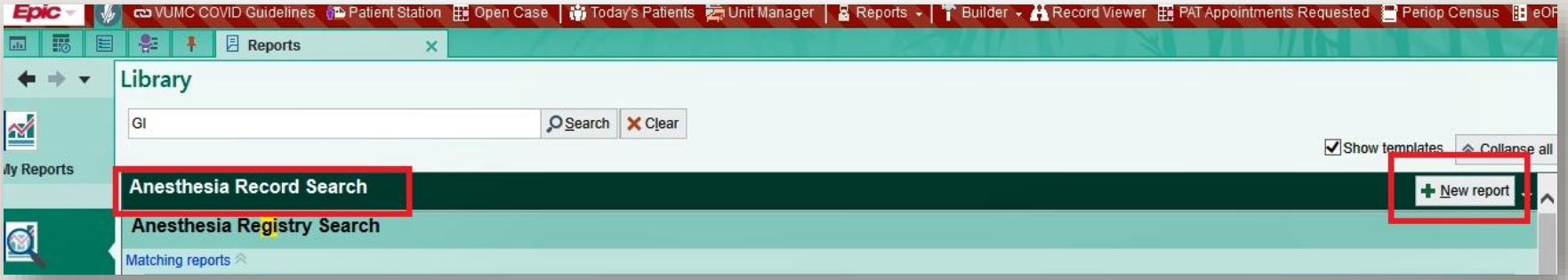


An Example

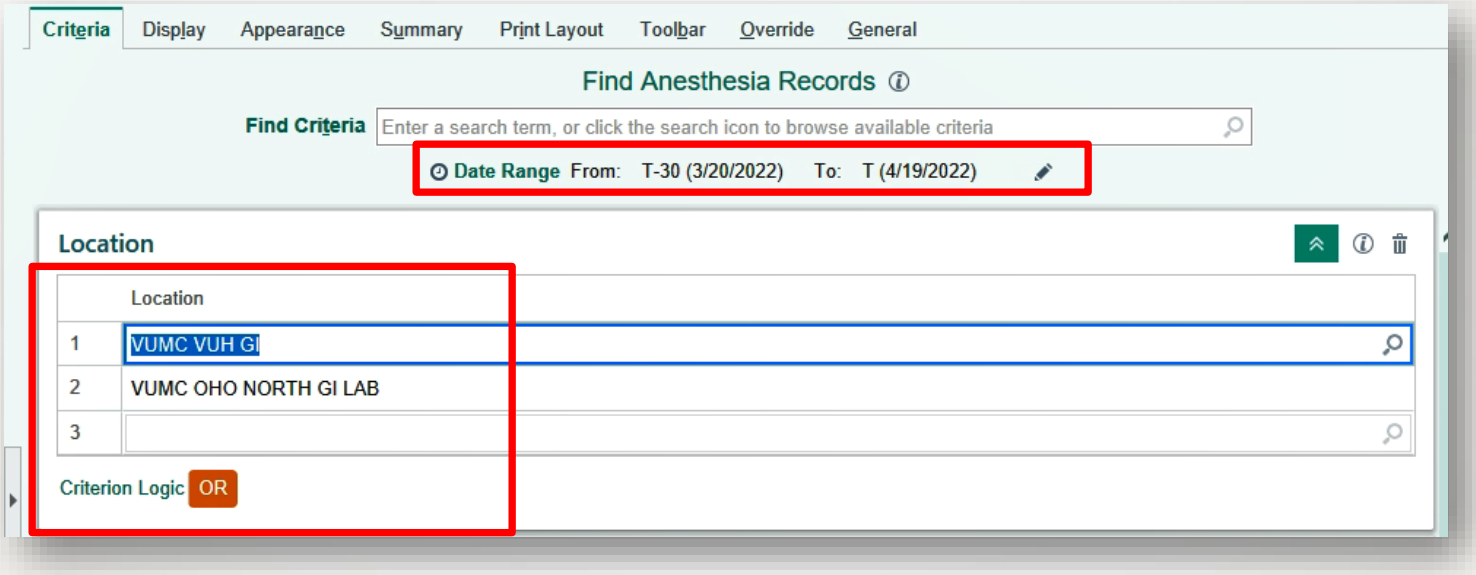
- How many times did we lose an airway in GI the past 30 days?
  - Defined as any SpO2 < 50%

