

InfoSphere Clinical Analytics 8.1

General Information Manual

Second Edition, December 2009

CHANGES IN THE SECOND EDITION

The release of ICA 8.1 brings significant new functionality to the product as well as extending the capabilities and value of the Healthcare Intelligence Dashboard analytics. These changes are summarized below and detailed throughout the remainder of this updated General Information Manual:

- *Clinical Query Application, version 3.0 – A browser-based interface to facilitate comprehensive searches through all elements within the InfoSphere Clinical Analytics data warehouse using a user-friendly guided interface that does not require SQL coding. In addition, the CQA manages the re-identification workflow and approval cycle (when permitted) as well as maintaining the documentation and logging required to meet HIPAA requirements.*
- *Heuristic Mapping Manager, version 2.2 – A browser-based tool to facilitate correlation of LOINC and RxNorm descriptions with their respective codes as part of the data transformations performed in the ICA product.*
- *Clinical Data Model, version 2.2 – An extension of the v2.0 model to include additional data elements as well as management for Type 2 slowly changing dimensions and upgrades to the ETL flows and validation.*
- *Healthcare Intelligence Dashboard, version 1.4 – New dashboards covering Cardiovascular Disease Profiles and Diagnosis-Related Group (DRG) Profiles have been introduced, along with enhancements to the existing Diabetes Profile and Hospital-Acquired Conditions dashboards.*

INTRODUCTION

Healthcare in America is in the midst of a revolution, both at the governmental level due to fundamental policy changes intended to address the ever-growing spiral of delivery costs and at the technological level as care management informatics adoption reaches critical mass among the nation's practitioners.

This is a time of transition and of crucial business decisions in healthcare management; ironically it comes at a point where huge amounts of patient, diagnostic, and billing data exist, but very little actionable information. Maximizing revenue while maintaining high standards of patient care and meeting new government guidelines demands accurate, timely, and insightful information in the face of ever-accelerating volumes of data.

Resolving that conundrum is the objective of InfoSphere Clinical Analytics.

Gartner Group has highlighted the growing need for predictive analytics that are flexible to an organization's needs, while Forrester Research notes the trend to increased use of decision management applications in healthcare.

Of the many challenges currently facing healthcare executives, none is more persistently troublesome than the widespread lack of integrated real-time patient data for medical decision support. The effects of this "information gap" are increased costs, reduced operational efficiency, adverse quality of care and diminished outcomes.

At the root of the problem is a tangle of legacy enterprise and departmental systems; dedicated systems, often with proprietary environments and isolated data, that create a series of "data islands" that must be accurately linked. Poor access to existing data is a recurring factor in avoidable medication errors, redundant testing, ineffective therapy selection and overall inefficiencies in optimizing Medicare/Medicaid reimbursements.

