MPOG DataDirect:
User Access & Demonstration

Michael Mathis, MD
Associate Research Director, MPOG
Assistant Professor, Michigan Medicine
DataDirect Access

MPOG Research Tips and Tricks Webpage Live!
Check our new resources using high-powered research tools!

VISIT WEBPAGE
DataDirect Access

• Pre-requisites:
  – Security Checklist & Authorization Form
  – Obtain Login
DataDirect Access

• Pre-requisites:
  – Authorization

MPOG DataDirect Security Checklist and Authorization Form
DataDirect

• Pre-requisites:
  – Authorization

MPOG DataDirect
Security Checklist and Authorization Form

Thank you for your interest in using MPOGs DataDirect application for Quality Improvement and/or Research Projects at your institution. DataDirect contains limited dataset (protected health information is excluded except for date of service). However, because DataDirect may contain information regarding hospital level quality indicators (i.e. hospital mortality), we ask that approval from the appropriate hospital department (i.e. Quality or Health Information Management) is obtained.

Standard data security processes must be followed when using the application. These are detailed below.

The site’s Anesthesiology Quality Champion and/or Practice Leader is responsible for all of the data that is downloaded for their institution from DataDirect. All individuals gaining access to MPOG DataDirect will need to complete and sign the affidavit below. This affidavit affirms that he/she understands the necessary processes and policies to ensure data security. Detailed descriptions of all items on the checklist can be found on the MPOG Security

Use of this data for Research
Anyone downloading data using Data Direct for the purpose of research should follow their institution review board policies.

Please do not hesitate to contact the MPOG with any questions/concerns.

Secure Computer
  ▪ Encrypt all mobile workstations (laptops): encrypt computer hard drive using approved tools (described on MPOG website)
  ▪ Ensure physical security or encryption of any desktop workstations
  ▪ Ensure physical security of servers: Institutional server room with near zero risk of physical theft
DataDirect Key Features

- User Guide

DataDirect User Guide
DataDirect

User Guide

DataDirect User Guide

For questions or comments, please contact:
Multicenter Perioperative Outcomes Group
support@mpog.zendesk.com
DataDirect Key Features

• Query Modes
  – **Cohort Only**
    – Goals:
      – Determine if a research/QI question is **answerable**
      – Sample size $\rightarrow$ roughly estimate **statistical power**
      – Ensure a **satisfying experience** doing MPOG research or QI
    – No prior approval
      – (except login)
    – **Multicenter** data (counts only)
DataDirect Key Features

• Query Modes
  
  — **Quality Report**
    
    — Goal:
      
      — Review cases, processes of care, and outcomes for *local research and QI*
    
    — Approval from your site leadership
      
      — Implied with DataDirect login, but user re-attests at time of access
    
    — **Single center** data
DataDirect Key Features

• Query Modes

  – **Research**
    – Goal:
      – Execute *high-impact multicenter research* for manuscripts / grants
    – Approval from PCRC Committee
      – Formal submission/review process
  – **Single-center data** *before* PCRC review/approval
  – **Multi-center** data *after* PCRC review/approval
DataDirect Key Features

- **Query Modes**

<table>
<thead>
<tr>
<th>Access Requirements</th>
<th>Scope</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohort Only</strong></td>
<td>Login</td>
<td>Multicenter (counts)</td>
</tr>
<tr>
<td>Quality Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## DataDirect Key Features

### Query Modes

<table>
<thead>
<tr>
<th>Access Requirements</th>
<th>Scope</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohort Only</strong></td>
<td>Login</td>
<td>Multicenter (counts)</td>
</tr>
<tr>
<td><strong>Quality Report</strong></td>
<td>Login + Re-attest with download</td>
<td>Single Center</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### DataDirect Key Features

#### Query Modes

<table>
<thead>
<tr>
<th>Access Requirements</th>
<th>Scope</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohort Only</strong></td>
<td>Login</td>
<td>Multicenter (counts)</td>
</tr>
<tr>
<td><strong>Quality Report</strong></td>
<td>Login + Re-attest with download</td>
<td>Single Center</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td>PCRC Approval</td>
<td>Single Center $\rightarrow$ Multicenter</td>
</tr>
</tbody>
</table>
... some thoughts on data wrangling in MPOG
MPOG Data Wrangling