Reporting Workbench

Create a New Report

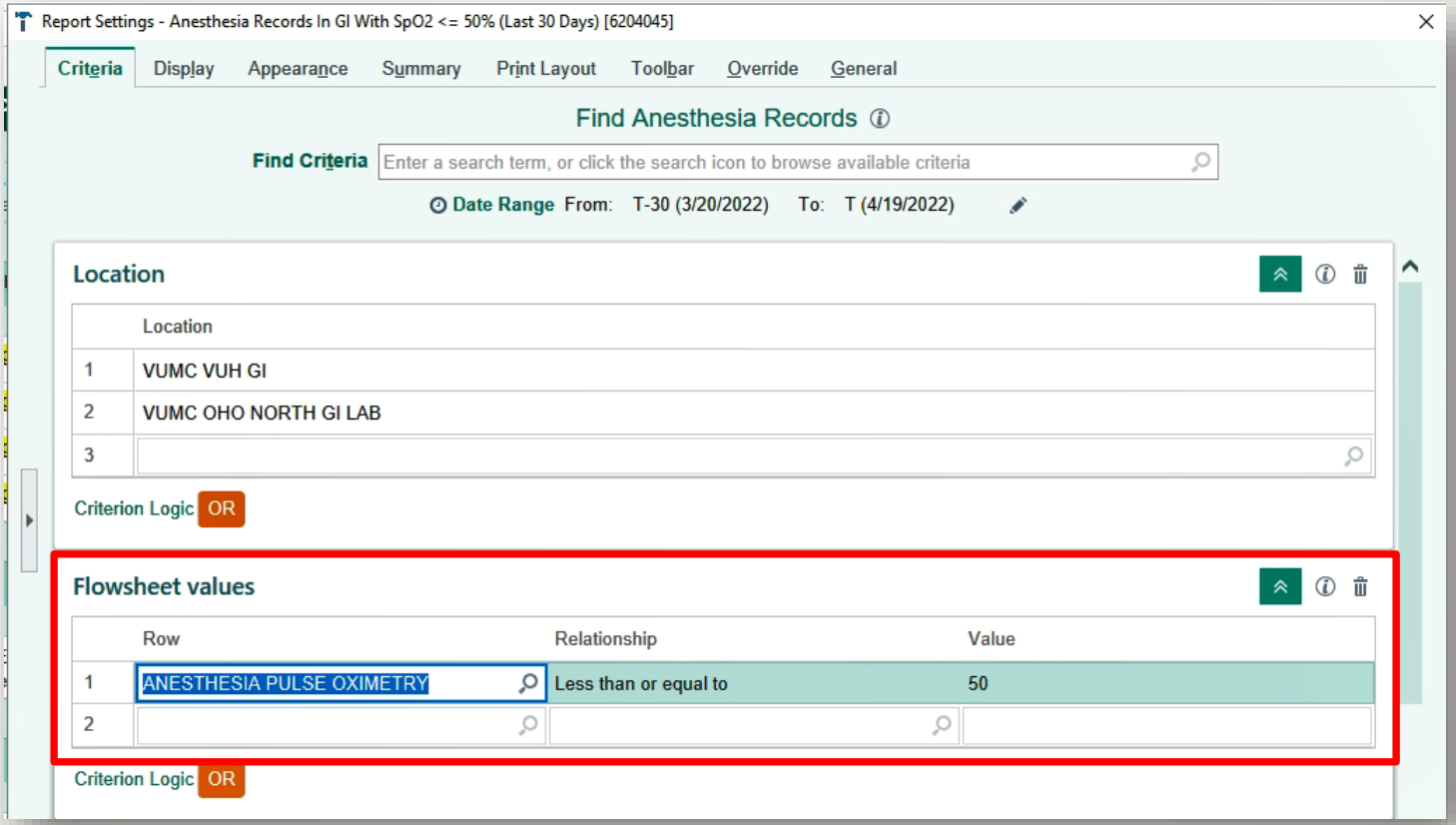


Add location and dates

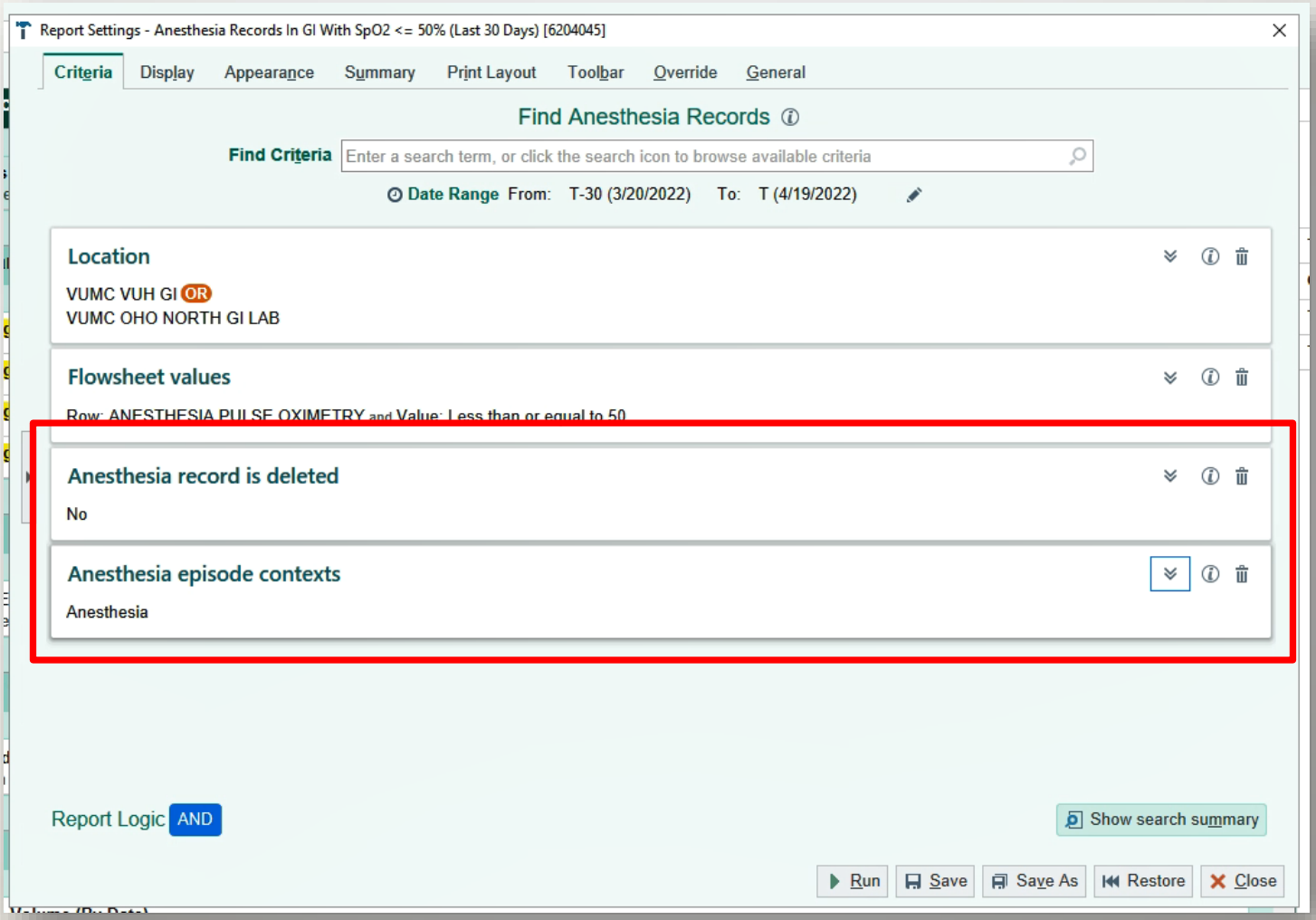


Reporting Workbench

Add SpO2 < 50%



Completed Report



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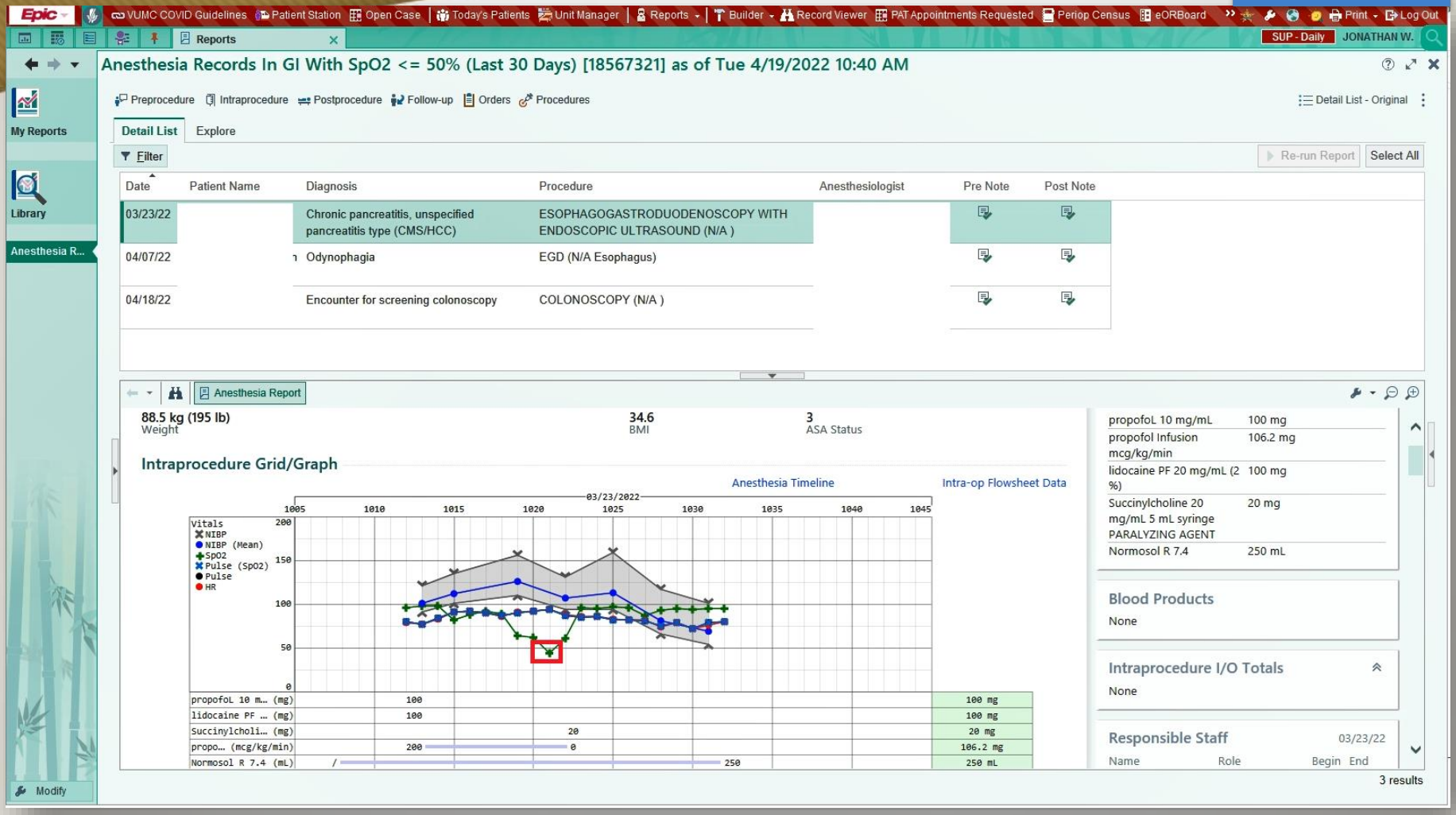
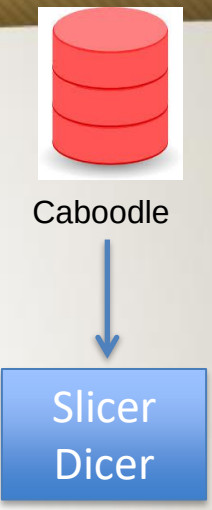
Reporting Workbench



