

Mount Sinai Data Warehouse Data Sources



Icahn
School of
Medicine at
**Mount
Sinai**

Systems

Cerner

IDX-ADT

Epic

Blood Bank

SCC Labs

BISLR Prism

IDX/RAD (Radiology)

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Tamtron (Pathology)

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Cerner Access Management System (CAMS) commonly known as Cerner is Mount Sinai's primary access management and medical record application. It went live on July 1st, 2002, however MSDW took the cutoff as Jan 1st 2003. Access management refers to a set of core administrative services that focus upon managing information about patients and visits. These services include scheduling outpatient clinic or ambulatory surgery appointments, registering Emergency Department visits and tracking inpatient hospitalizations. Access Management Systems are also referred to as ADT (Admissions, Discharges, and Transfers) or Registration systems.

Cerner is the primary system of record for maintaining patient demographic information; this includes details about the patient's next of kin, emergency contacts, payment guarantor, subscriber and insurance coverage. During the course of an inpatient hospitalization, the application tracks patient location details such as the nursing unit, room/bed assignment. The Cerner application also records relevant information specific to a patient's encounter/visit such as provider information, reason for visit, billing information etc. Cerner is the "gold standard" for generating Medical Record Number (MRN) which is a unique patient identifier and this number is used by all applications in Mount Sinai for patient data.

As the core system of record for tracking patient visits, Cerner broadcasts new or updated patient visit (scheduling or registration) information to a variety of secondary systems throughout the care delivery organization; integrating and synchronizing these various applications is important to ensuring stable, manageable and accurately coordinated workflow across the organization.

IDX Flowcast is an application parallel to Cerner which is used exclusively in the FPA clinics. A MPI project was implemented in Mount Sinai to enable handshake between Cerner and Flowcast, allowing them to share MRN and related patient demographics. The purpose of the project was to eliminate duplicate patient registrations and provide a controlled MRN generation.

Cerner is integrated to MSDW via HL7 messages. MSDW receives all the ADT messages and process them on nightly basis. ADT message may include admit messages (like A01, A04), discharge messages (A03), transfer message (A02, A06, A07) and other visit related messages.

Cerner data mostly populates the Person and Encounter dimension of the MSDW. It also loads Facility and Organization dimension which are referenced by other application data as well.

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Cerner Transactions

Patient Information:

- Medical Record Number (MRN)
- Name
- Date of Birth
- Address and Telephone
- Gender
- Ethnicity and Ethnic Group
- Language and Interpreter Need
- Marital Status
- Date of Death
- Citizenship
- Religion
- Social Security Number
- Driver License, Donor ID, etc.

Encounter Information:

- Encounter Visit ID
- Visit Type
- Admit Date
- Discharge Date
- VIP Indicator
- Discharge Disposition
- Means of Arrival
- Estimated Length of Stay (ELOS)
- Specialty Unit
- Next of Kin information

Encounter Facts:

- Admission
 - Admit Date Time
 - Associated Caregivers
 - Insurance
 - Admitting Facility
 - Admitting Service
 - Admitting Diagnosis
 - Admit Reason
- Discharge
 - Discharge Date Time
 - Discharge Disposition
 - Discharging Caregiver
 - Discharging Facility
 - Discharging Service
- Transfer
 - Transfer Date Time
 - Facility Transferred to
 - Transferring Caregiver
 - Transfer Reason
- Cancel Discharge
- Pre-admit
 - Expected Arrival Date

Merge and Unmerge:

- Merge two MRNs
- Unmerge two MRNs
- Move encounter from one MRN to another

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Epic

Epic Care is Mount Sinai's EMR application which captures all clinical information during the patient's visit. It was initially rolled out in ambulatory care (2006-12) and later implemented in Inpatient and Emergency (May 1st 2011). EPIC replaced TDS and IBEX application in IP and ED. A variety of vital patient information was abstracted from the retiring applications in to EPIC to maintain the patient history.

Epic Care is built on Caché Database and uses Clarity for its reporting purposes. Epic functionality includes: documentation, results review, order entry, secure messaging, clinical decision support, prescription writing, and support for scanned documents.

The documentation module supports all clinical charting including progress notes, discharge summaries and letters. Results review provides integration of clinical data from multiple sources including lab, radiology, and pathology. Computerized order entry (CPOE) is used to order medications, medical supplies, testing, and referrals. Secure messaging facilitates communication between providers by attaching relevant clinical information including the chart to messages. Finally, Epic provides shared viewable clinical data among all clinical providers in a secure role based system.

