Cogito

COG427i Diagnostic Imaging Data Model (Without Answers)

February 2024

Materials and assessments for the next version available: 10/20/2024

If completing Continuing Epic Education requirements, visit your My Certificates page for additional information.

Epic Systems Corporation
1979 Milky Way | Verona, WI 53593 | Voice: 608.271.9000 | Fax: 608.271.7237
www.epic.com
documentation@epic.com
Last Revised: May 10, 2024

Table of Contents

Introduction to the Diagnostic Imaging Data Model

Introduction

Welcome to the data model for Diagnostic Imaging!

You've already learned so much about the clinical data models in Clarity and Caboodle, and you've seen that extended to imaging specialties. In this class we'll dive even deeper and explore the unique features of diagnostic imaging.

Prerequisites and Expectations

Before undertaking the course of study within this class, you must have completed the following tasks:

- Attend the COG170 Cogito Fundamentals or COG171v Cogito Fundamentals for the Data Model Certified class
- Complete the RPT101i SQL I self-assessment
- Attend the CDW110v Caboodle Data Model Fundamentals class
- Attend the CLR110 Clarity Data Model Fundamentals class
- Attend the COG240 Clinical Data Model class

How to Use This Training Companion

This training companion is for use in conjunction with other course materials.

Note that new training materials are released regularly throughout the year. If you downloaded this companion even a few weeks or months ago, there may be a new version that you should use instead. At the beginning of this companion, look at the version and dates listed. If you'll complete a task after its listed date, be sure to check the All Training Companion Change Log to see if there are significant changes to the new materials. If there are, be sure to download the new materials when they're released.

You'll find informative text boxes and do-now steps throughout the lessons to draw your attention to specific content. There are a few different types of text boxes you might encounter. Each has a different purpose as defined below:

A "Critical Box" means that information shared here is critical.

An "Example Box" gives a scenario for the content that follows.

A "Beyond the Basics" box provides additional information that may be helpful to enhance understanding, but is not critical. You do not need to know this information for this course's assessment(s).

	A "Write-It-Down" box allows you to write down information or answer a question.
	A "Foundation System FYI" shares information about how the Foundation System handles the workflow you are seeing or other Foundation considerations.
	A "Setup" box gives you more information about system configuration.
	A "Real World Context" box will clarify industry-standard terminology or practice for those who are new to the industry.

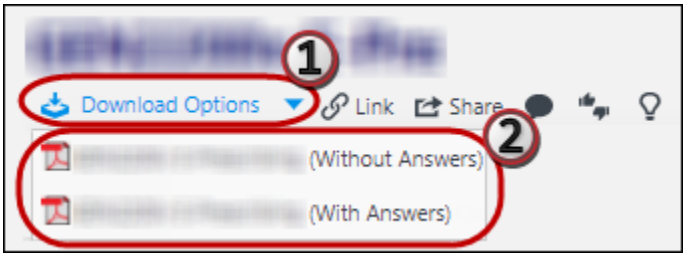
View a Training Companion With and Without Answers

During class, you will use the training companion without answers. It would be inefficient to print out the version of the training companion that includes answers. Instead, refer to it on Galaxy or download it as a PDF.

In Galaxy, you can view a training companion with and without answers using a toggle on the menu on the right:

You can also download either version from the toolbar:

1. Click **Download Options**.
2. Select **(Without Answers)** or **(With Answers)**.



How to Practice Outside of Class

If you are self-studying this course or reviewing it again after class, you'll need to complete the following to use all of the materials outside of class. Even if you've already downloaded materials, be sure that you're using the current version. At the beginning of this companion, look at the version and dates listed. If you'll complete a task after its listed date, be sure to check the All Training Companion Change Log to see if there are significant changes to the new materials. If there are, be sure to download the newest materials using the steps below.

If you are self-studying this course and want to earn a proficient self-study training status, review the information in this section of Epic's Training Guide - Epic Community Member and watch the **EA002 Overview of Proficient Self-Study** e-learning lesson. **This status is only available to direct (W2) Epic community member employees and is not available for badges and some applications in general. You should first receive approval from your employer, then e-mail your intent to pursue proficiency self-study and the name of the intended track to training@epic.com.** If you are not sure if your train track offers this status, send an email to the email address listed at the beginning of this training companion.

If you are reviewing these materials to prepare for a Continuing Epic Education (CEE) requirement, you can review more information on the CEE program in this section of Epic's Training Guide - Epic Community Member or this section of Epic's Training Guide - Consultant.

Download Course Materials

Course materials are available on Galaxy, the Course Catalog, and linked through EpicU.

If you previously completed your certificate, you can find course materials on the Course Catalog. Use the appropriate application and/or role filters to locate your training track. Materials for each course are listed in the corresponding course card.

If you're currently completing your certificate, follow the steps below to find course materials using EpicU.

1. Go to the Training Home.
2. Find the section titled **Your In-Progress Certificates**.
    - If you do not see this section and have not completed your certificate yet, email training@epic.com to ensure the correct training track is attached. If you're unsure which track should be attached, review your application's Course Catalog listings and discuss with your manager.
3. Click the link for the relevant course of study.
4. In EpicU, expand the various sections to find links to course materials.
5. Click the links to open the documents in Galaxy.
6. Download the materials.

Alternatively, you can find the materials on the Course Catalog. Use the appropriate application and/or

role filters to locate your training track. Materials for each course are listed in the corresponding course card.

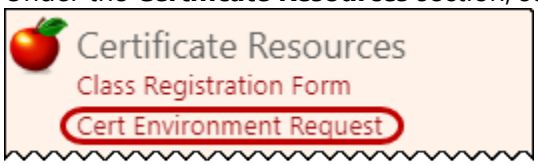
How to Request Access to Epic's Cert Environments

Epic's cert environments allow you to complete projects and study. Using the steps below, you can request access to these environments. If you already have access, you'll be able to confirm that access during the request steps.

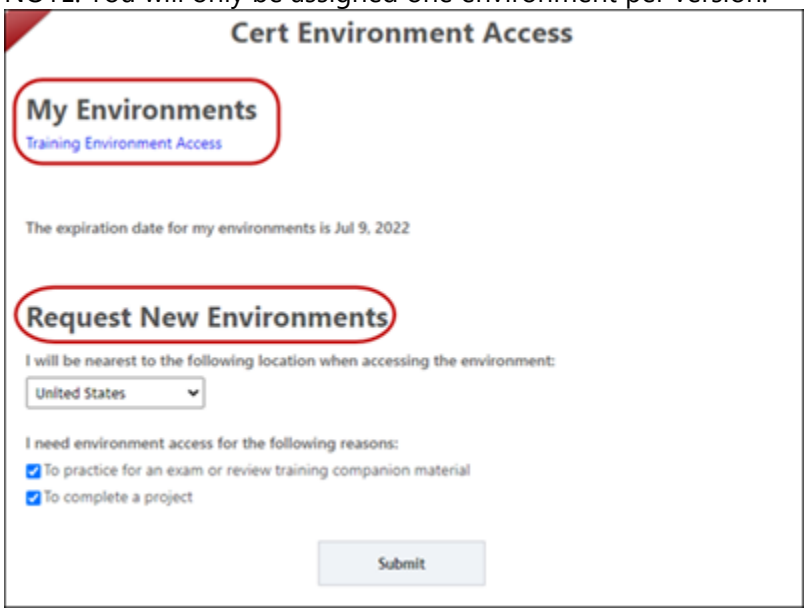
There might be some additional setup you have to do in order to access a cert environment. For example, you may need to work with your IT team to confirm you have the current version of Citrix installed. For a full overview of this process, view the **EA001 Using Epic Access** e-learning lesson or review the Welcome to Certification Environments document on Galaxy.