• Commonly **structured**, or with **cleanable artifact**:
  – Demographics – height, weight, gender, age, etc.
  – Simple case details – ASA class, Anesthesia CPT, duration
  – Simple anesthetic details – GA, ETT/LMA attempted
  – *Elixhauser* comorbidities, ICD-9/10 diagnosis codes
  – *Intraoperative* medications
  – *Standard* physiologic monitors
  – Laboratory values
MPOG Data Wrangling

• Sometimes **unstructured**, or with **complex artifact**:
  – Surgical diagnosis and/or procedure text
  – Nuanced intraoperative interventions
    – e.g. positioning, awake/deep extubation, jet ventilation, partial CPB
  – *Anesthesia H&P* comorbidities
  – *Non-intraoperative* medications (e.g. home, preop, postop)
  – *Advanced* physiologic monitors (e.g. CVP, cerebral oximetry)
# MPOG Data Wrangling

<table>
<thead>
<tr>
<th>Usually Structured, Cleanable</th>
<th>Sometimes Unstructured, Cleaning is Challenging or Intractable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, Labs</td>
<td></td>
</tr>
</tbody>
</table>
# MPOG Data Wrangling

<table>
<thead>
<tr>
<th>Usually Structured, Cleanable</th>
<th>Sometimes Unstructured, Cleaning is Challenging or Intractable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, Labs</td>
<td>Diagnosis/Procedure Text</td>
</tr>
<tr>
<td>Simple Case Details (e.g. Anes CPT)</td>
<td></td>
</tr>
</tbody>
</table>
## MPOG Data Wrangling

<table>
<thead>
<tr>
<th>Usually Structured, Cleanable</th>
<th>Sometimes Unstructured, Cleaning is Challenging or Intractable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, Labs</td>
<td>Diagnosis/Procedure Text</td>
</tr>
<tr>
<td>Simple Case Details (e.g. Anes CPT)</td>
<td>Nuanced Interventions (e.g. jet vent)</td>
</tr>
<tr>
<td>Simple Anesthetic Details (e.g. ETT)</td>
<td></td>
</tr>
</tbody>
</table>
# MPOG Data Wrangling

<table>
<thead>
<tr>
<th>Usually Structured, Cleanable</th>
<th>Sometimes Unstructured, Cleaning is Challenging or Intractable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, Labs</td>
<td>Diagnosis/Procedure Text</td>
</tr>
<tr>
<td>Simple Case Details (e.g. Anes CPT)</td>
<td>Nuanced Interventions (e.g. jet vent)</td>
</tr>
<tr>
<td>Simple Anesthetic Details (e.g. ETT)</td>
<td>Comorbidities – <em>Elixhauser</em></td>
</tr>
<tr>
<td>Comorbidities – <em>Elixhauser</em></td>
<td>Comorbidities – <em>Anesthesia H&amp;P</em></td>
</tr>
</tbody>
</table>
# MPOG Data Wrangling

<table>
<thead>
<tr>
<th>Usually Structured, Cleanable</th>
<th>Sometimes Unstructured, Cleaning is Challenging or Intractable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, Labs</td>
<td>Diagnosis/Procedure Text</td>
</tr>
<tr>
<td>Simple Case Details (e.g. Anes CPT)</td>
<td>Nuanced Interventions (e.g. jet vent)</td>
</tr>
<tr>
<td>Simple Anesthetic Details (e.g. ETT)</td>
<td>Comorbidities – <em>Elixhauser</em></td>
</tr>
<tr>
<td>Comorbidities – <em>Elixhauser</em></td>
<td>Comorbidities – <em>Anesthesia H&amp;P</em></td>
</tr>
<tr>
<td>Medications – <em>Intraoperative</em></td>
<td>Medications – <em>Home, Preop, Postop</em></td>
</tr>
</tbody>
</table>
# MPOG Data Wrangling

<table>
<thead>
<tr>
<th>Usually Structured, Cleanable</th>
<th>Sometimes Unstructured, Cleaning is Challenging or Intractable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics, Labs</td>
<td>Diagnosis/Procedure Text</td>
</tr>
<tr>
<td>Simple Case Details (e.g. Anes CPT)</td>
<td>Nuanced Interventions (e.g. jet vent)</td>
</tr>
<tr>
<td>Simple Anesthetic Details (e.g. ETT)</td>
<td>Comorbidities – <em>Elixhauser</em></td>
</tr>
<tr>
<td>Comorbidities – <em>Elixhauser</em></td>
<td>Comorbidities – <em>Anesthesia H&amp;P</em></td>
</tr>
<tr>
<td>Medications – <em>Intraoperative</em></td>
<td>Medications – <em>Home, Preop, Postop</em></td>
</tr>
<tr>
<td>Standard Monitors (e.g. BP)</td>
<td>Advanced Monitors (e.g. CVP)</td>
</tr>
</tbody>
</table>
DataDirect v2.0 Updates
DataDirect v2.0