Every patient visit is scheduled in Epic through Cerner or IDX Flowcast. For Epic to start documentation and ordering it requires not only a schedule for every patient but also the patient needs to check-in into the Outpatient Clinic i.e. "arrived". When a scheduled patient arrives at a clinic, a case is opened for the patient. Assessments like Allergy, Vital Sign, and Pain, etc are registered. . During the patient arrival process, medical history documentation is also completed. Physician's diagnosis and prescriptions are endorsed in the system. Associated caregivers complete other case related documentation. Orders that need to be sent to other applications are out-bounded. Necessary review and approvals as part of workflow management is also triggered by the application.

Clarity functions as reporting environment for EPIC. It is built on Oracle database. Data in Clarity is organized by Epic Care functional subject matter area. A subject matter area is a group of data elements of interest to a particular subject. Eg: Medications may contain details like medicine name, frequency, dosage, route etc. Data across all Epic implementation in Mount Sinai is collected in Clarity. For extraction into the Data Warehouse various data elements have been identified in EPIC and a customized routine has been written to populate extract tables. These tables serve as primary source of EPIC data for MSDW.

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Epic Transactions

Patient History:

- Medical History
- Surgical History
- Employment History
- Family History
- Social History
 - Alcohol
 - Tobacco
 - Illicit Drug Use
 - Sexual Habit
 - Education
 - Narratives

Encounter Information:

- Admission Date
- Discharge Date
- Transfer Date
- Caregiver Associated
- Means of Arrival
- ED Acuity level (severity index)
- Labor Status

Patient Medication:

- Medication Order
- Medication Administration (MAR)
- Prescription
- Immunization
- Medication History

The following are key fields captured for all above transactions:

- Medication Name
- SIG
- Unit
- Dose
- Route
- Start Date
- End Date
- Refills

Clinical Documentation:

- Progress Notes
- Discharge Summary
- Patient Instructions
- Operative Reports (WIP)
- Physician Documentation (WIP)

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Epic Transactions Continued

Clinical Assessments:

- Diagnosis (ICD-9 and IMO Codes)
- Reason for visit
- Chief Complaint
- Problem List
- Noted Date
- Resolved Date
- Comments

Allergy Assessment:

- Allergen
- Reaction
- Severity

Vital Signs:

- Height
- Weight
- Length (Peds)
- Blood Pressure
- Temperature
- Pain Score
- Pulse
- O2 Saturation
- Respiration

Clinical Orders:

- Lab Order
- Radiology Order
- Pathology Order
- Admit Service Order
- Discharge Service Order
- EKG Order
- Encounter (misc.) Order
 - Nursing Order
 - Diet Order
 - Isolation Order
 - Dialysis Order
 - Referral Order
 - Rehab Order
 - Therapy Order
 - DME Order
 - Consult Order
- All possible orders from EPIC Order Entry workflow

Encounter Information:

- Admission Date
- Discharge Date
- Transfer Date
- Caregiver Associated
- Discharge Disposition
- Means of Arrival
- ED Acuity Level (Severity Index)
- Labor Status

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SCC Labs

SCC Lab Information System (LIS) is lab management application at Mt. Sinai since 1999. MSDW is holding the data since 2003. The application receives Lab Orders from various clinical order entry applications in MSMC like EPIC, TDS and IBEX. In return it sends lab results back to the ordering application.

All the order and result communication happens through HL7 interface. SCC is also used to send result transactions to EDR. It stopped doing so when the EDR application was archived in April 2011. The MSMC laboratory also functions as a reference laboratory, providing services to community-based providers. The results for the referred patients are sent directly to the ordering providers. Charges associated with each order are captured and sent to the MSMC Eagle Hospital Billing System for hospital patients and to Sunrise Billing System for External Patients.

SCC maintains a lab code master which are ordering codes i.e. list of tests done at MSMC lab. MSDW sources these lab codes for its Procedure Dimension. These codes are non-standard and local to MSMC. Future plan is to convert them to LOINC codes.

With Release 4 we have integrated the Bloodbank module of the SCC Lab. The bloodbank data will provide the order and provision information between blood bank and EPIC.