Below are the basic steps to obtain access to a Study and/or Project environment.

1. Go to the Training Home on the UserWeb.
    - Epic employees: Go to step 4. You do not need to request these environments.
2. Under the **Certificate Resources** section, select **Cert Environment Request.**



    - You can see any environments currently assigned to you.
    - You can request new Study and/or Project environments.
        - NOTE: You will only be assigned one environment per version.



3. Once you submit your request, close your web browser.
4. Open a new browser tab and go to Epic Access:
   - Most learners: Go to access.epic.com.
   - If you selected a country in Europe or the Middle East: Wait 15 minutes; then go to EUaccess.epic.com.
     - The system takes up to 15 minutes to process access requests for Europe or the Middle East.
5. Log in, using the same credentials you use to log in to the UserWeb.
   - If prompted, provide your 6-digit authentication code. (If you haven't configured multi-factor authentication, click the Learn More link.)
   - You might be prompted to log in again; use the same credentials you use for the UserWeb.
   - You have completed this step when the site displays "Home" and "Apps" at the top of the page.
6. Consider using the **Check Your Setup** option before you start using cert environments. This will confirm if your device meets all the requirements.
7. Click the icon to launch the corresponding application.
   - Use **Study** icons for self-study or after-class practice.
   - Use **Project** icons for projects or when explicitly told to use Project environments.
   - Use **Virtual Training** icons only during virtual classes, or when explicitly told to use them.
   - If your training materials instruct you to find an icon you don't see, use the search field to find it. To add the icon to the Home screen, click the star in the icon.

Technical Difficulties?

If you're experiencing technical difficulties, such as your computer asking you, "How do you want to open this file?" when you click an icon, see this article on Galaxy. If you still experience issues or have questions on training materials (including training user IDs and passwords), use the email address listed at the beginning of this training companion.

Access a Study Environment

A Study environment allows you to complete the exercises from this training companion independently. Keep in mind that Study environments refresh every Friday at 10:00 PM Central Time (or 10:00 PM European Central Time for EUaccess). This means that anything you complete on a Friday will be removed by Saturday morning. If you find that another trainee has completed the work using your classroom information sheet, simply choose another classroom information sheet.

To access a Study environment, you may have to request access first (see the section titled "How to Request Access to Epic's Cert Environments"). If you already have access, you can find the environments

following the steps below:

1. Go to Epic Access.
   - Most learners: Go to access.epic.com.
   - Learners in Europe or the Middle East: Go to EUaccess.epic.com.
2. Log in, using the same credentials you use to log in to the UserWeb.
   - If prompted, provide your 6-digit authentication code. (If you haven't configured multi-factor authentication, click the Learn More link.)
   - You might be prompted to log in again; use the same credentials you use for the UserWeb.
   - You have completed this step when the site displays "Home" and "Apps" at the top of the page.
3. Confirm each Study icon's name contains the *month* of the version listed on the first page of this companion.
   - If you don't see the Study icon you need, use the search field to find it. To add the icon to the Home screen, click the star in the icon.
4. Click the Study icon to launch the application.
   - Log in using the login credentials provided to you from your training materials. If you attended a class, you can likely use the same logins you used for that class. You can also reach out to your application's training team for assistance.

Additional Documentation

Document	Used For
Welcome to Certification Environments	General access information, Classic, Hyperspace, and Text login information, and FAQs.
Cogito's Introduction to Epic's Cert Environments	Cogito-specific login and usage information, specifically practicing in SQL Management Studio.

Contact Information

The table below provides contact information you may need during your cert process:

Contact	Used For
CogitoTrainingSubmissions@epic.com	The majority of your questions should be directed to this email address. This address connects you with our team of Cogito trainers who can answer your questions on anything related to reporting training. All class-related questions should be directed to this email address and not to the Cert Environments or UserWeb addresses listed below. If you aren't sure about whom to contact, use this email address.
UserWebAccounts@epic.com	Use this email address only if your access specifically to the UserWeb is broken or lost. If you have a question regarding Cogito training contact CogitoTrainingSubmissions@epic.com.
Direct email for your Epic representative (either the implementers or your technical services representative)	For all exam reviews, contact your Epic representative. You can find this information by asking a member of your own project team or by asking CogitoTrainingSubmissions@epic.com.
Exams@epic.com	Use this email address to ask questions about requesting, submitting, or taking exams, as well as proctors for those exams.
Registrations@epic.com	Use this email address to ask questions about registering for classes at Epic.
TrainingAdminTeamSubmissions@epic.com	Use this email address to inquire about the status of your paper certification or NVT stickers.

Epic Resources

After leaving training at Epic, you will likely get asked questions that you do not know the answers to. This table outlines supplemental resources that are available to you that will help you find the information that you need. Here is a list of the tools available and how they should be used:

galaxy	Epic's online documentation portal. Contains training materials, setup and support guides, and a variety of other useful documents. https://galaxy.epic.com
weLearning	Epic provided platform for E-Learning content. Hosts e-learnings created by Epic as well as customer built modules. https://welearning.epic.com
Epic UserWeb	Online collection of tools and information about Epic and our software. On your front page you can favorite discussions to read/participate in. https://userweb.epic.com
	The Community Library is Epic's content sharing program. Technical Services routinely extract content data from customers' systems, which Epic then hosts on the UserWeb for customer review and use. https://comlib.epic.com
Sherlock	Epic's web-based issue tracking tool. Use Sherlock to have direct access to create and update Support Logs (SLGs), Release Authorizations, and Reportable Issues. https://sherlock.epic.com
	Epic's training website encompassing a variety of training-related tools used by our organizations. Contains Certification Tracking, Course Catalog, Exam Requests, training announcements, and Training Wheels materials. https://training.epic.com
Epic Data Handbook	The Data Handbook provides reference information to access data within your enterprise production database. https://datahandbook.epic.com
NOVA	Nova is an Epic-developed web program for release note management. You can use Nova to assign and review release notes, select which enhancements to implement, and report on

	release note progress. https://nova.epic.com

Looking for more guidance through these tools?