• Major updates
  – **Intuitive** workflow
    – Step-wise process
    – Differentiation between inclusion criteria vs. covariates/outcomes
  – **Broader range** of data types
    – MPOG concepts, phenotypes, QI measures all accessible
  – (Coming soon): Automated, downloadable **data summaries**
    – QI: Quality Report
    – Research: Data Query Spec
DataDirect v2.0 Demo

(note: DataDirect continues to be updated...current version not identical to this presentation)
Defining your project

Queries within DataDirect are organized into projects. You can choose to create a new project for your query or to open a project created previously.
All cases
Valid case times, age, sex, CPT, ASA class
ICD-9/10 codes present, labs present
Mortality, discharge diagnoses
Valid case times, age, sex, CPT, ASA class
ICD-9/10 codes present, labs present
Mortality, discharge diagnoses

All cases  Intraop Standard
---
X

---
<table>
<thead>
<tr>
<th></th>
<th>All cases</th>
<th>Intraop Standard</th>
<th>Periop Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid case times, age, sex, CPT, ASA class</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ICD-9/10 codes present, labs present</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Mortality, discharge diagnoses</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Create a New Query

Name your project and set a few attributes.

**Project Name**
MPDG DataDirect Demo Query

**Description (optional)**
Demonstration for MPDG Retreat

**Query Mode**
- Cohort Only
- Quality Report
- Single Center Research
- Multi-Center Research

**Choose Starting Population**

*Intraoperative Research Standard*
- Has valid Anesthesia Start and end
- Patient in room time should be valid if exists
- Has a valid institution if
- Case Duration must be at least 15 minutes if Anesthesia Technique General is true
- Case Duration must be at least 3 minutes if Anesthesia Technique General is false
- Actual or predicted anesthesist CPT code must be present
- Age must be present
- Sex must be unknown
- ASA Code must not be missing, invalid, or conflicting
- Systolic Blood Pressure Min must be present
- At least one intraoperative medication was administered

<table>
<thead>
<tr>
<th>Feature</th>
<th>All cases</th>
<th>Intraop Standard</th>
<th>Periop Standard</th>
<th>Outcome Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid case times, age, sex, CPT, ASA class</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ICD-9/10 codes present, labs present</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mortality, discharge diagnoses</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Filtering Cases

Here you will apply filters to define your cohort and return only cases that you're interested in. The available filters are listed on the left sidebar while the size of your cohort will be dynamically updated on the right.
Cases

Panoreoperative case characteristics from the clinical documentation and professional fee billing systems. Some patient characteristics (ASA status) may change from one case to another and reflect the information known at the time of that case.

- **Procedure Date**: 01/01/2000 to 10/14/2019
- **CPT Base Units**: 3 to 30
- **Weekend Case**: Yes / No
- **Holiday Case**: Yes / No
- **ASA Status**: ASA 1 / ASA 2 / ASA 3 / ASA 4 / ASA 5 / ASA 6
- **Emergency Status**: Yes / No / Unspecified
- **Admission Type**: Inpatient / Outpatient / Other / Unknown
- **Case Duration**: Anesthesia time: 1 minute(s) to 1440 minute(s)
- **Cardiac Case**: Yes / No
- **Anesthesia Technique General**: Yes / No
- **Anesthesia Technique LMA**: Yes / No
- **Endotracheal Tube Used**: Yes / No
- **Anesthesia Technique Neuromax**: Yes / No
- **Anesthesia Technique Block**: Yes / No
Comorbidities

Ellis-Hauser comorbidity measures are pre-defined collections of ICD-9 and ICD-10 codes which assess for 31 patient comorbidities, commonly used for correlation to a higher risk of in-hospital mortality. The comorbidities are only available for centers contributing Problem Summary List ICD9/10 or Discharge ICD9/10 data. ICD-10 coding was initially developed by the World Health Organization in 1992, and the United States began requiring the use of ICD-10 coding October 1, 2015.