An Example



- What's the NORA acuity like over the past 6 months, aside from GI?
  - Defined as
    - Interventional radiology
    - Fluoroscopy
    - MRI
    - CT (ED, main hospital)

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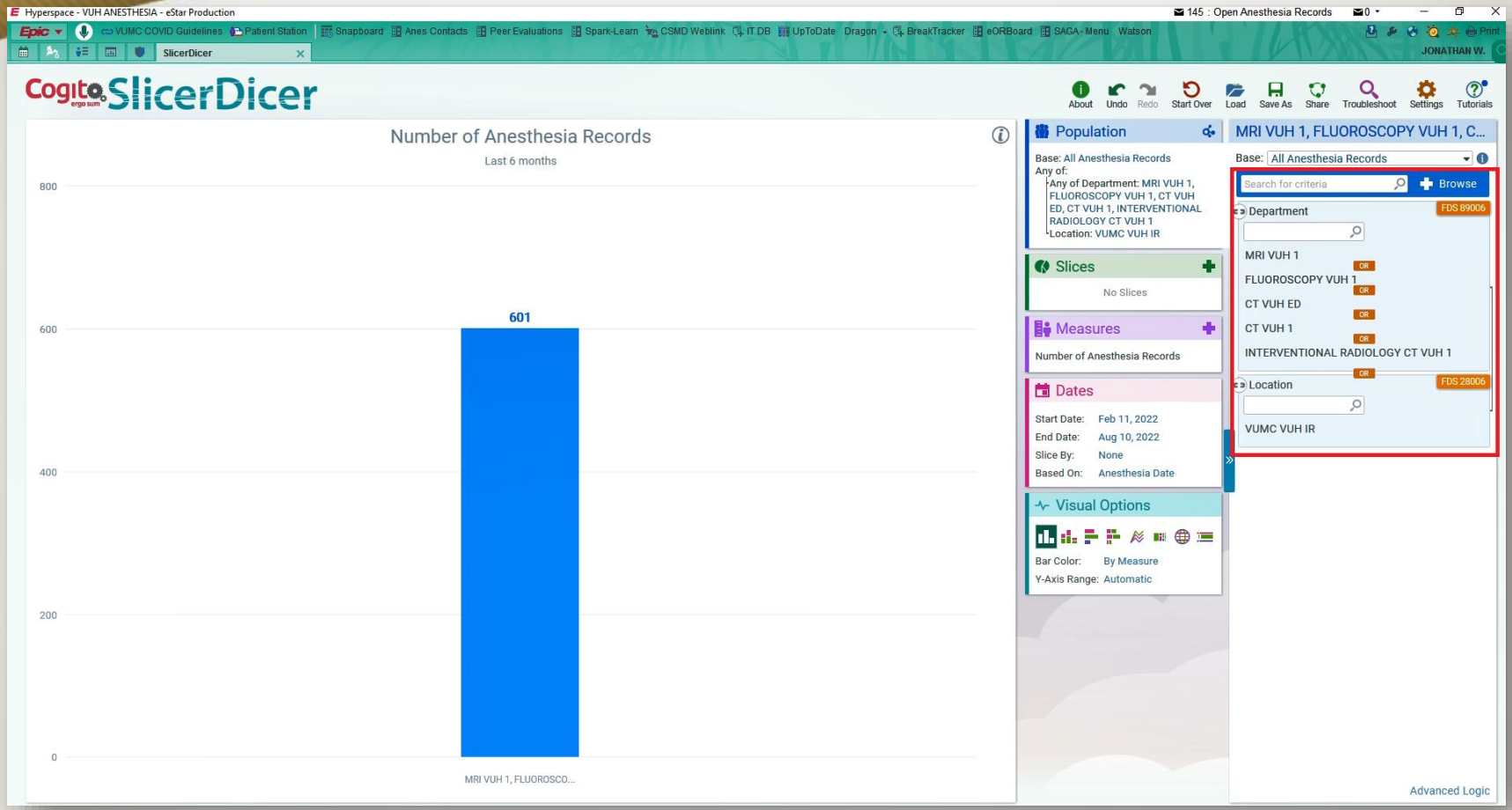
Slicer Dicer



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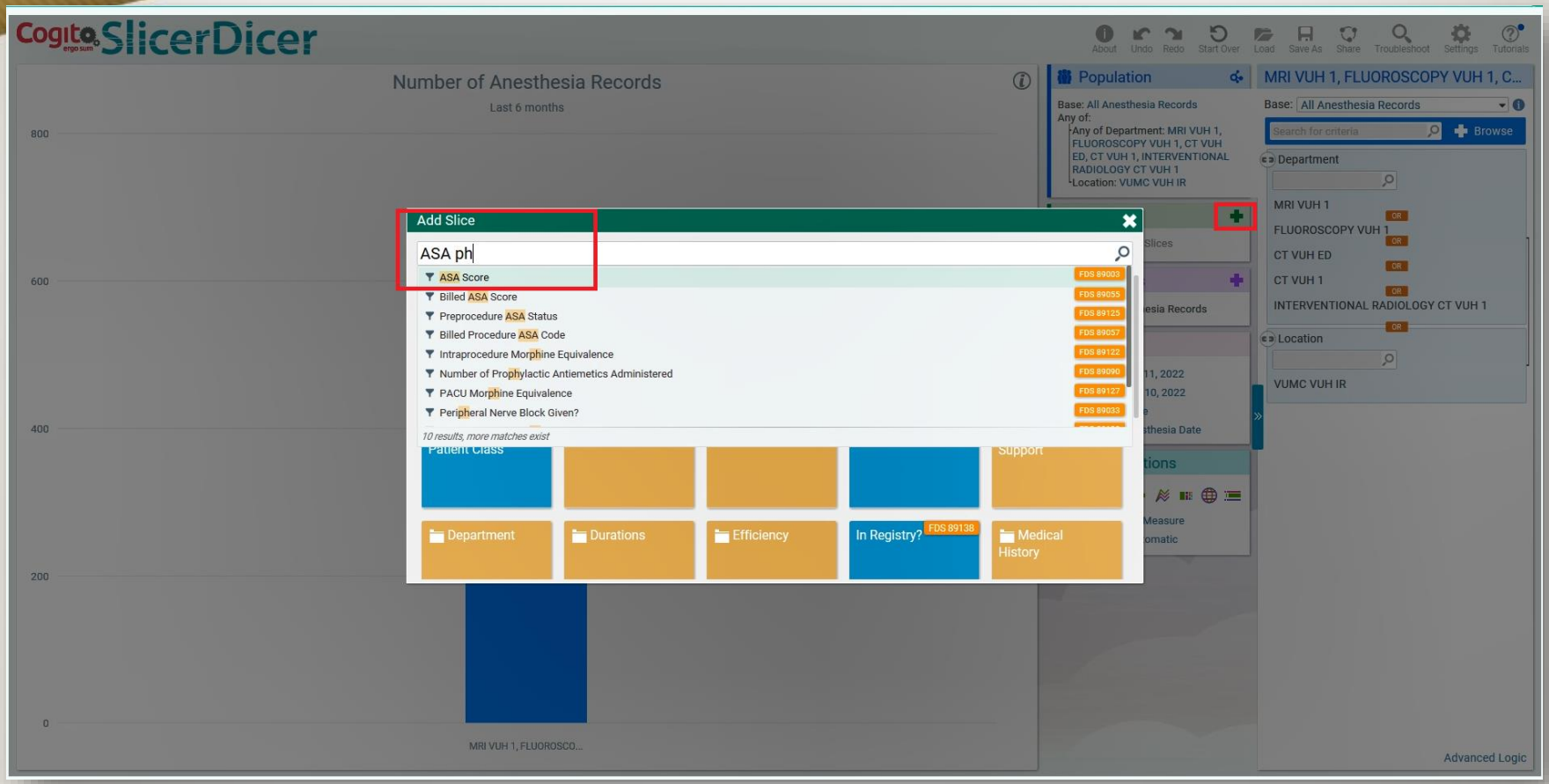