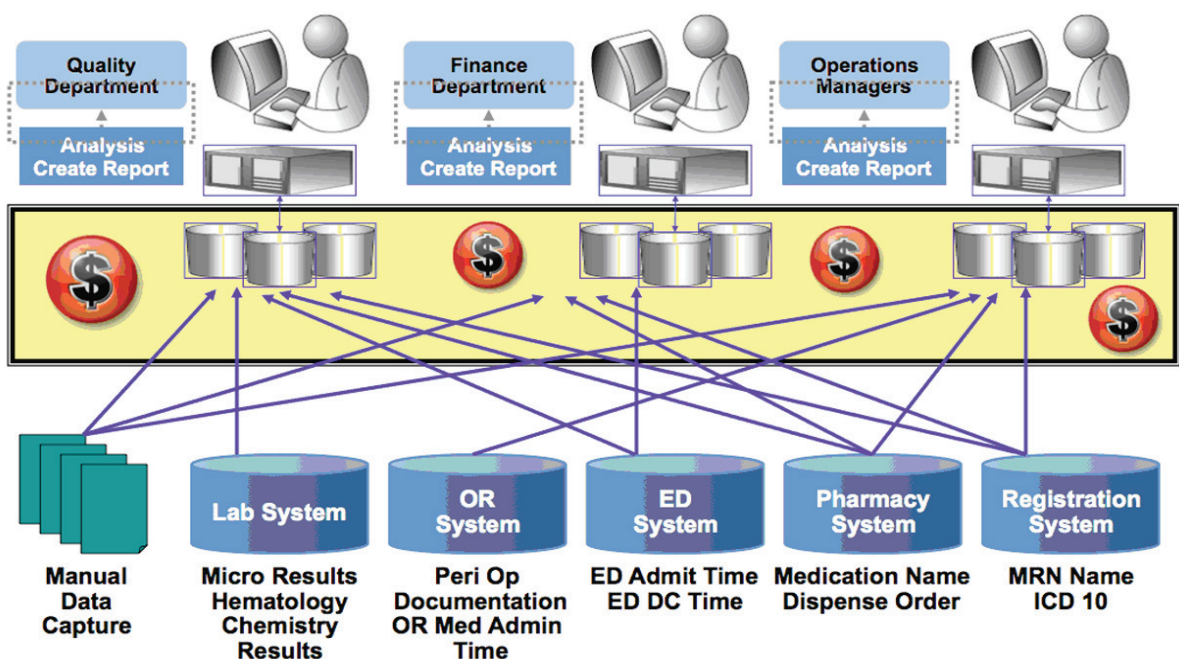


Figure 1: Multiple systems with each focused on one function means additional costs, reduced efficiency, and poorer information that reduces quality of care and diminishes outcomes.

Data volumes and reporting requirements are exploding, adding terabytes of data. New governmental guidelines and programs are changing the method by which treatment costs are justified and reimbursed while adding new payer alternatives. Additionally, privacy regulation is changing the ground rules for storing and exchanging sensitive patient data. To address these issues, the InfoSphere Clinical Analytics (ICA) product along with its thorough data normalization and verification workflow was developed.

This product validates and normalizes extracted patient health data from a wide variety of healthcare organization clinical systems (for example, operating room, pharmacy, admissions, laboratory, etc.) as well as operational systems (for example, billing and insurance processing), then consolidates these data into a secure, central, location for analysis. Security features of ICA protect the identities of patients and physicians while tracking activity and access into and out of the patient record. The Healthcare Intelligence Dashboard (HID) provides a flexible view into this data using the Cognos Business Intelligence server platform.

In addition to providing a central, normalized source of truth for clinical analytics, the ICA database also can be utilized as a resource for identifying patient cohorts to inform clinical trial selection for pharmaceutical and medical device testing, screening disease populations for disease management across longitudinal patient histories, and care location optimization utilizing patient demographics and outcomes, to name a few.

An ICA customer in the northeast has leveraged the normalized historical data to justify higher reimbursement rates from insurance providers by showing that the standard of care they provide resulted in improved outcomes from comparable organizations.

By quickly screening clinical trial protocols and isolating a small number of potential participants, another ICA-equipped hospital and clinic was able to avoid entering into an unprofitable drug trial before having to invest in the CRO start-up costs; instead they were able to direct their efforts to more effective uses of their time and research staff.

These are just a few examples of the benefits that having an ICA data warehouse can offer.

SYSTEM DESCRIPTION

The InfoSphere Clinical Analytics (ICA) solution development platform is based on a combination of a detailed data model, thorough data mapping, cleansing, and validation process, along with a high-level presentation capability, building upon an integrated web services architecture. Because of this approach, the user only needs a standard web browser on their workstation to access the data warehouse to perform searches or access the dashboard charts and reports using the Cognos BI server. The IBM InfoSphere Warehouse Edition scalable database server is used to house the ICA repository, running within the IBM Balanced Server family of computing systems. In addition, the ICA offers a high-level Business Intelligence dashboard along with a set of report and scorecard templates that can be extended to address specific customer needs.