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SCC Labs Transactions

Lab Order:

- Lab Initiated Order
 - Order Test Code
 - Order Date Time
 - Ordering Caregiver
 - Ordering Location
 - Order Status (new/cancel)
- **Specimen Collection**
 - Specimen Collection Date Time
 - Specimen Received Date Time

Clinical Orders:

- Result Value (could be numeric, string or text report)
- Unit of Measure
- Abnormal Flag
- Reference Range
- Research Indicator
- Specimen Source
- Comments

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IDX/Rad (Radiology)

GE IDXRAD Radiology Information System (LIS) is the radiology management application at Mt. Sinai since 1992. MSDW is holding the data since 2003. The application receives Radiology Orders from various clinical order entry applications in MSMC like EPIC, TDS and IBEX. In return it sends radiology results back to the ordering application. The results are text reports which contain clinical impression etc.

All the order and result communication happens through HL7 interface. IDXRAD is also used to send result transactions to EDR. It stopped doing so when the EDR application was archived in April 2011. The MSMC radiology also takes in referral patients i.e. orders not from MSMC's clinics. The results for the referred patients are sent directly to the ordering providers. Charges associated with each order are captured and sent to the MSMC Eagle Hospital Billing System for hospital patients and to Sunrise Billing System for External Patients.

IDXRAD maintains a radiology code master which are ordering codes i.e. list of tests done at MSMC. MSDW sources these radiology codes for its Procedure Dimension. These codes are non-standard and local to MSMC.

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IDX/Rad (Radiology) Transactions

Radiology Order:

- Radiology Initiated Order
 - Order Test Code
 - Order Date Time
 - Ordering Caregiver
 - Ordering Location
 - Order Status (new/cancel)

Clinical Orders:

- Report Text
- Clinical Info
- Pregnancy Indicator
- Reason for Study
- Research Indicator
- Planned Duration
- Actual Exam Duration
- Allergy Comments
- Resource
- Scheduled Date and Time
- Stat Exam Indicator
- Stat Exam Date and Time
- Comments

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Tamtron/Powerpath (Pathology)

The PowerPath Pathology Information System from IMPAC Medical Systems Inc. was installed at Mount Sinai in 2002 and MSDW is holding the data since 2003. The application generates pathology orders for clinical order entry applications in MSMC like EPIC, TDS and IBEX. It also sends the radiology results back to the clinical applications. The results are text reports.

All the order and result communication happens through HL7 interface. IDXRAD is also used to send result transactions to EDR. It stopped doing so when the EDR application was archived in April 2011. The MSMC radiology also takes in referral patients i.e. orders not from MSMC's clinics. The system creates an "accession number", a unique identifier for the case. A case is started when a specimen arrives from the Operation Theatre (OR), other hospital area or from outside doctor or institution. The specimen may be structured tissue (anatomic), fluid containing cells (cytology), Pap smear (gyn cytology), cadaver (autopsy) or prepared slides (consult). Diagnostic information is usually entered via free text in Word. Cytology cases use a dictionary, which is a pre-defined diagnostic information.

Charges associated with each Inpatient Order are captured, verified and sent to the MSMC Eagle Hospital Billing System. For External Patients and Outpatients, Technical charges are sent to Eagle Hospital Billing System and Professional Charges to Per-Se Billing System.

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Tamtron/Powerpath (Pathology) Transactions

Pathology Initiated Order:

- Pathology Initiated Order
 - Order Test Code
 - Order Date Time
 - Ordering Caregiver
 - Ordering Location
 - Order Status (new/cancel)

Pathology Report:

- Report Text
- Specimen Source
- Unit Charged
- Rate Charged
- Rate Charge for Single Unit
- Pathology Diagnosis

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Eagle (hospital billing and accounts receivable)

The Eagle Hospital Billing System has been in use for managing billing and remittances at Mount Sinai since 1992 for inpatient accounts and since 1996 for outpatient accounts. MSDW however holds data since 2003. For outpatient, the data is available for hospital clinics only; the FPA clinic data is available through IDX Flowcast.

Each patient registration in the Cerner ADT system creates an account to be created in Eagle. The 3M encoder system sends diagnosis, procedure, and attending physician information to Eagle. Charges captured by ancillary systems (e.g., SCC, IDXRad, Tamtron, SCC, et al) are forwarded to Eagle for consolidation.

Eagle application produces bills/charges for the encounter related charges. It also generates allowance (or adjustment). Electronic and manual payments are posted in the application.