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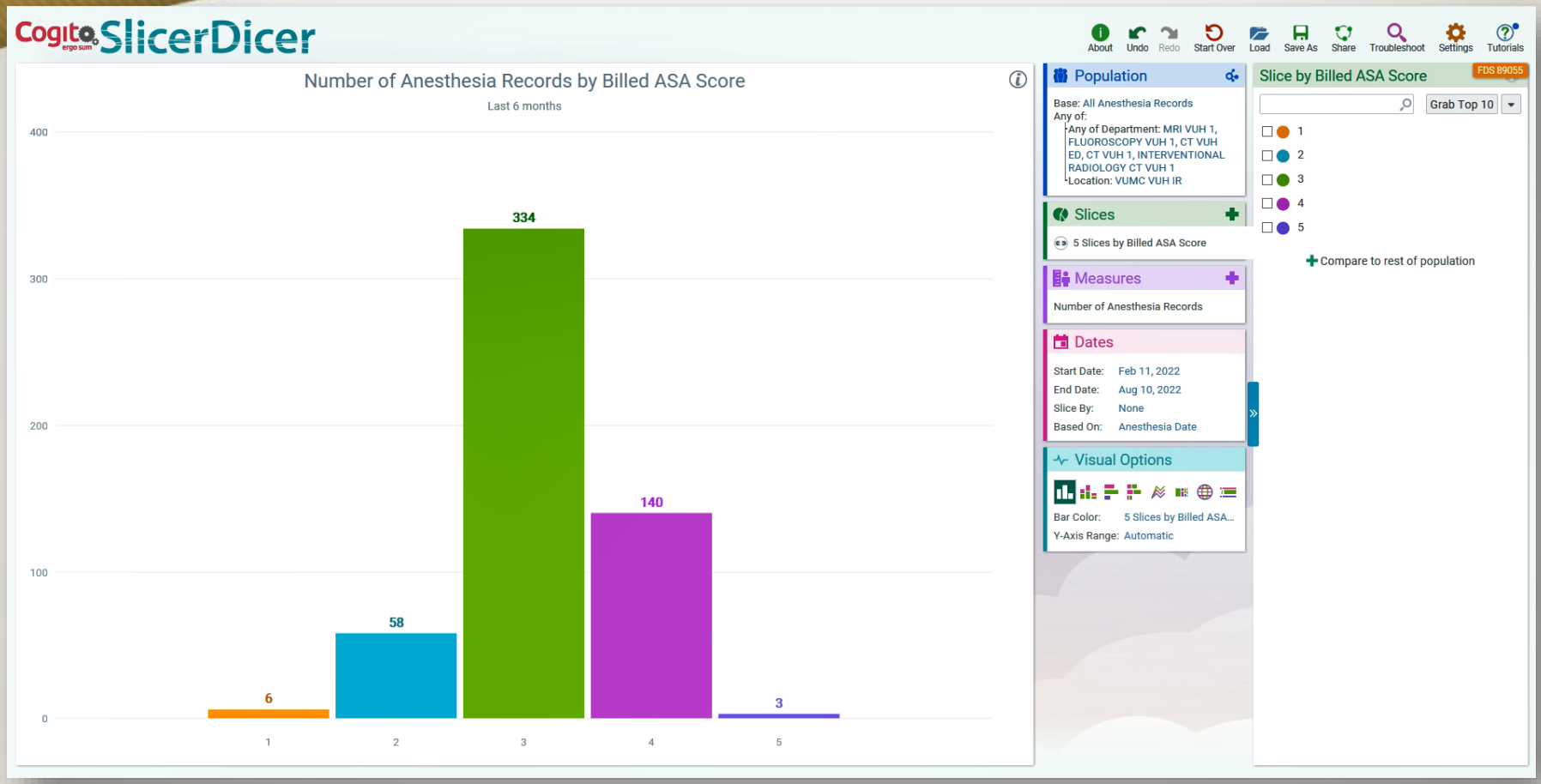
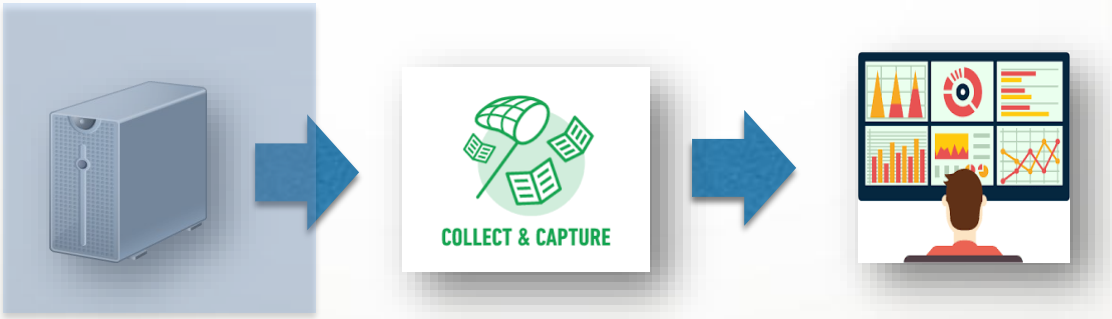