COMPONENTS

The complete IBM Solution for Provider Clinical and Business Intelligence is comprised of four integrated components: The InfoSphere Clinical Analytics (ICA) product data model and ETL; The IBM InfoSphere Balanced Warehouse Edition (including SQL Warehousing) providing the database layer; The IBM Cognos Business Intelligence Server presenting dashboard analytics; hosted on scalable pre-configured IBM Balanced Server systems.

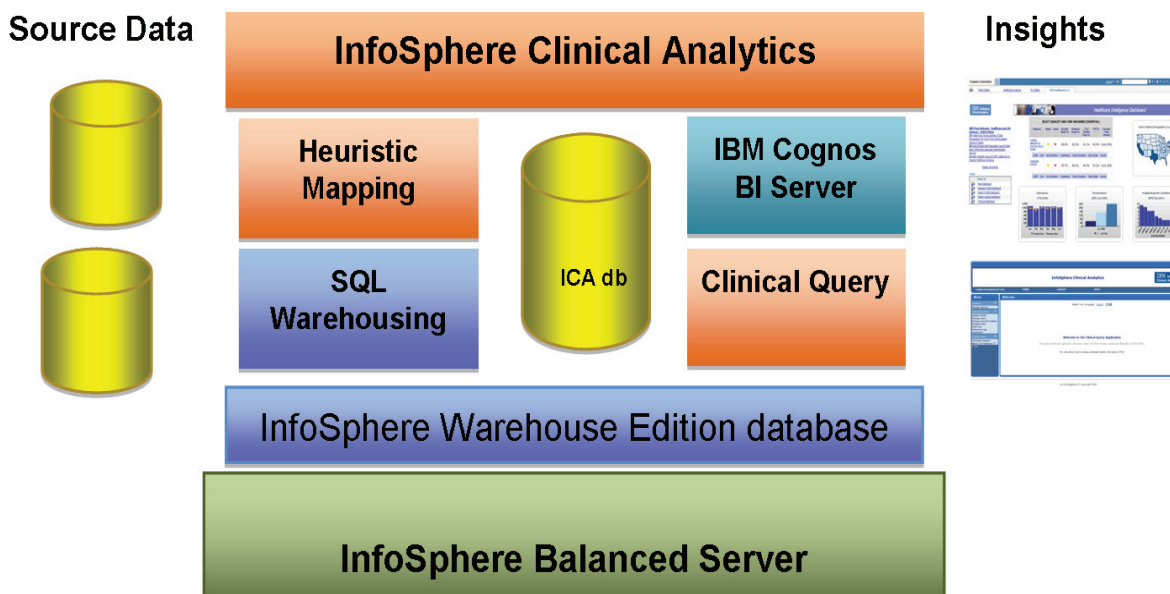


Figure 2: The four integrated layers of the InfoSphere Clinical Analytics data mode: the ICA heuristic mapping tool & SQL Warehousing, the Cognos dashboard analytics & ICA Clinical Query Application, the InfoSphere Warehouse, and the IBM InfoSphere Balanced Warehouse Platform.

Since most healthcare organizations utilize analytics that have been tailored to their particular environment, the ICA offers a set of dashboard report, chart, and scorecard templates that provide a “starter set” of quality, operational, and disease management measures that can then be extended by either customer staff or professional services organizations.

The ICA Clinical Query Application facilitates controlled searching of the entire ICA warehouse to isolate patients of interest for clinical trials, research studies, or other analysis. Protected Health Information (PHI) is isolated by the user’s role and may be re-identified only after approval by the healthcare organization’s governance policy.

The complete set of data elements in the ICA data warehouse can be queried if desired by third-party applications using standard SQL network database interfaces.

All accesses, however, draw upon the same central source of truth instead of the multiple incongruent sources of previous ‘silo’ed reporting systems.