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Eagle Transactions

Account Receivables:

- Billing
 - Allowance
 - Charges
 - Late Stay
 - On/Account Applied
 - Room and Board
 - Transfer (deductible)
 - Allowance
 - Cancellations
 - Descriptions, zero value item
 - Available fields are: credit amount, debit amount, indicator, denial reason, description, entry amount
 - Data available for Inpatient and Outpatient
- Cash
 - Adjustment
 - Allowance
 - Denial
 - Payment
 - Transfer
 - Available fields are: credit amount, debit amount, indicator, denial reason, description, entry amount
 - Data available for Inpatient and Outpatient
- Restored Accounts (Outpatients)
 - Credit amount, debit amount, indicator, denial reason, description, entry amount
- Status Change (inpatient)
 - Credit amount, debit amount, indicator, denial, description, entry amount

Diagnosis:

- Admitting
- Principal
- Secondary

Encounter:

- Begin Date Time
- Encounter Type
- Encounter Visit ID
- Medical Record Number

Hospital Charge

- Posting Date
- Rate Charged for Multiple Unit
- Rate Charged for Single Unit
- Units Charged

Medical Profile

- Admitting Diagnosis
- Caregiver
- Encounter Summary
- Principal Diagnosis
- Principal Procedure
- Secondary Diagnosis
- Secondary Procedure

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TSI (cost accounting and strategic support)

TSI, Transitions System Inc., is a comprehensive financial and clinical decision support, contract management and clinical resource management system. It combines both the financial and clinical information captured in Eagle and clinical systems, and integrates them into a powerful tool for both clinical and financial decision making. The following is the functionality provided by TSI:

Financial	Clinical
Cost Accounting	Care pattern analysis for specific populations
Flexible Budgeting	Utilization analysis
Product Line Management	Phase of Care/Episode of Care Analysis
Modeling and Forecasting	Outcomes Measurements
Profitability Analysis	Clinical Pathways
Contract Analysis	Length of Stay Analysis

TSI data goes back till 2003 and it cover both inpatient and outpatient encounters. It accepts data from several applications including ADT data from Cerner, billing data from Eagle, clinical data from EMR (Epic) etc.

TSI users can create reports using CCM or KIT report writers based on the complexity of the report. It also creates data that is loaded in to Information Builders, which is later used for Dashboard. Dashboard supports several canned reports and provides functionality to generate user-defined reports as well.

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TSI Transactions

Diagnosis Documented:

- APRDRG
- APRMDC
- Federal DRG
- NYDRG
- MSDRG
- Principal Diagnosis
- Secondary Diagnosis

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IDX-ADT

IDX Flowcast is primary access management application for Mount Sinai Faculty Practice Associates. MSDW plans to have data from it starting Jan 1st 2003. Access management refers to a set of core administrative services that focus upon managing information about patients and visits. These services include scheduling FPA clinic appointments and for the services rendered during the visit.

IDX Flowcast along with Cerner are the primary systems of record for maintaining patient demographic information; this includes details about the patient's next of kin, emergency contacts, payment guarantor, subscriber and insurance coverage.

A MPI project was implemented in Mount Sinai to enable handshake between Cerner and Flowcast, allowing them to share MRN and related patient demographics. The purpose of the project was to eliminate duplicate patient registrations and provide a controlled MRN generation. For several key fields Flowcast and Cerner sync their data sets on each of the patient's visit. Now Flowcast uses Cerner generated MRNs only; the visit ids are internal to it.

Billing data from Flowcast is available at Account level as well as at Invoice Level. CPT-4 codes for all the services rendered during the visits are also provided.

Flowcast is integrated to MSDW via HL7 messages. MSDW receives all the ADT and SIU messages and process them on nightly basis. Billing data is delivered as flat file on nightly basis and is loaded to MSDW.

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IDX-ADT Transactions

Patient Information:

- Medical Record Number (MRN)
- Name
- Date of Birth
- Address and Telephone
- Gender
- Ethnicity and Ethnixe Group
- Language
- Marital Status
- Deceased Indicator
- Religion
- Social Security Number
- Primary Care Physician
- Employment Status
- NOPP Status and Signed Date

Encounter Information:

- Encounter Visit ID
- Visit Type
- Appointment Date
- Visit Class
- Financial Class
- VIP Indicator
- Discharge Disposition
- Next of Kin Information
- Guarantor Information

Encounter Facts:

- Appointment
 - Appointment Date and Time
 - Associated Caregivers
 - Insurance
 - Attending Facility
 - Attending Service
 - Reason for visit
- Scheduling
 - Appointment Date
 - Scheduling Date
 - Appointment Status
 - Reschedule / No-show

Billing:

- Invoice Level
- CPT-4 codes for services rendered

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Blood Bank

Blood type and cross test, blood products ordered and used

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BISLR Prism

Admissions, discharges and transfers, labs, medication.

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Social Security Death Index

Update forthcoming..

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