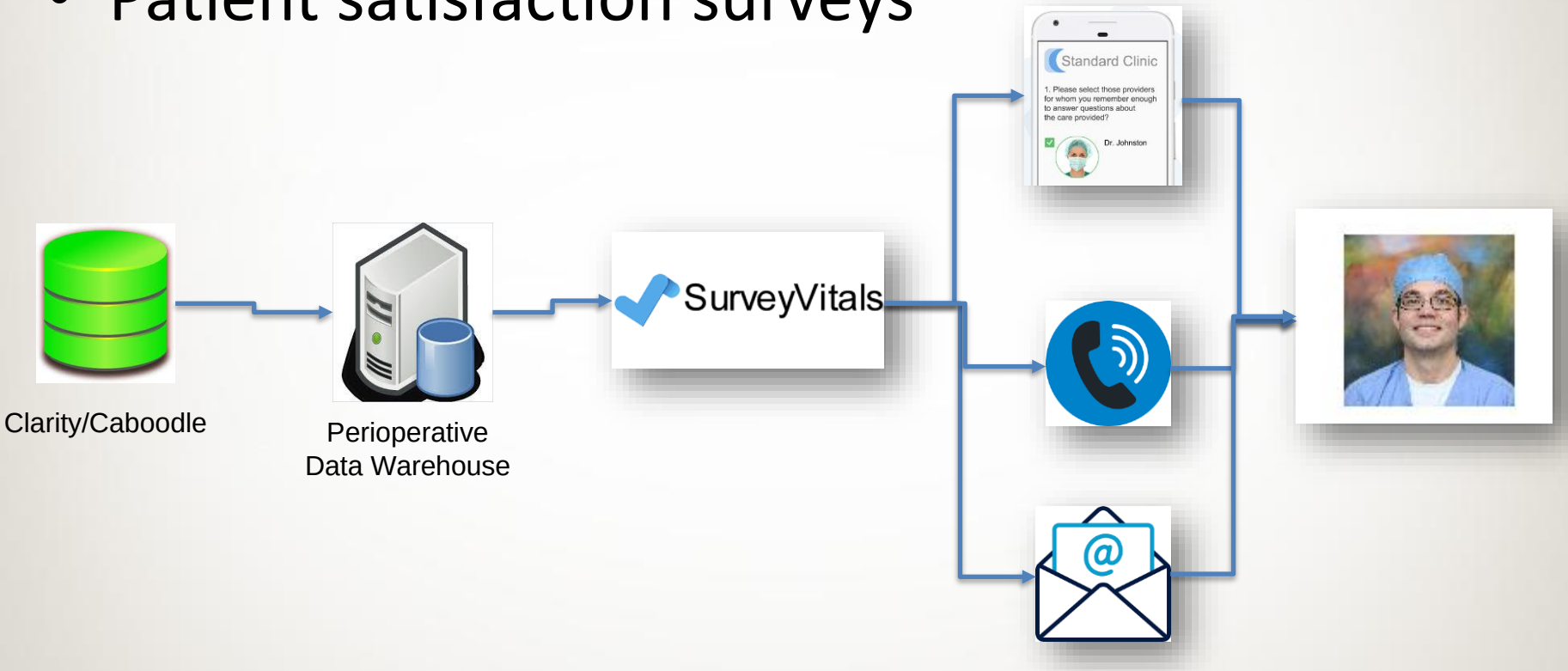
Roadmap

- How to get quality data out of your EHR
- Systems for quality data capture
- Review of NORA “big data” analyses

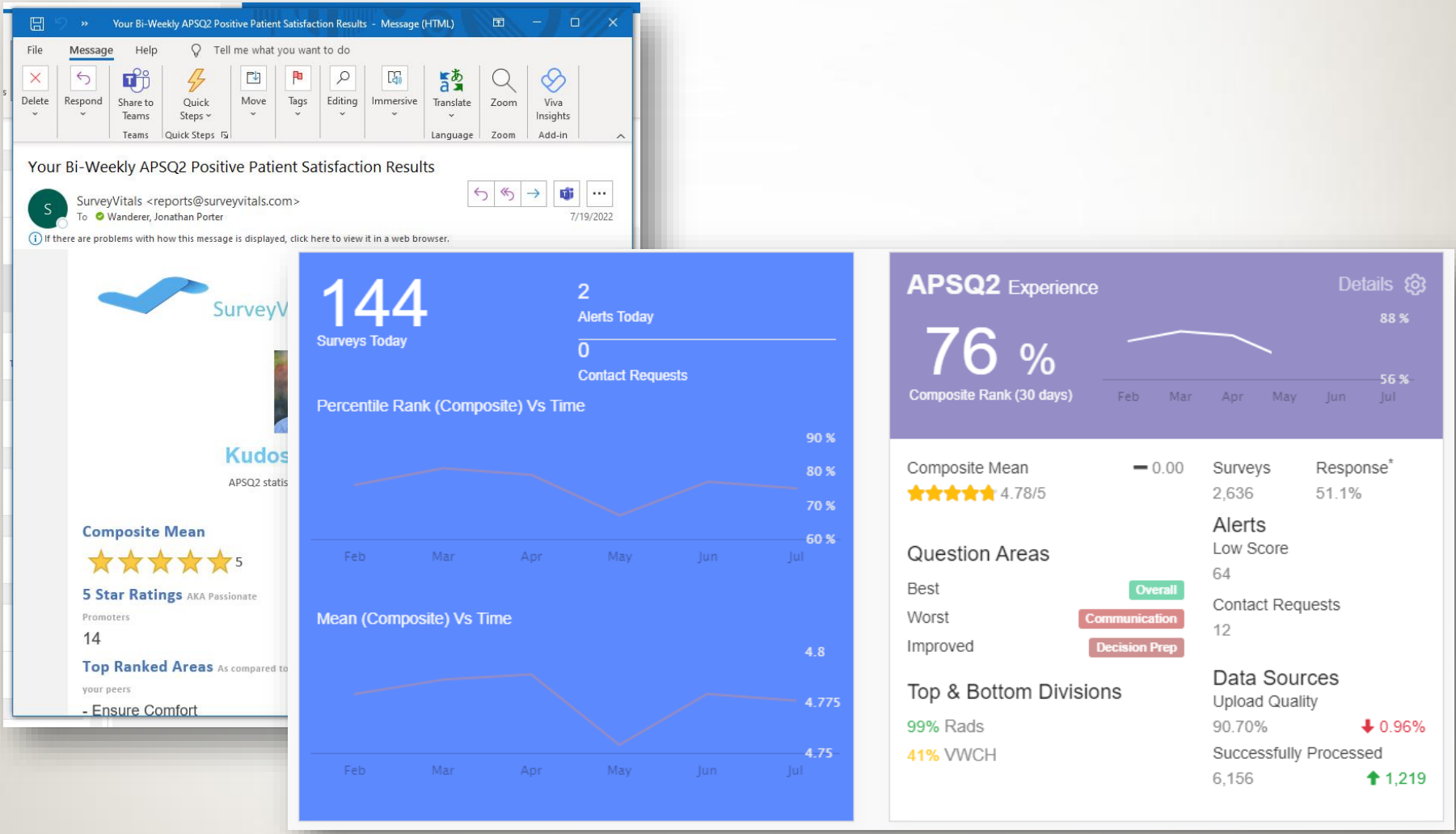


Data from Patients

- Patient satisfaction surveys

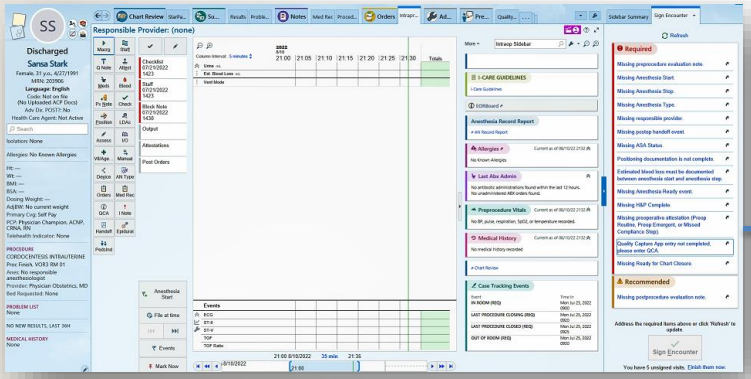


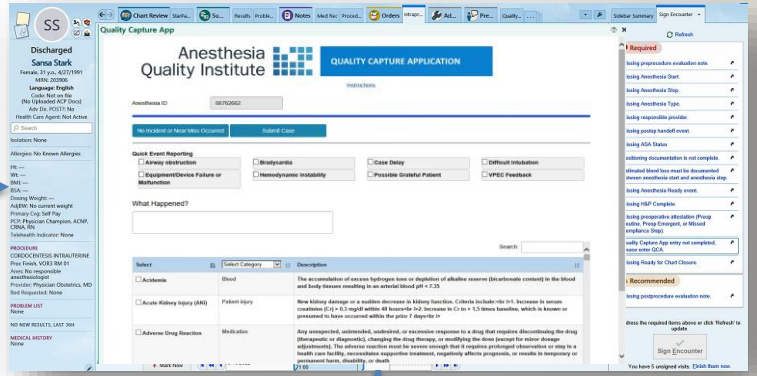
Data from Patients



Non-EHR Data from Providers

- Quality Capture Application





Requirement completed?