- **Ellis-Hauser comorbidities**: 1 comorbidity selected
- **Mode**: Keep only cases with these comorbidities
- **Selection**: Vascular Disease

Project
MPOG DataDirect Demo Query
Project ID: 2159
Query Mode: Cohort
Last updated on 10/14/2019

Cohort Size
- Total: 3,170,027 cases
- Interscrepe: 3,170,027 cases
- Demographics:
  - Age: 18 years - 100 years
  - BMI: 0.0 - 100.0
  - Race: American Indian or Alaska Native or Native Hawaiian or Other Pacific Islander or Black, not of Hispanic Origin or Hispanic, Black or Hispanic, Color Unknown or Hispanic, White or Mid-Eastern or White, not of Hispanic Origin or Biracial or Other Race Not Listed
  - 2,465,118 cases
- Institutions: 29 institutions

Cases
- Procedure date: 02/06/2014 - 10/19/2015
- ASA Status: ASA 1 or ASA 2 or ASA 3 or ASA 4 or ASA 5
- Emergency Status: Yes or No
- Anesthesia Time: 0 minutes - 1440 minutes
- Cardiac Case: Yes
- Anest/Alg Blocks: Yes
- Endotracheal Tube: Yes
- 28,367 cases
- Institutions: 29 institutions
Procedures

Perioperative procedures activity identified using Current Procedure Terminology (CPT) codes, professional fee charges, or using free text procedure descriptions.

CPT search

Type a CPT code or a procedure name

Add

Actual or Scheduled Procedure Text

Type a procedure name to search, and hit 'Enter' or click 'Add' button to add

Add

Mode

* Keep only cases with these procedures
□ Remove cases with these procedures

Selection

[Actual or Scheduled Procedure] mitral
Intraoperative Notes

Enforce inclusion or exclusion of patients with documentation of specific MPOG concepts in the intraoperative notes, such as cardiopulmonary bypass, thoracic surgery, specific blocks, etc.

Search Not Concept: MPOG Intraoperative Note Concept Name, ID, or Group Name

Mode:
- Keep only cases with these intraoperative notes
- Remove cases with these intraoperative notes

Selection:
- [0122] Intubation Endotracheal Tube Size
- [0115] Intubation Laryngoscopy Blade Type and Size
- [0118] Intubation Number of Attempts
- [0199] Intubation Direct Laryngoscopy View
- [0123] Intubation Endotracheal Tube Type
- [0334] Intubation - cricoid pressure applied
- [0202] Intubation ETT Placed
- [0197] Intubation - atraumatic
- [0695] Categorized note - Intubation
- [0009] Intubation Tube Note
- [0207] Intubation device and adjunct note
- [0688] Intubation - comment
- [0101] Intubation - Observed to be difficult
Medication Administration

Perioperative medications that were administered. Medication data is at the case-level. Medications are searchable by drug name (generic only, MPOG concept name) or drug ID (MPOG concept ID). Bolus or infusion administrations can be identified distinctly.

Name of Medication

Mode
- Keep only cases with these medications that were administered
- Remove cases with these medications that were administered

Selection
[10301] MIDAZOLAM (Bolus or Infusion)
Intraoperative physiologic data acquired from automated device interfaces (blood pressure, SpO2) or manually entered (Heart rate, EKG rhythm). Search by MPOG concept ID or concept name.

- **Name of Physiologic Data**: [ ]
- **Mode**:
  - Keep only cases with these physiologic data
  - Remove cases with these physiologic data
- **Selection**: [ ] [0800] Central Venous Pressure

Minimum number of values per case: [ ]

---

**Physiologic**

Intraoperative physiologic data acquired from automated device interfaces (blood pressure, SpO2) or manually entered (Heart rate, EKG rhythm). Search by MPOG concept ID or concept name.

- **Name of Physiologic Data**: [ ]
- **Mode**:
  - Keep only cases with these physiologic data
  - Remove cases with these physiologic data
- **Selection**: [ ] [0800] Central Venous Pressure

Minimum number of values per case: [ ]

---

**Cohort Size**

- **Race**: American Indian or Alaska Native or Asian or Pacific Islander or Black, not of Hispanic Origin or Hispanic, Black or Hispanic, Color Unknown or Hispanic, White or Middle Eastern or White, not of Hispanic Origin or Bi or Multi-Racial or Other Race Not Listed
- **2,465,118 cases**

- **Cases**
  - Procedure Date: 01/01/2014 - 10/31/2019
  - ASA Status: ASA 1 or ASA 2 or ASA 3 or ASA 4 or ASA 5
  - Emergency Status: Yes or No
  - Anesthesia Type: General
  - Cardiac Case: Yes or No
  - Anesthesiologist: Yes
  - Intubation: Yes
  - Central Venous Pressure: [ ]
- **28,367 cases**

- **Comorbidities**
  - Hypertension: [ ]
- **15,773 cases**

- **Procedures**
  - Intraoperative Notas: [ ]
  - Mitral or MV: [ ]
- **3,498 cases**

- **Medication Administration**
  - Notas: [ ]
  - Mitral or MV: [ ]
- **904 cases**
**Laboratory**

Perioperative laboratory cohort identification criteria which includes lab results. This is patient-level data, but can be connected to specific cases using result dates and case time linkages.