Check out the UserWeb Overview document which can be found by clicking the blue button in the top right of your screen as soon as you log into the https://userweb.epic.com site:

UserWeb Overview

What You Already Know

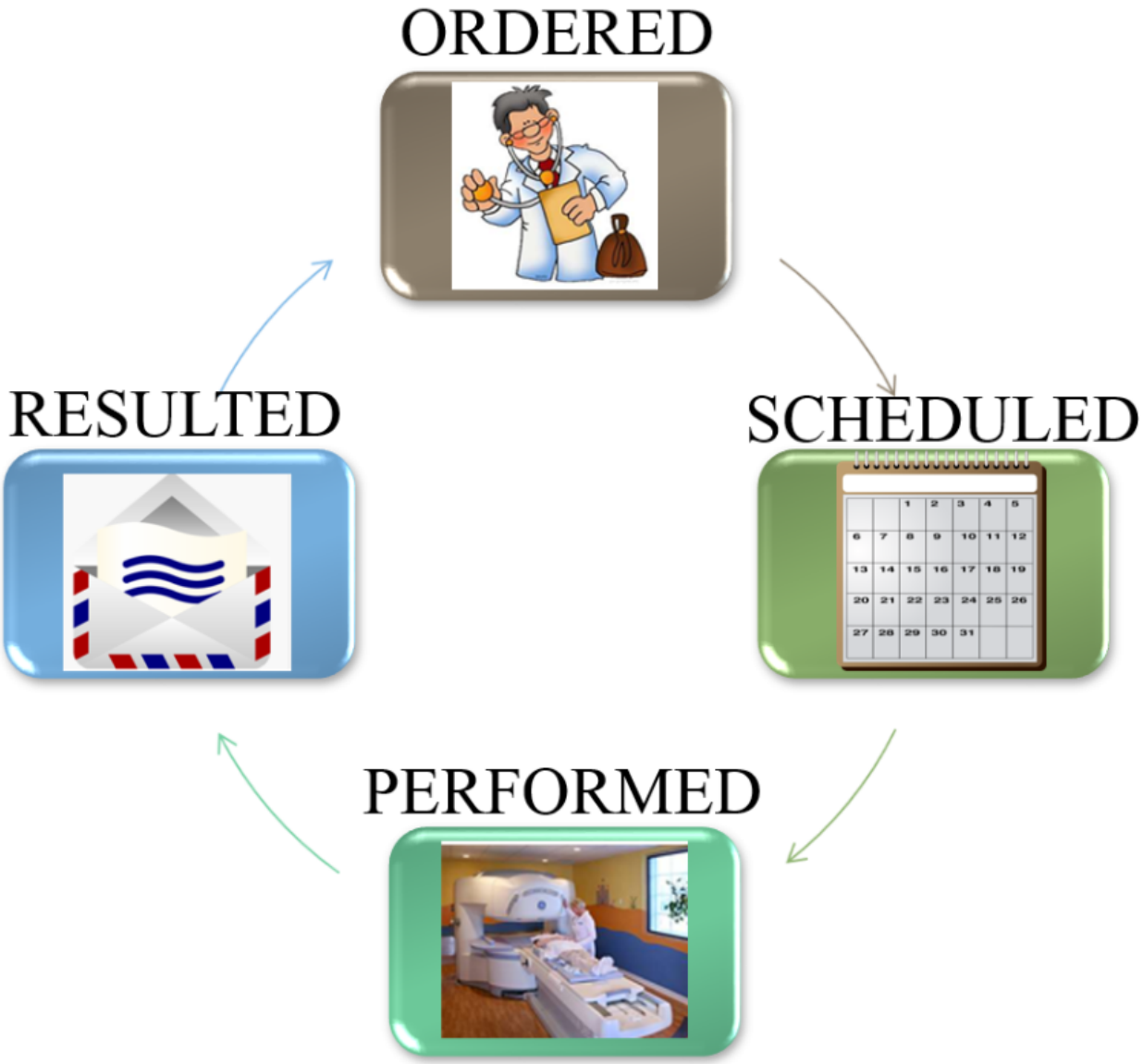
The following topics are particularly relevant to this class. If you are less familiar with any of these topics, consider reviewing them before you continue.

COG240 Clinical Data Model:

- The Why of Patient Encounters
  - Diagnoses
- The How of Patient Encounters
  - Procedure orders
  - Order results
- Flexible Data Structures
  - Notes
  - SmartData Elements
  - Events

Overview of the Imaging Workflow

Life Cycle of an Imaging Order



Diagnostic vs. Interventional Radiology

This course focuses on the types of procedures that we traditionally associate with radiology: x-ray, CT, MRI, ultrasound. These types of procedures are often categorized under the umbrella term diagnostic radiology to distinguish them from procedures in interventional radiology. These categories roughly break down along the following lines:

Diagnostic	Interventional
• Passive image • Patient is unchanged by the procedure • Performed by technologist • Documentation centers on the order record	• Image-guided surgery • Patient is altered in some way • Performed by radiologist, nurse, and technologist • Documentation on both the order and the surgical log

You will learn more about reporting on interventional radiology in COG418i Radiant Interventional and Screening Data Model.

Simplified Reporting for Diagnostic Imaging

Both Caboodle and Clarity have provided simplified solutions for reporting on diagnostic imaging procedures.

Caboodle DMCs for Diagnostic Imaging

Diagnostic Imaging Fact Tables

- EncounterFact
  - Granularity: An encounter
  - Description: The encounter fact contains information about encounters documented in an EMR and encounters derived from billing data. Each row represents an encounter. Encounters from an EMR are flagged with IsDerivedFromBilling = 0 and encounters derived from billing data are flagged with IsDerivedFromBilling = 1. For Epic EMR data, one encounter is one CSN. For encounters derived from billing data, Epic has released definitions that combine multiple outgoing and paid claims into one encounter based on comparing attributes like patient, provider, and date.
  - Versions applicable: V12 or before and beyond
  - Packages of interest: Encounter Load
- ImagingFact
  - Granularity: An imaging study
  - Description: The imaging fact contains information about imaging studies. Each row represents an imaging study.
  - Versions applicable: V12 or before and beyond
  - Packages of interest: Imaging Study Load
- PatientLocationEventFact
  - Granularity: A location for a patient
  - Description: The patient location event fact contains information about where a patient was located at a given point in time during an encounter. For hospital stays, each row represents a patients location for a given period of time. For outpatient encounters, each row represents a department.For Epic data, this fact includes information from admissions, transfers, patient location updates, and outpatient encounters.
  - Versions applicable: V16 and beyond
  - Packages of interest: Outpatient Encounter Load, Patient Location Event Load

Reporting with Caboodle Document

The Imaging Studies section of the Reporting with Caboodle document provides a detailed section on how to use the Caboodle tables for diagnostic imaging reporting.