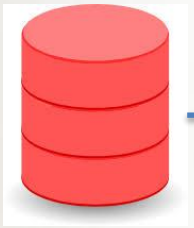
Epic Database

Details of event

QCA Database

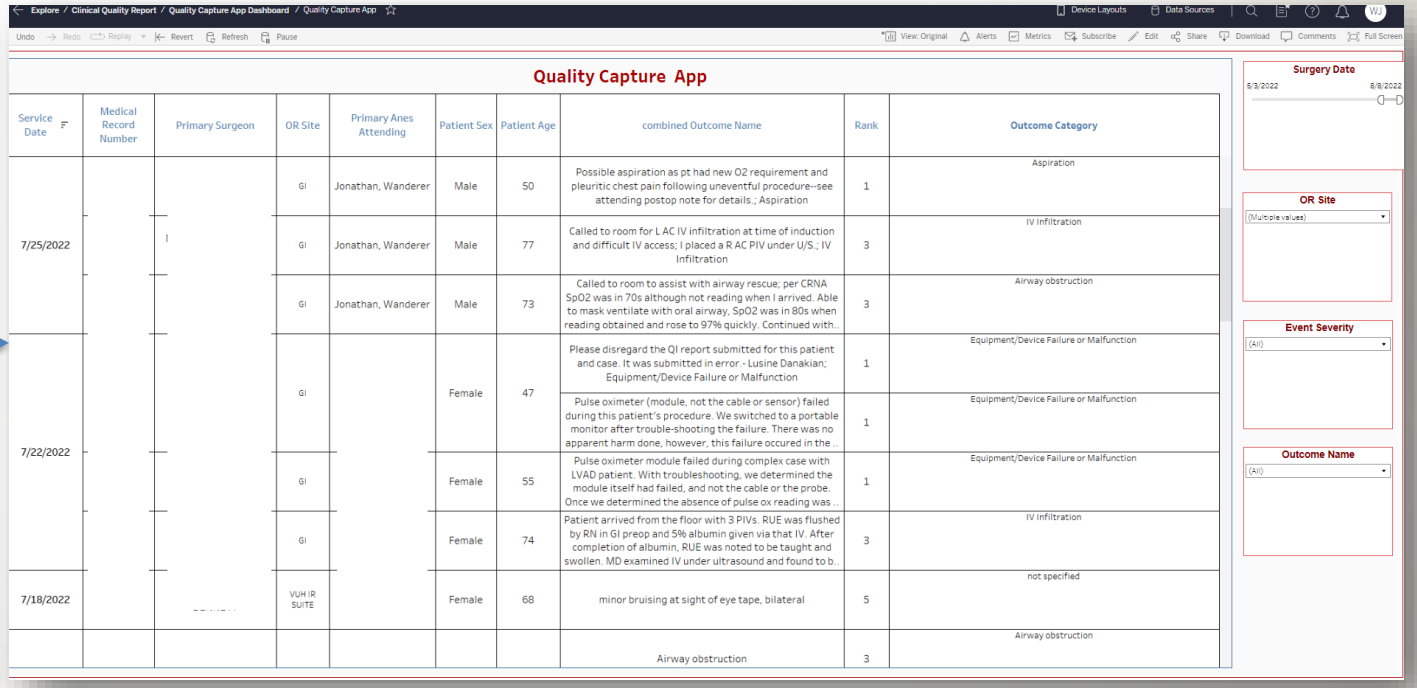
Non-EHR Data from Providers

- QCA Dashboard, NORA Filtered



QCA Database

Perioperative
Data Warehouse



Quality Capture App

Service Date	Medical Record Number	Primary Surgeon	OR Site	Primary Anes Attending	Patient Sex	Patient Age	combined Outcome Name	Rank	Outcome Category
7/25/2022			GI	Jonathan, Wanderer	Male	50	Possible aspiration as pt had new O2 requirement and pleuritic chest pain following uneventful procedure--see attending postop note for details.; Aspiration	1	Aspiration
			GI	Jonathan, Wanderer	Male	77	Called to room for L AC IV infiltration at time of induction and difficult IV access; I placed a R AC PIV under U/S.; IV Infiltration	3	IV Infiltration
			GI	Jonathan, Wanderer	Male	73	Called to room to assist with airway rescue; per CRNA SpO2 was in 70s although not reading when I arrived. Able to mask ventilate with oral airway, SpO2 was in 80s when reading obtained and rose to 97% quickly. Continued with..	3	Airway obstruction
7/22/2022			GI		Female	47	Please disregard the QI report submitted for this patient and case. It was submitted in error.- Lusine Danakian; Equipment/Device Failure or Malfunction	1	Equipment/Device Failure or Malfunction
							Pulse oximeter (module, not the cable or sensor) failed during this patient's procedure. We switched to a portable monitor after trouble-shooting the failure. There was no apparent harm done, however, this failure occured in the..	1	Equipment/Device Failure or Malfunction
			GI		Female	55	Pulse oximeter module failed during complex case with LVAD patient. With troubleshooting, we determined the module itself had failed, and not the cable or the probe. Once we determined the absence of pulse ox reading was ..	1	Equipment/Device Failure or Malfunction
			GI		Female	74	Patient arrived from the floor with 3 PIVs. RUE was flushed by RN in GI preop and 5% albumin given via that IV. After completion of albumin, RUE was noted to be taught and swollen. MD examined IV under ultrasound and found to b..	3	IV Infiltration
7/18/2022			VUH IR SUITE		Female	68	minor bruising at sight of eye tape, bilateral	5	not specified
							Airway obstruction	3	Airway obstruction

Surgery Date
5/3/2022 8/8/2022

OR Site
(Multiple values)

Event Severity
(All)

Outcome Name
(All)

Use a Data Model

Perioperative
Data Warehouse

- Automated system that retrieves EHR data for postoperative outcomes, detecting
  - PONV
  - Reintubation
  - Care escalation
  - Positive troponin
  - Acute kidney injury
  - Rapid response calls
  - In-hospital mortality
- Feedback provided
  - Weekly summary email

Here are your patients' outcomes:

Surgery Date	Description	Length Of Stay	Patient Outcomes
	64yo F with Gamboa	No d/c found	RIFLE Risk Within 07 Days
	34yo F with Wiese	0.31	
	31yo F with Bream	No d/c found	Repeat Anesthetic Within 7 Days; RIFLE Risk Within 07 Days
	70yo F for THROMBOENDARTERECTOMY, W/PATCH GRAFT; CAROTID, VERTEBRAL, SUBCLAVIAN, BY NECK INCISION (35301)(35301) with Garrard	No d/c found	PACU PONV; PACU PONV Rx
	70yo F for ABDOMINAL TUMOR EXCISION & DEBULKING (49205) (49205) with Idrees	No d/c found	
	69yo F for EXPLORATORY LAPAROTOMY (49000)(49000) with Garrard	No d/c found	Death in Hospital; RIFLE Injury Within 07 Days; RIFLE Risk Within 07 Days
	59yo M for LAPAROTOMY FOR OPEN ABD (49002)(49002) with Hopper	No d/c found	Repeat Anesthetic Within 7 Days
	56yo M for EXPLORATORY LAPAROSCOPY (49320)(49320) with Idrees	0.33	Elevated PostOperative Troponin within 7 days

For detailed information on your cases' outcomes, please visit the Patient Outcomes Dashboard

This automated email was generated by Vanderbilt Anesthesiology and Perioperative Informatics Research. Contact VAPIR Tech Support for assistance.