- **Name of Laboratory Value**
- **Mode**
  - Keep only cases with these laboratory values
  - Remove cases with these laboratory values
- **Selection**
  - [5002] Formal lab - Creatinine, Serum/Plasma
- **Date of Lab Test**
  - Any time
  - 0 days before Anesthesia Start
  - During Intraoperative Period (Anesthesia Start to End)
Outcomes

Clinical outcomes derived from Electronic Health Record and Administrative Data.

Acute Kidney Injury
- No AKI
- Stage 1 AKI
- Stage 2 AKI
- Stage 3 AKI
- No preoperative creatinine
- Preoperative renal failure
- No postoperative creatinine
- Missing or invalid

30-day Hospital Mortality
- Yes
- No
- ASA6
- Missing
- Conflicting

Project
MPDG DataDirect Demo Query
Project ID: 2169
Query Model: Cohort
Last updated on 10/14/2019

Cohort Size
28,367 cases
25 institutions

Cases
- Procedure Date: 01/01/2014 - 10/14/2019
- ASA Status: ASA 1 or ASA 2 or ASA 3 or ASA 4 or ASA 5
- Emergency Status: Yes or No
- Anesthesia time: 0 minutes - 1440 minutes
- Carcinomatous: Yes
- Anasthesia General: Yes
- Endotracheal Tube: Yes

Comorbidities
- 13,737 cases
- 22 institutions

Diagnoses
- Diagnosis category: Clinical Problem Summary
  - List, Professional Billing, Administrative
  - Discharge Billing
  - Present on admission: any
diagnosis type: none specified
- diagnosis status: none specified
- keep codes: 125.131 or 125.131 or 125.131 or 125.131 or
  125.118 or 125.113 or 125.131 or 132.19 or 125.810 or 125.799
  or 125.31 or 125.812 or 141.01 or 141.02 or
  141.03 or 141.04 or 141.05 or 141.06 or
  141.07 or 143.3
- 4,988 cases
- 18 institutions

Procedures
- 1,035 cases
- 14 institutions

Intraoperative Notes
- 1,035 cases
- 14 institutions

Medication Administration
- 940 cases
- 13 institutions

Physiologic
- 885 cases
- 13 institutions

Laboratory
- 862 cases
- 12 institutions
DataDirect v2.0
• Outputs
  – Single vs. Repeated Measures

<table>
<thead>
<tr>
<th>Example</th>
<th>Values Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Measures (One value per case)</td>
<td></td>
</tr>
<tr>
<td>Repeated Measures (Many values per case)</td>
<td></td>
</tr>
</tbody>
</table>
**DataDirect v2.0**

- Outputs
  - Single vs. Repeated Measures

<table>
<thead>
<tr>
<th>Example</th>
<th>Values Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Measures (One value per case)</td>
<td>Age</td>
</tr>
<tr>
<td>Repeated Measures (Many values per case)</td>
<td></td>
</tr>
</tbody>
</table>
DataDirect v2.0

• Outputs
  – Single vs. Repeated Measures

<table>
<thead>
<tr>
<th>Example</th>
<th>Values Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Measures</td>
<td>Age</td>
</tr>
<tr>
<td>(One value per case)</td>
<td>MPOG Case ID, MPOG Patient ID, Date of Procedure, Value</td>
</tr>
<tr>
<td>Repeated Measures</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>(Many values per case)</td>
<td>MPOG Case ID, MPOG Patient ID, BP Source, Dates/Times of Measurements, Values</td>
</tr>
</tbody>
</table>
Take-Home Points

• DataDirect can catalyze research/QI, without needing:
  ... to be a computer programmer
  ... to be a 1st-degree relative of your hospital’s CMIO

• DataDirect **query modes** can be tailored to use-case:
  – Cohort ID mode → Research/QI “speed dating”
  – Quality Report → Improve care at your hospital
  – Research → High-impact science
Thank You