ACHIEVING ACTIONABLE ANALYTICS

ICA creates a clinical data warehouse populated with data from those applications that the healthcare organization currently has available (e.g., billing system, laboratory system, pharmacy system, admissions, etc.). A key requirement is the existence of a common patient identifier that can be used to link the records from the disparate systems prior to the de-identification process. This is typically the medical record number, which healthcare organizations universally use to identify a patient.

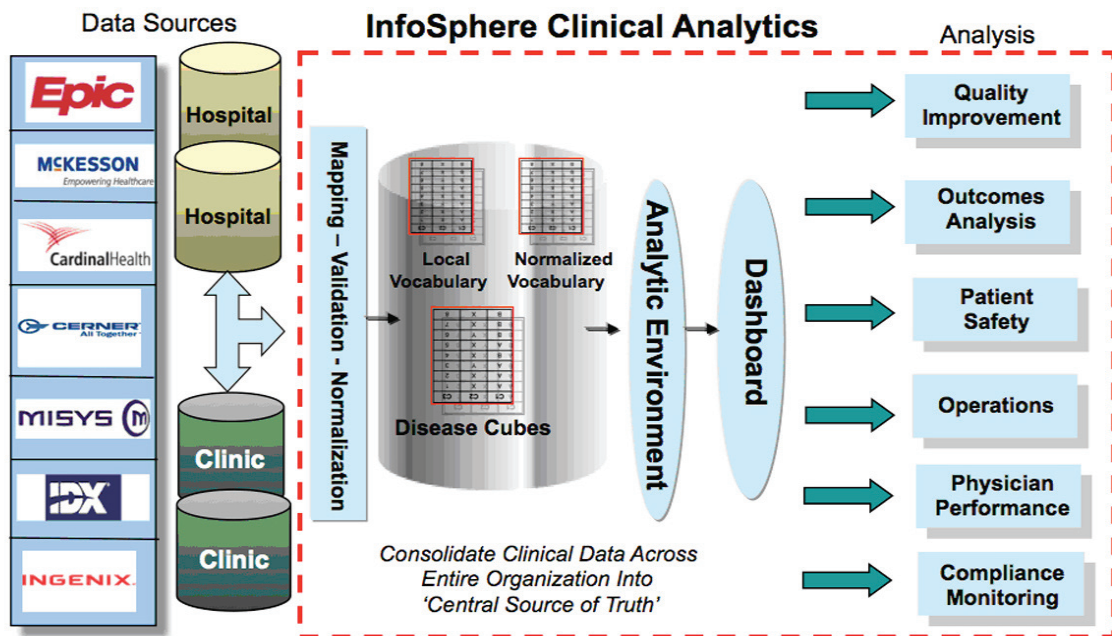


Figure 3: Data is sourced from a wide variety of systems, including EMR, billing, laboratory, pharmacy, admissions, etc.

The relevant data in the operational systems is exported from the respective system using an existing export or backup process. The export file can be in comma-separated value (CSV), tab-delimited (TDF), XML, or fixed record format. The ICA Loader allows the mapping of the data from the different export files into the format needed for loading into ICA. The data from each export file can then be separately imported into ICA and then standardized.

ICA PROVIDER DATA MODEL AND SCHEMA

ICA includes a pre-packaged provider-oriented database schema, which relates data from a number of independent healthcare organizational systems. Data from each of these sources are normalized, de-identified, encrypted, and then integrated into the ICA Provider Data Model.

The model, while comprehensive, is also extensible to address the variety of local variations and customized data elements present in existing healthcare informatics systems. These elements can be added to the ICA Provider Data Model via the use of 'supplementary' elements that are described using the same metadata so they may be accessed in the same manner and with the same flexibility as pre-defined values.