Wanderer JP, Fowler L, Ehrenfeld JM, Kappen T, Sandberg WS, McEvoy MD. Association of University Anesthesiologists Annual Meeting. Washington, District of Columbia. 2017 May; Automated Feedback Improves Perioperative Outcomes Awareness.

Roadmap

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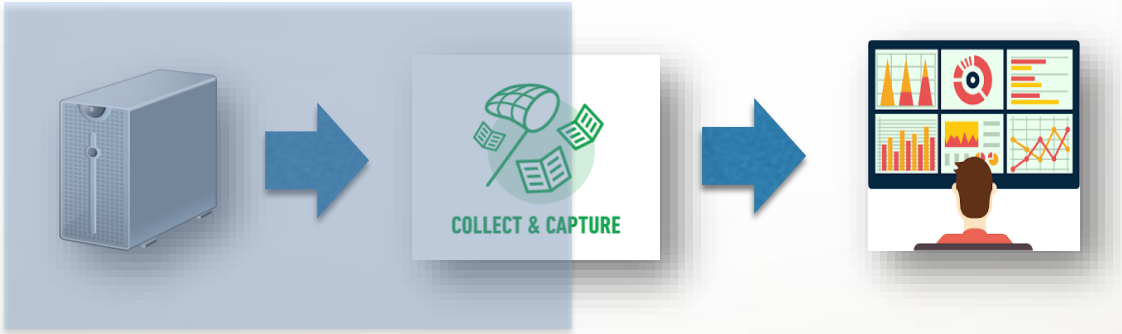


NACOR

- AQI chartered in 2008 by ASA to develop the National Anesthesia Clinical Outcomes Registry
- Millions of cases from thousands of practices
  - **"Mile wide"**
- Minimal Data Elements
  - Staff information
  - Anesthesia dates/times
  - Patient characteristics
  - Procedure codes
  - Anesthesia type
  - Diagnosis codes
  - Payment type
  - **"Inch deep"**

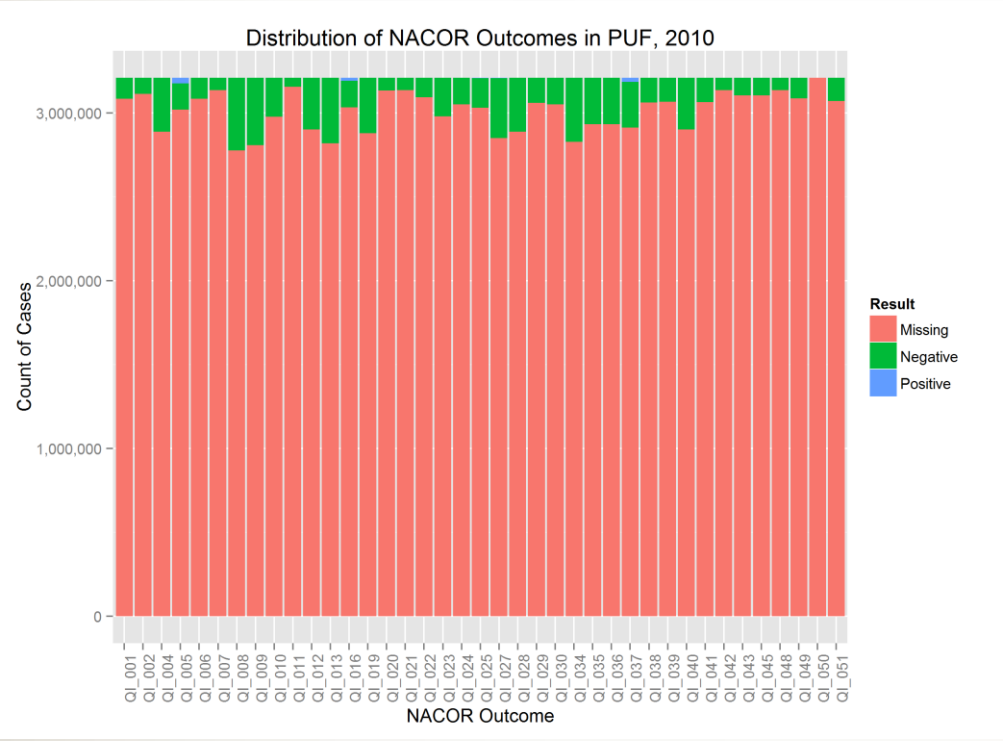
NACOR Minimum Data Fields

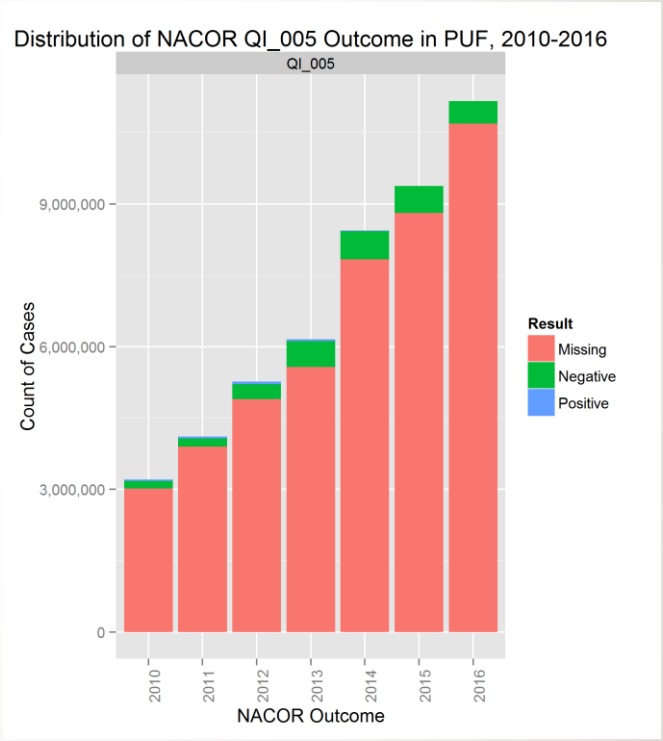
Data Element	Location in XML Schema	NACOR (Declined QR or QCDR)	Qualified Registry	Qualified Clinical Data Registry
Unique Anesthesia Episode of Care ID	<AnesthesiaRecordID>	✓	✓	✓
Staff ID	<StaffID>	✓	✓	✓
Staff Role (MD, DO, CRNA, AA)	<StaffRole>	✓	✓	✓
Staff NPI Number	<NPI>	✓	✓	✓
Facility ID	<FacilityID>	✓	✓	✓
Date of Service	<AnesthesiaStartTime>	✓	✓	✓
Anesthesia Start Time	<AnesthesiaStartTime>	✓	✓	✓
Anesthesia End Time	<AnesthesiaEndTime>	✓	✓	✓
Patient Gender	<Gender>	✓	✓	✓
Patient age or Date of Birth	<DOB> or <Age>	✓	✓	✓
Anesthesia Type (General, MAC, etc.)	<AnesthesiaCategory>	✓	✓	✓
ASA Physical Status (E Designator when appropriate)	<ASAClass>	✓	✓	✓
Surgical CPT Code	<CPTValue>	✓	✓	✓
Payment Code (i.e., Medicare)	<PaymentCode>	✓	✓	✓
PQRS Measure Number *	<QCDRMeasure>		✓	✓
ASA Measure Number	<QCDRMeasure>			✓
PQRS Measure Code* (i.e., 0581F)	<QCDRCodeValue>		✓	✓
ASA Measure Code (i.e., ASA10A)	<QCDRCodeValue>			✓
Modifier (1P or 8P, if applicable)*	<QCDRModifier>		✓	✓
Denominator Exclusion*	<QCDRDenomExclusion>		✓	✓
ASA CPT Code (If billing vendor does not collect Surgical CPT codes ok to send ASA CPT code)	<CPTAnesValue>	✓	✓	✓
ICD10 (Required if part of the denominator criteria for a measure)	<ICDValue>		✓	✓

*Note: Measures reported for Qualified Registry (QR) should use the XML QCDR Node Set

Liau et al. The National Anesthesia Clinical Outcomes Registry. Anesth Analg 2015;121:1604–10.