Clarity View for Diagnostic Imaging

While you can find almost all Radiant data extracted from Chronicles to Clarity following the Clarity Data Model, there is also a view you may use for easier diagnostic imaging reporting.

Although the Caboodle tables and V_IMG_STUDY make it easy to report on diagnostic imaging data, they do not contain all diagnostic imaging data collected by Epic. The remainder of this course will explore where to find data as you are reporting on the full lifecycle of an imaging order.

V_IMG_STUDY

V_IMG_STUDY is a view that was designed to simplify imaging reporting. V_IMG_STUDY only contains rows for imaging orders, as opposed to other orders tables which contain information on all types of orders.

When using V_IMG_STUDY, it is important to note that it only contains one row per performed imaging procedure. This means that it cannot hold information on multiple-response items. Also, parent orders do not get their own rows in this view. The data from a parent order is included in the same row as the child order.

Setting Up the Imaging Appointment

Introduction

You have already learned how to report on many topics related to patients, orders, and appointments in your previous data model classes. This lesson covers extra topics that are common to diagnostic imaging reporting such as modifying orders, and the link between an order and its related appointment.

By the End of This Lesson, You Will Be Able To...

- Recognize the different roles related to orders and how to include the appropriate staff on a report.
- Use V_IMG_STUDY and/or PAT_ENC_APPT appropriately to pull scheduled resources.
- Pull custom event tracking actions into reports.

Orders

Imaging orders are procedure orders, and thus follow the same reporting patterns you saw in the COG240 Clinical Data Model class.

Sample Workflow: Placing Imaging Orders

To see a sample workflow for placing an imaging order, review the "Transcribe an order" portion of the RAD001 E-learning.

Reporting on Orders

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Basic imaging order information	V_IMG_STUDY (Clarity view)	ImagingFact
Procedure order information (all procedure orders)	ORDER_PROC (ORD, No-Add Single)	ImagingFact, EncounterFact
Full imaging order audit trail	ORDER_RAD_AUDIT (ORD, No-Add Multiple)	No
Ordering diagnoses	ORDER_DX_PROC (ORD, No-Add Multiple)	DiagnosisBridge
Appropriateness scores	IMG_DECISION_SUP (ORD, No-Add Multiple)	ImagingFact
Patient location	PAT_ENC, PAT_ENC_2 (EPT, Overtime Single)	PatientLocationEventFact
Basic imaging procedure information	V_IMG_STUDY (Clarity view)	ImagingFact
Procedure information (all procedures)	CLARITY_EAP (EAP, No-Add Single)	ProcedureDim
Procedure category information*	EDP_PROC_CAT_INFO (EDP, No-Add Single)	ProcedureDim
Imaging productivity tracking	ORDER_IMG_PRODUCTIVITY (ORD, No-Add Multiple)	ImagingFact
Anatomical region	EAP_ANATOMICAL_RGN (EAPT, No-Add Multiple)	ProcedureAnatomicalRegionBridge

* Procedure categories are used to group together related procedures, such as all GI orderable procedures.

** These tables can be used for RVU (relative value unit) reporting. They store custom weighted point

systems configured at the procedure or procedure category level. These are useful because certain procedures might take exponentially longer than others to complete, and comparing a straight count of procedures completed is not fair to users who take on difficult procedures.

Other Reporting Topics

Changed Orders

Imaging procedures are very specific, and it can be difficult to identify the correct procedure when placing the order. If the order was placed for an inappropriate procedure, it needs to be changed to reflect the correct procedure. There may be other reasons to change the procedure on an order as well. For example, the patient may have an allergy to the contrast used in the procedure.

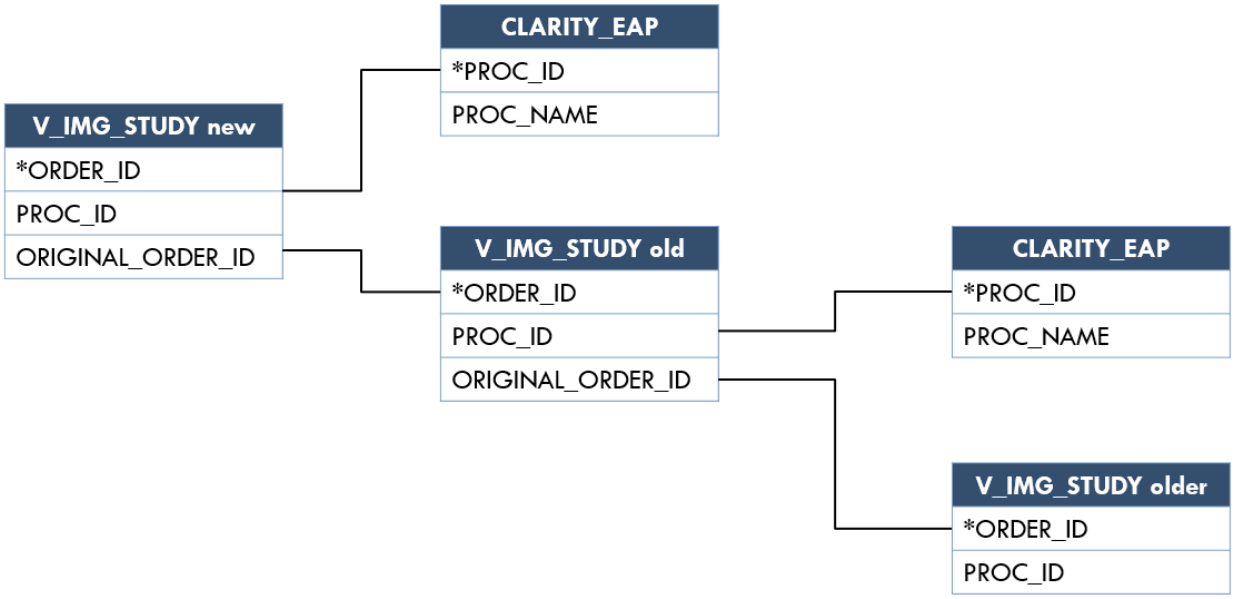
A change to the procedure that was ordered is considered a pretty big deal, so we don't want to overwrite the information on the original order. Instead, a new order record is generated with the new information. The original order record is then canceled. This allows us to easily report on orders that were changed.

Other circumstances might require a clinician to cancel an order without placing a new order. For example, the procedure may no longer be necessary for the patient, or the patient may be unwilling or unable to complete the exam.