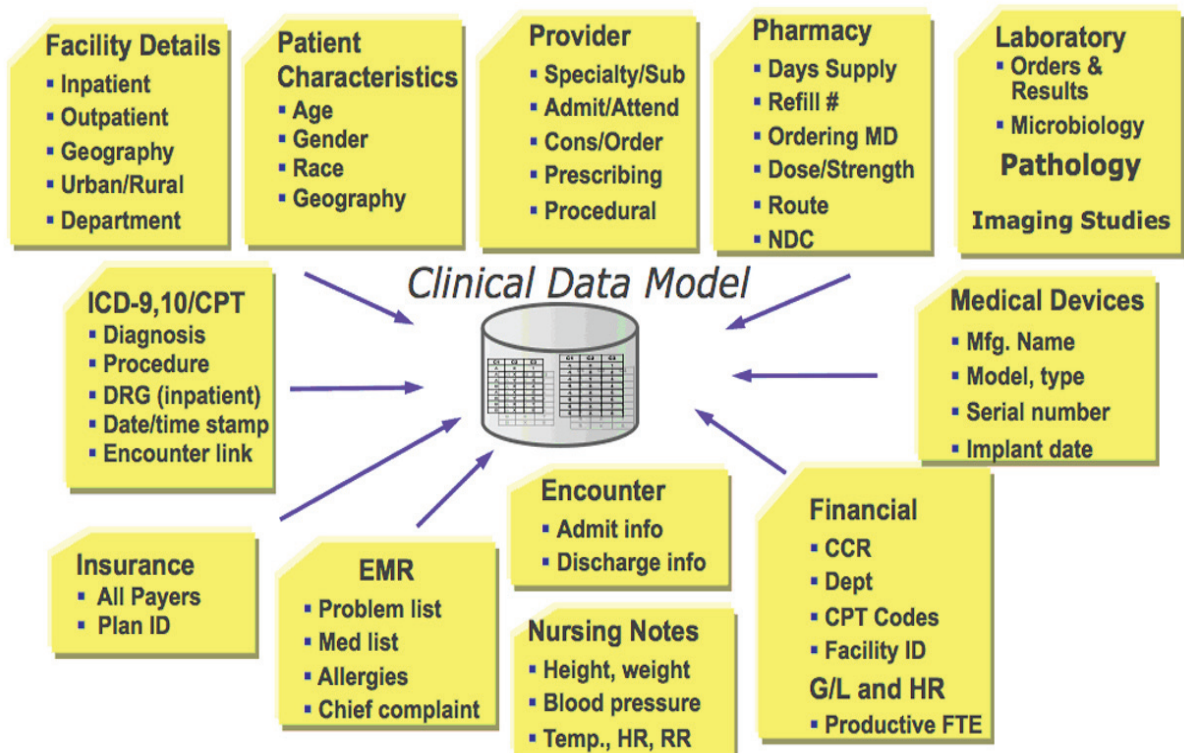


Figure 4: The model contains a provider-centric database schema v2.2, which relates data from a number of independent healthcare organizational systems.

CREATING THE ICA DATA WAREHOUSE

ICA is installed on the healthcare organization's premises as a separate server and collects data from clinical applications using data maps through an extract program that receives data from each clinical application. The patient data are transformed into a standard format, de-identified, and encrypted. The patient identifiers are maintained in a separate encrypted database to facilitate re-identification at a later time.

This process is described below:

- *Data is extracted from clinical and administration applications (i.e. Admissions, Laboratory, Pharmacy and Billing, etc.)*
- *Data connectors are used to interface to dynamic data sources such as HL-7 feeds, etc. to place these data in extract form*
- *Data flows are used to load the extracted data into a source table in textual format. The data are then profiled, characterized and the proper mapping to the ICA data model established. At this point, the first of an ongoing series of content integrity, accuracy, and cross-validation checks is performed. The ICA ETL+V process then moves the data elements into a defined file format, which is then normalized to local conventions (i.e. codes and data element structures linked via validated reference tables).*
- *ICA transforms the data elements into a common code set and, if desired, de-identifies each patient's consolidated record.*
- *Date fields are retained but converted via a proprietary algorithm so only the relative difference between dates are known. This permits time sequence analysis of all medical events.*
- *A random (non-derived) key is assigned to each de-identified patient record and the key and identifying data is stored in a separate encrypted database (Master Key File).*
- *Further validation of the data elements is performed and records that fail these checks are stored in a separate 'outlier' table for reconciliation and re-processing once the discrepancies have been resolved.*
- *The validated data are committed to the InfoSphere Data Warehouse for user access, dashboard measures, and clinical queries.*