NACOR: The outcome part





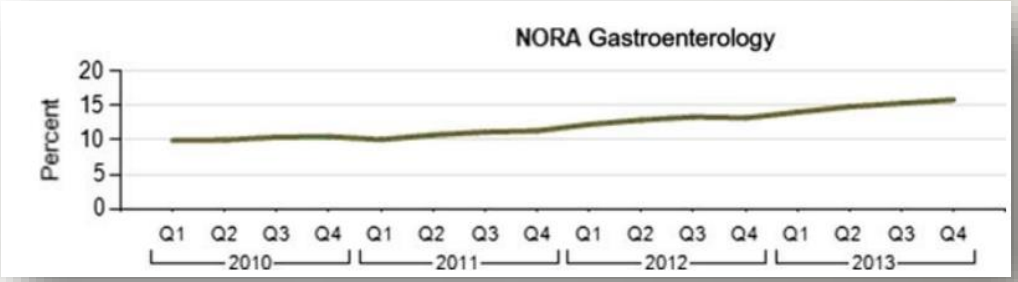
Zapf M, Grant B, McEvoy M, Wanderer JP. International Anesthesia Research Society Annual Meeting. Chicago, Illinois. 2018 Apr; An Analysis of the Utilization of Anesthesia Quality Measures using the Anesthesia Quality Institute's National Anesthesia Clinical Outcomes Registry.

NACOR

Strengths	Limitations
• Great capture of anesthetics across the US • Longitudinal data • (10+ years) • Represents different types of practices • Supported by the ASA	• Significant missingness for some data elements • Not much granular data • Data is variable by practice

NORA Complications

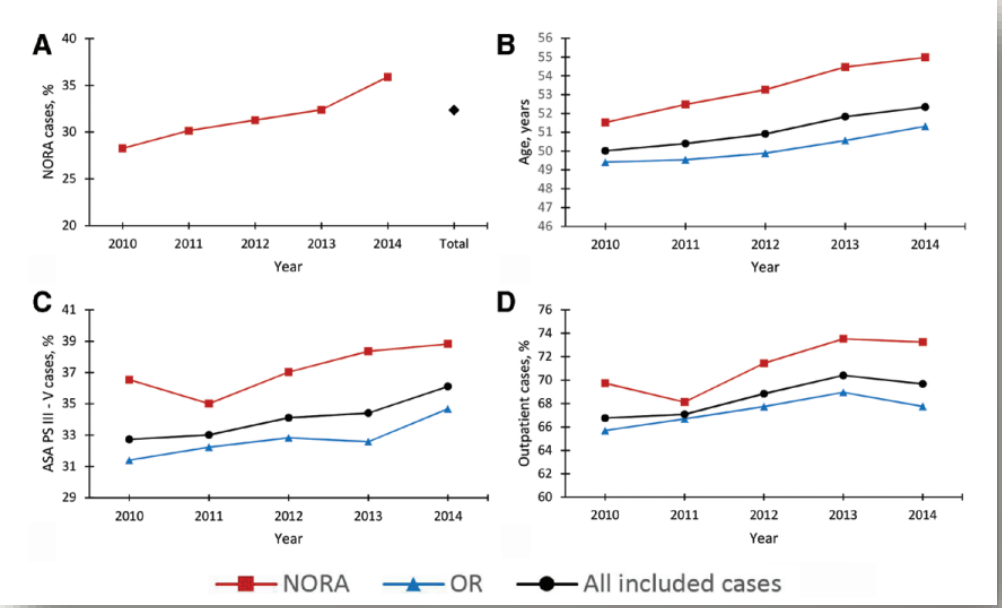
- NACOR 2010-2013
  - 12,252,846 cases
  - Most common complication PONV (1.06%)
  - Lower overall mortality than OR locations (0.02% vs 0.04%, P<0.0001)
  - Higher mortality in cardiology and radiology (0.05%)
  - Growth in GI cases



Chang B, Kaye AD, Diaz JH, Westlake B, Dutton RP, Urman RD. Interventional Procedures Outside of the Operating Room: Results From the National Anesthesia Clinical Outcomes Registry. J Patient Saf. 2018 Mar;14(1):9-16.

Growth of NORA

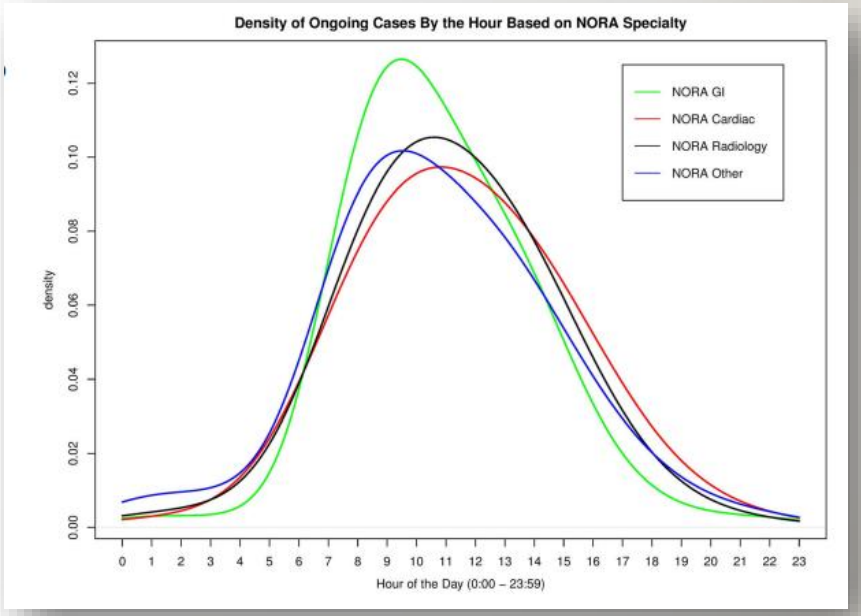
- NACOR 2010-2014
  - 5,929,953 NORA; 12,387,574 OR cases
  - Older patients
  - Sicker patients
  - More outpts
  - More NORA



Nagrebetsky A, Gabriel RA, Dutton RP, Urman RD. Growth of Nonoperating Room Anesthesia Care in the United States: A Contemporary Trends Analysis. Anesth Analg. 2017 Apr;124(4):1261-1267.

NORA By Day and Night

- NACOR, 2010-2015
  - 4,948,634 cases
  - 4.3% during after hours
    - Higher ASA scores
    - Longer cases
  - GI cases least frequent



Gabriel RA, Burton NN, Tsai MH, Ehrenfeld JM, Dutton RP, Urman RD. After-hour Versus Daytime Shifts in Non-Operating Room Anesthesia Environments: National Distribution of Case Volume, Patient Characteristics, and Procedures. J Med Syst. 2017 Sep;41(9):140.

The Conclusion Slide

- You too can get useful data out of your EHR
- You can do much more with modeled data
- You can get useful data from systems interfaced with your EHR
- NACOR can tell us a bit about NORA

Thanks!

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