Reporting on Changed Orders

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Changed imaging orders	V_IMG_STUDY (Clarity view)	ImagingFact
Full imaging order audit trail	ORDER_RAD_AUDIT (ORD, No-Add Multiple)	No


CLARITY_EAP
*PROC_ID
PROC_NAME
V_IMG_STUDY new
*ORDER_ID
PROC_ID
ORIGINAL_ORDER_ID
V_IMG_STUDY old
*ORDER_ID
PROC_ID
ORIGINAL_ORDER_ID
CLARITY_EAP
*PROC_ID
PROC_NAME
V_IMG_STUDY older
*ORDER_ID
PROC_ID

Appointments

Before we can perform an imaging exam, we must link the order to an imaging appointment. All radiology procedures will be scheduled to appointments.

Sample Workflow: Scheduling a Single Imaging Appointment

To see a sample workflow for scheduling an imaging appointment, review the "Schedule an appointment" and "Check in an appointment" portions of the RAD001 E-learning.

Types of Imaging Appointments

One imaging order can be linked many appointments. One appointment may have more than one provider/resource associated with it. Here are some of the special one-to-many scenarios we encounter in imaging, and how we can deal with them:

- *Joint Appointments* are where one appointment has multiple resources scheduled into it. The provider/department held in V_IMG_STUDY will typically correspond to the modality resource, but there may be clinicians scheduled to the appointment as well. Therefore, using V_IMG_STUDY is not always sufficient. Fortunately, the table PAT_ENC_APPT can get us the additional multiple-response information.
- *Panel Appointments* are where one imaging order is linked to multiple appointments. This is visible in the data model by looking at the ORD_APPT_SRL_NUM table. This table has order ID as part of the primary key and stores all the appointment serial numbers an order is linked to. If showing all the appointments is not necessary, use the appointment information in V_IMG_STUDY which corresponds to the first appointment in the series.
- *Single Appointments with Multiple Orders* are also possible in the system. This is evident only in that two or more orders will share one or more appointment serial numbers. Nothing special is necessary in order to accommodate this, but it is important to consider when generating counts of orders or appointments.

Reporting on Appointments

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Basic imaging appointment information	V_IMG_STUDY (Clarity view)	ImagingFact
Joint appointments	PAT_ENC_APPT (EPT, Overtime Multiple)	PatientLocationEventFact
Panel appointments - link from order to all appointments	ORD_APPT_SRL_NUM (ORD, No-Add Multiple)	No (only one encounter is linked).
Appointment contact	PAT_ENC (EPT, Overtime Single)	EncounterFact
Basic department info	CLARITY_DEP (DEP, No-Add Single)	DepartmentDim
Basic provider info	CLARITY_SER (SER, No-Add Single)	ProviderDim

Careful! The link from ORD_APPT_SRL_NUM to PAT_ENC is not a CSN link but rather an ASN (Appointment Serial Number). As a result, it is very important to join ORD_APPT_SRL_NUM.APPTS_SCHEDULED to PAT_ENC.APPT_SERIAL_NO, not the CSN column.

For more information on appointment serial numbers and how they work, check out the Rescheduling Appointments section of the COG220 Access Data Model companion.

Other Reporting Topics

Custom Event Tracking

The imaging applications contain a customizable event tracking module for the purpose of collecting a date, time and user associated with a real world event that does not correspond with any other standard functionality.

Within imaging reporting, the time differences between certain events are very important. For example, you might want to report on the time between the start of an exam and the time when the patient receives contrast. The time an exam started is often considered as the Exam Begun timestamp (V_IMG_STUDY.BEGIN_EXAM_DTTM), but Epic does not have a standard discrete field to collect "contrast completion". One option is to configure this custom event tracking functionality to collect this timestamp.

These custom events are stored in a unique type of event record. Within the imaging applications, these generic customizable events are stored at the appointment level.

The data model for this tracking data closely resembles the extensible data models you have seen in your previous courses.

Reporting on Custom Event Tracking

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Bridge to from appointment to event	ED_IEV_PAT_INFO (IEV, No-Add Single)	No
Appointment event data	ED_IEV_EVENT_INFO (IEV, No-Add Multiple)	No

Exercises

Exercise 1: Reporting on Patient Radiation Exposure

Write a report that shows all patients that have received lifetime totals of radiation exposure that exceed 1.00 mSv. You are told by your imaging application administrator that the tracked chemical that stands for radiation is category ID 9 and that radiation exposure is stored in mSv. Display the patient name, MRN, date of birth, sex abbreviation, and lifetime dose amount.

Exercise 2: Reporting on Canceled Orders

Create a new report that shows the number of orders canceled, grouped by canceling user. Display the user's name and the number of orders they canceled.

Exercise 3: Reporting on Custom Event Tracking

Write a report that displays the time difference between a custom event tracking event (contrast administered) and the begin exam timestamp. Display the order ID, begin exam timestamp (V_IMG_STUDY.BEGIN_EXAM_DTTM), event tracking timestamp, and the time difference in minutes. Use event type 57021 for the contrast administered event. Do not display orders that did not have this event documented.

Note: while event type 57021 is not actually the contrast administered event in this environment, this value will suffice for the purpose of this exercise. Outside of the training setting, you will need to determine the appropriate event type specific to your organization prior to completing a similar report.

Answer Keys

Solutions to Exercises

See the Cogito's Introduction to Epic's Certification Environments document on Galaxy for information on accessing the answer key files.

Reviewing the Chapter

Review Questions

1. How would you determine a patient's lifetime cumulative dosage of radiation?

2. Will the column ORDER_MED_ID always be populated with an imaging order for radiation exposure-related rows of PAT_LIFEDOSE_HX?

3. What should we be concerned with how we are joining from V_IMG_STUDY to retrieve fields such as ORDER_PROC.FUTURE_OR_STAND or ORDER_PROC.STAND_ORIG_OCCURS?

4. V_IMG_STUDY and PAT_ENC_APPT both have fields that hold a provider and department. What is the difference between them?

Review Key

1. How would you determine a patient's lifetime cumulative dosage of radiation?

Check PAT_LIFEDOSE.SIMP_DOSE_AMT where the CHEMICAL_C is equal to your system's configured chemical for "radiation".

2. Will the column ORDER_MED_ID always be populated with an imaging order for radiation exposure-related rows of PAT_LIFEDOSE_HX?

No, invasive and externally performed procedures will not contain a value in the ORDER_MED_ID column.

3. What should we be concerned with how we are joining from V_IMG_STUDY to retrieve fields such as ORDER_PROC.FUTURE_OR_STAND or ORDER_PROC.STAND_ORIG_OCCURS?

These fields will potentially reflect information surrounding the context in which the child order was released and not information from the parent order's ordering context.

4. V_IMG_STUDY and PAT_ENC_APPT both have fields that hold a provider and department. What is the difference between them?

V_IMG_STUDY only holds the first of potentially many provider/department pairs. The system allows a type of appointment known as "joint appointments" where more than one resource is scheduled into a single appointment. To pull all information on these types of appointments, the PAT_ENC_APPT table is necessary.

Study Checklist

Make sure you can define the following key terms:

- ☐ Lifetime dose
- ☐ Panel appointment
- ☐ Joint appointment
- ☐ Custom event tracking

Make sure you can perform the following tasks:

- ☐ Identify the column used to limit PAT_LIFEDOSE to just radiation values.
- ☐ Report on canceled and changed orders.
- ☐ Pull custom event tracking actions into reports.
- ☐ Report on imaging appointments.

Make sure you fully understand and can explain the following concepts:

- ☐ The difference between the pre-summarized and order-level radiation exposure tables.
- ☐ The difference between order and procedure information.
- ☐ When to use PAT_ENC_APPT instead of V_IMG_STUDY.
- ☐ The difference between appointments and procedures.

Performing the Imaging Exam

Introduction

Once the patient is at the imaging appointment, the technologist performs the imaging exam(s).

In this lesson, you will learn about how to report on the documentation around the imaging exam including the basic workflow, medications, supplies and charges, and chargeable procedures.

By the End of This Lesson, You Will Be Able To...

- Identify the difference between linked chargeable procedures and other chargeable procedures
- Report on different components of an imaging exam

Imaging Exams

Important Vocabulary

There are a few terms that are used somewhat interchangeably when it comes to imaging. We will attempt to divide out these terms so that we can better understand the data structure, but most practitioners will not use this same precision of language.

- A procedure is ordered by a physician.
- An exam is performed by a technologist.
- A study is interpreted by a radiologist.

The distinction will become more important as we continue. For example, a technologist may be able to perform multiple procedures within a single exam (such as an x-ray of the hand and x-ray of the wrist). Likewise, a radiologist may provide a single interpretation that encompasses multiple exams.

This lesson focuses on the exam itself, and the documentation surrounding how the exam was performed.

Sample Workflow: Performing an Exam

To see a sample workflow for a technologist performing an imaging exam, review the "Perform an exam" portion of the RAD001 E-learning.

Reporting on Imaging Exams

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Basic performing information	V_IMG_STUDY (Clarity view)	ImagingFact
Supporting staff associated with performing the exam	RIS_SUPP_STAFF (ORD, No-Add Multiple)	No

Other Reporting Topics

Medications

Within imaging workflows, certain procedures require the administration of contrast in order to obtain a good picture for the reading physician. These contrasts are treated as medications due to the potential for an allergic reaction.

In the Begin Exam or End Exam navigators, imaging technologists have the ability to order contrast and mark it as exam-related. By doing this, the technologist is making a link between the imaging procedure

order and the contrast medication order.

Reporting on Medications

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Exam-related medications	PROC_RELATED_MEDS (ORD, No-Add Multiple)	No

Supplies

Supply usage and documentation is common among interventional procedure workflows. However, the documentation of supplies is still used during diagnostic procedures within the end exam activity. Organizations use this functionality to document trays, needles, or materials used during an exam, as seen in the screenshot below.

Reporting on Supplies

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Supplies	ORDER_SUPPLY (ORD, No-Add Multiple)	No

Chargeable Procedures

There are two types of chargeable procedures:

- Linked chargeable procedures
  Created automatically by the system to generate codes to send to the billing office
- Added chargeable procedures
  Created when a user manually adds a procedure

An example of both types of chargeable procedures can be seen when a patient has a screening mammogram with CAD (computer aided detection).

The actual procedure on the order record is the mammogram. This procedure might have technical and professional components tied to it through linked chargeable procedures that are generated every time the order is performed. It also might cause additional charges to generate through an added chargeable procedure if CAD was used in the exam.

Either type of chargeable procedure is what is sent to the billing office to be charged. However, there is no guarantee that the patient will be billed for exactly what the Radiant application sent over. For more information, see the Revenue data model courses.

Reporting on Chargeable Procedures

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Linked chargeable procedures	LINKED_CHARGEABLES (EAP, Overtime Multiple)	No
Added chargeable procedures	ORD_PROC_CHG_EAPS (ORD, Overtime Multiple)	No

When reporting on linked chargeable procedures, you need to make sure you are pulling the chargeable procedures linked to the most recent contact of the orderable procedure. You can accomplish that using the CLARITY_EAP_OT table as outlined in the following query:

```
SELECT
     V_IMG_STUDY.ORDER_ID
    ,V_IMG_STUDY.PROC_ID                    'Orderable/Performable EAP ID'
    ,LINKED_CHARGEABLES.LINKED_CHRG_ID    'Chargeable EAP ID'
FROM
    V_IMG_STUDY
    INNER JOIN
    ( SELECT ORDER_ID, ot.PROC_ID, MAX(CONTACT_DATE_REAL) MostRecentContactDat
eReal
      FROM V_IMG_STUDY study INNER JOIN CLARITY_EAP_OT ot ON study.PROC_ID = o
t.PROC_ID AND CONTACT_DATE < BEGIN_EXAM_DTTM
      GROUP BY ORDER_ID, ot.PROC_ID
    ) MostRecentOrderableContact
    ON V_IMG_STUDY.PROC_ID = MostRecentOrderableContact.PROC_ID
      AND V_IMG_STUDY.ORDER_ID = MostRecentOrderableContact.ORDER_ID
    LEFT OUTER JOIN LINKED_CHARGEABLES
       ON MostRecentOrderableContact.PROC_ID = LINKED_CHARGEABLES.PROC_ID
       AND MostRecentOrderableContact.MostRecentContactDateReal = LINKED_CHARG
EABLES.CONTACT_DATE_REAL
```

Radiation Tracking

Radiation Exposure

Tracking radiation exposure is an important aspect of an imaging department manager's job. The imaging applications allow users to enter how much radiation the patient was exposed to during the exam or procedure. The actual method for storing and compiling totals is functionality originally created by Willow Inpatient, so if you have created reports on lifetime dosing of pharmaceutical drugs, the tables below will be very familiar. Consequently, the data that lives in the following tables will not be exclusive to radiation.

Radiation data can be entered using three different workflows:

- Performing a non-invasive procedure such as a chest x-ray.
- Performing an invasive procedure in Cupid, such as a cardiac catheterization.
- Documenting an external procedure the patient underwent (not performed at your organization), so there is not an order or procedure log.

There are two Chronicles related groups that store dosing information on an EPT record.

- Individual Doses
  Related group starting at I EPT 34700
- Lifetime Sum of Doses
  Related group starting at I EPT 34720

Reporting on Radiation

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Individual radiation doses	PAT_LIFEDOSE_HX (EPT, No-Add Multiple)	No
Lifetime sum of radiation doses	PAT_LIFEDOSE (EPT, No-Add Multiple)	No

One order, procedure log, or external procedure might have multiple lines in PAT_LIFEDOSE_HX. This happens when a user modifies a previously documented radiation exposure value. The original value appears as a row that contains a null value in the EMAR_LINE column. Subsequent updates to the original documentation will point to the original LINE using the EMAR_LINE. The subsequent lines with EMAR_LINE populated contain the change in radiation.

For example, if a user originally documents a radiation of 10 mSv and later updates the exposure to be 9 mSv, the original line will always contain a 10 in the SIMP_DOSE_AMT column, and the second/updated line will contain a -1 in the SIMP_DOSE_AMT column. Sum all the lines for a single ORDER_MED_ID, SURGERY_CSN, or LIFEDOSE_PROC_ID in order to display the true radiation exposure for that exam or procedure.

Exercises

Exercise 1: Reporting on Chargeable Procedure Information

Oh no! Our application administrator just discovered that a particular chargeable procedure has not been generating charges at end exam since 1/1/2015. Display the order ID, accession number, end exam date, patient name, and the procedure name for all exams since the beginning of 2015 that had a linked chargeable procedure of ID 66212.

Answer Keys

Solutions to Exercises

See the Cogito's Introduction to Epic's Certification Environments document on Galaxy for information on accessing the answer key files.

Reviewing the Chapter

Review Questions

1. A department manager asks why there is no contrast order for a particular exam on your report. You confirm that you have appropriately used the PROC_RELATED_MEDS table. Why might the contrast order not appear?

Review Key

1. A department manager asks why there is no contrast order for a particular exam on your report. You confirm that you have appropriately used the PROC_RELATED_MEDS table. Why might the contrast order not appear?

Possibilities include:

* *Contrast was not needed for the exam.*
* *The technologist determined that it was not appropriate to use contrast, but did not update the procedure on the order.*
* *The technologist did administer contrast, but neglected to mark the contrast order as "exam-related".*

Study Checklist

Make sure you can define the following key terms:

- ☐ Chargeable procedures
- ☐ Supply

Make sure you can perform the following tasks:

- ☐ Identify the difference between linked chargeable procedures and other chargeable procedures
- ☐ Report on different components of an imaging exam

Interpreting the Study Results

Introduction

Imaging procedures can be resulted in a variety of ways.

Some procedures receive only dictations that are transcribed word for word and stored either on the order or a related record. Other procedures' results are more involved and receive discrete documentation. For example, mammography and many cardiovascular procedures receive a great deal of discrete result documentation. These highly specialized areas are discussed in COG418i Radiant Interventional and Screening Data Model. This lesson focuses on the basic imaging procedure workflow.

By the End of This Lesson, You Will Be Able To...

- Identify types of results, such as preliminary reads performed in the imaging applications, ED interpretations, final results, and addenda
- Provide counts of orders and counts of studies
- Report on imaging physicians' performance as evaluated by their peers
- Report on the amount of time it takes to reach care team providers when a critical result is found

Study Results

After the images are captured, the next step for an imaging study is interpretation by a reading physician. This interpretation, not the image itself, is considered to be the study "result". It is often saved as free text.

There are three main types of study results:

- Radiologist interpretations
- ED interpretations (Wet Reads)
- Discrepancies

Radiologist Interpretations - Typical Workflow

In a typical diagnostic imaging workflow, the radiologist dictates their interpretation of the results after they review the images.

There are typically two main parts to a single study interpretation:

- Narrative
  The narrative typically comprises the majority of result text.
- Impression
  The impression represents a concise conclusion to the result text.

Epic Integration with Other Resulting Software

Reading and resulting workflows may vary between your organization and another organization, especially when third-party software is used. Imaging physicians can use two other main types of software besides Epic: dictation systems and PACS (Picture Archive and Communication System). A dictation system is the tool into which an imaging physician dictates an interpretation of the images. Some of these systems have voice recognition capabilities and can insert text directly into our applications' result text fields, and sometimes they require an HL7 interface to file the result text. Other dictation systems, like Epic's built-in dictation system, record the interpretation for a human transcriptionist to type into Epic. A PACS is a digital image storage and viewing solution.

Epic has deep integrations with several third-party products, and much result information can be collected in real time in Epic. However, some organizations' reading and resulting workflows do not involve Epic software and instead rely on an HL7 interface to create the result. In the latter case, the information available in Epic can be limited. For example, in the Study Review activity within Epic, an imaging physician can mark a discrepancy with an ED interpretation, and this information files discretely to the ORDER_RAD_STUDY table. If an imaging physician is working exclusively in a third-party system where discrepancies are not available as a discrete field, then the interface will not be able to populate the discrete item in Epic. Therefore, if the entire workflow is not performed in Epic, some of the information described in this lesson might not be available.

Sample Workflow: Interpreting Study Results

To see a sample workflow for a radiologist interpreting the results of an imaging order, review the "Read a study" portion of the RAD001 E-learning.

ED Interpretations

Patients coming from the emergency department might have their images initially interpreted by a physician who does not specialize in imaging. They are supplied by an emergency department physician, as opposed to an imaging physician, in situations where an immediate interpretation is necessary. These reads are sometimes called wet reads or ED interpretations.

This method of resulting is never considered the final result. The final result is given at a later time by an imaging physician.

Discrepancies

A discrepancy is found when an imaging physician disagrees with a result as indicated on a previous contact. At the time a discrepancy is marked, results routing configuration can trigger In Basket messages to various providers to alert them to the fact they have seen a preliminary result where an imaging physician has disagreed.

Reporting on Study Results

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Result information	V_IMG_STUDY (Clarity view)	ImagingFact
All study signatures (including preliminary, final result, and addendum signatures)	RIS_SGND_INFO (ORD, No-Add Multiple)	No
Final result and addendum result text (both narrative and impression)	HNO_NOTE_TEXT (HNO, Overtime Multiple)	ImagingTextFact
Link from order to result note	ORDER_STATUS (ORD, Overtime Single)	No
Link from order to result note, addendums only	ORDER_RAD_ADDEND (ORD, No-Add Multiple)	No
ED Interpretations	ORDER_ED_INTERP (ORD, No-Add Multiple)	ImagingFact
Final result Narrative text only	ORDER_NARRATIVE (ORD, No-Add Multiple)	ImagingTextFact
Final result Impression text only	ORDER_IMPRESSION (ORD, No-Add Multiple)	ImagingTextFact
Actions performed on an imaging study (including discrepancy information)	ORDER_RAD_STUDY (ORD, Overtime Single)	ImagingFact

The ORDER_NARRATIVE and ORDER_IMPRESSION tables only have the narrative and impression for the most recent contact. Therefore, for most reporting purposes it is safe to ignore the ORD_DATE_REAL columns in these tables. If reporting on the data from a different contact is important, use the ORDER_STATUS and HNO_NOTE_TEXT as indicated earlier.

Choosing the Right Result Text

Imaging studies often contain results that are stored as text. There are several different tables that hold result text. Choosing the right table depends on the reporting need.

Using HNO_NOTE_TEXT

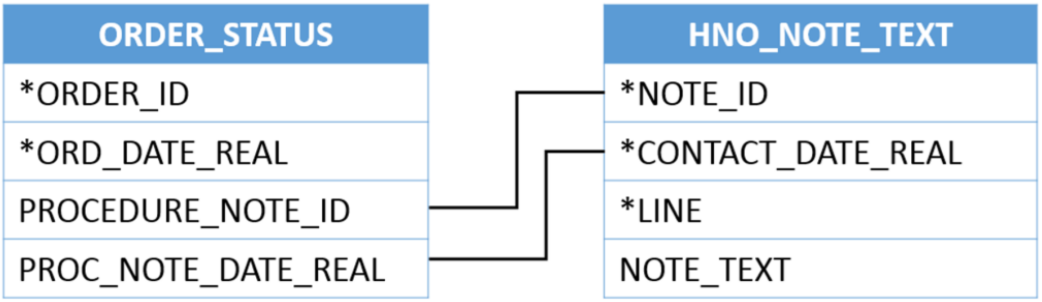
HNO_NOTE_TEXT stores many different kinds of notes including imaging final result text and addenda to result text. Specific contact filtering should not be necessary as long as you are joining to this table via V_IMG_STUDY.RESULT_NOTE_CSN or ORDER_STATUS.PROC_NOTE_DATE_REAL.

Filtering on the most recent contact is necessary if joining here using ORDER_RAD_ADDEND for addendum text. Manually inserted line breaks in result text are not preserved in this table. It contains a LINE column, but that is due to lines being split into 1,950 characters or fewer.

Using ORDER_STATUS with HNO_NOTE_TEXT

ORDER_STATUS stores all order contacts. In the context of result text reporting, it is used to join to the note records that hold the imaging physician's interpretation. This does not include addenda to results. See ORDER_RAD_ADDEND for those note IDs. In most cases, you need to display only the most recent contact per order.

The typical query uses ORDER_STATUS as a bridge table to link between the imaging order and the result text, as seen in the linking diagram below.



Using ORDER_RAD_ADDEND with HNO_NOTE_TEXT

If you would like to show addendum results only, use ORDER_RAD_ADDEND to join to HNO_NOTE_TEXT.

Unlike ORDER_STATUS, we do not store the relevant note contact on the order record. Use the most recent contact of the HNO_NOTE_TEXT record for the most relevant version of the addendum text.

Be aware that if you display narrative and/or impression text in a Radiant report, the addendum text should be displayed with it. At the very least, some sort of notation should appear to indicate that a change was made to the narrative or impression text after the study was finalized.

Cupid addenda often overwrite previous contacts instead of keeping each addendum on its own contact. As a result, the strategy for displaying addendum text will differ per application: for Cupid, display only the most recent addendum contact; for Radiant, display all addendum contacts.

Using ORDER_NARRATIVE or ORDER_IMPRESSION

An alternate to using HNO_NOTE_TEXT is to use ORDER_NARRATIVE or ORDER_IMPRESSION. Those tables will give you only the final results of either the narrative section or the impression section of the study interpretation.

Other Reporting Topics

Critical Result Tracking

When reading physicians need to communicate with a patient's primary care provider or other physicians about a critical result, it is important to track the communication that took place. The imaging applications contain a module for collecting information about these communication attempts. It is possible to report on these communication attempts to obtain figures such as the average time it takes to reach a physician.

Reporting on Critical Result Tracking

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Critical result findings	ORDER_RES (RES, No-Add Single)	No
Link from order to critical result finding	ORD_RSLT_TRK_FND_FOLLOWUP (ORD, No-Add Multiple)	No
Communication tracking	CAL_COMM_TRACKING (CAL, No-Add Single)	No
Bridge from communication to the critical result finding	CAL_REFERENCE_PAT (CAL, No-Add Multiple)	No
Critical result acuity levels	IMG_DEF_ACUITY (RDF, No-Add Multiple)	No

Peer Review

The imaging applications can be configured to allow imaging physicians to review their peers' work using the peer review module.

It is worth noting this information is considered strictly confidential and extremely sensitive. Use discretion in making this information widely available. It is intended to be seen by imaging physician department managers, chief imaging physicians, and the like.

Reporting on Peer Review

The following table presents common reporting topics, and where the relevant data can be found in Clarity and Caboodle.

Reporting Topic	Clarity Table	In Caboodle?
Peer review	PEER_REVIEW (ORD, No-Add Multiple)	No

Exercises

Exercise 1: Reporting on Result Information

Write a report that shows counts of orders grouped by signing physician. Only include orders that are either (1) not part of a study group or (2) are part of a study group but are not the grouper order (August 2020 and earlier: master order). Show the physician's name, a count of all orders, and the number of study groups.

Answer Keys

Solutions to Exercises

See the Cogito's Introduction to Epic's Certification Environments document on Galaxy for information on accessing the answer key files.

Reviewing the Chapter

Review Questions

1. If you wanted to show a count of studies instead of a count of orders, how would you go about this?

2. Explain the types of results found in ORDER_NARRATIVE, ORDER_IMPRESSION, and HNO_NOTE_TEXT.

3. Given that you're finding an ORDER_RAD_STUDY record where DISCREPANCY_C = 1 (category value indicating discrepancy is present), how would you join to the ORDER_ED_INTERP record the imaging physician was looking at when he or she marked the discrepancy.

Review Key

1. If you wanted to show a count of studies instead of a count of orders, how would you go about this?

One method would be only counting the order if either V_IMG_STUDY.STUDY_GRP_ORDER_ID is null or if it is equal to V_IMG_STUDY.ORDER_ID.

2. Explain the types of results found in ORDER_NARRATIVE, ORDER_IMPRESSION, and HNO_NOTE_TEXT.

ORDER_NARRATIVE holds the original result text's narrative. ORDER_IMPRESSION holds the original result text's impression. HNO_NOTE_TEXT holds the entire original result when linked through ORDER_STATUS and the addendum text when linked through ORDER_RAD_ADDEND.

3. Given that you're finding an ORDER_RAD_STUDY record where DISCREPANCY_C = 1 (category value indicating discrepancy is present), how would you join to the ORDER_ED_INTERP record the imaging physician was looking at when he or she marked the discrepancy.

Where ORDER_RAD_STUDY.ORDER_PROC_ID = ORDER_ED_INTERP.ORDER_ID and ORDER_RAD_STUDY.CONTACT_DATE_REAL > ORDER_ED_INTERP.CONTACT_DATE_REAL

Study Checklist

Make sure you can define the following key terms:

- ☐ Narrative
- ☐ Impression
- ☐ Addendum
- ☐ Result Code
- ☐ Imaging Result
- ☐ Discrepancy

Make sure you can perform the following tasks:

- ☐ Identify the various providers involved with the interpretation of a study.

Make sure you fully understand and can explain the following concepts:

- ☐ Explain the differences between the various result text tables to include on a report