ICA provides a proven Extract – Transform – Load plus Validation (ETL+V) process using IBM's Design Studio along with detailed ICA-specific quality and consistency checking during the processing of the data flow to verify the elements being placed in the ICA warehouse. In addition, assist applications included with the ICA solution expedite management of the following attributes:

- *The Heuristic Mapping Manager (HMM) leverages Bayesian search techniques and human expertise to quickly map laboratory descriptions and medication names to their respective LOINC and RxNorm coding standards.*
- *The Reference Management Tool (RMT) allows correlation of local coding references to the corresponding common reference standard coding and permits specification of usage boundaries for Type 2 slowly changing dimension common references.*

SECURITY ARCHITECTURE OVERVIEW

To protect confidentiality, patient and physician identifying data can be partitioned into a secure data warehouse with patient data being de-identified and encrypted. Re-identification of records is permitted only with appropriate review and approvals (for example, from a supervisor of the healthcare organization or the human investigations committee). A user's role determines whether they can access identified data or request re-identification of patients in a de-identified query result. Data extracts downloaded from the clinical data warehouse to the user's workstation via the Clinical Query Application are encrypted as well, and accesses to the data are logged.

Additionally, access to the warehouse can be restricted to personal computers that are part of the healthcare organization's domain or those that are authenticated.

The strength of the Digital Rights Management security architecture is measured in large part by the strength of the user registration process. The ICA product provides a registration process that is flexible to permit healthcare organization to establish and control their own security policy, yet still maintain the checks and balances necessary to support the trust structure of the overall system.

Trust begins at the organizational level. When an organization (department) is registered, its various personnel are also identified and registered in the system with defined operational roles explicitly associated with each individual. These roles govern the permissions granted to the individual to perform trusted operations (such as granting access to sensitive data) for that organizational entity.

Whereas healthcare organizations are trusted producers of controlled data, research organizations and individuals within those organizations are trusted consumers of that data. When a healthcare organization grants a researcher access to a patient data source, it must have a high degree of assurance as to the identity of the individual and that they have the proxy of their organization to access and otherwise make use of that controlled patient data.

Access to private data is logged at the database level by the ICA product; access control is achieved through the proven mechanisms in the InfoSphere Warehouse Edition database and Cognos Business Intelligence Server, working in conjunction.

A. MANAGING USER ACCESS

As part of the user registration process, secure password and security profile is generated for each authorized and authenticated individual. User identity is validated at login time by verifying against an encrypted username and password against a centrally maintained directory.

B. MANAGING SENSITIVE DATA

When sensitive data are exchanged, there are additional auditing and traceability requirements imposed by governing and regulatory authorities. The problem is further compounded as patient data is exchanged across covered entities boundaries.

Within ICA, when a healthcare organization gives a third-party (such as a researcher) access to patient data, it does so through the assignment of a username, a 'role' and a 'security profile'. This profile identifies:

- *The specific strength of a password (length, number of special characteristics such as numbers).*
- *The expiration period of the password, after which it must be renewed*

A username is also assigned a 'role' that controls what capabilities the user can access and whether a query can act against identifiable data or is restricted to de-identified data. This role includes:

- *The actions (e.g. view audit log, manage users) this role can perform*
- *The capabilities within an action (e.g. view users, but not create new ones) that can be accessed by this role*
- *When both identified (PHI) and de-identified data are loaded, which ones this role can create queries against. For roles that include both data schemas, the user is prompted when they login as to which schema mode is to be used for that session*

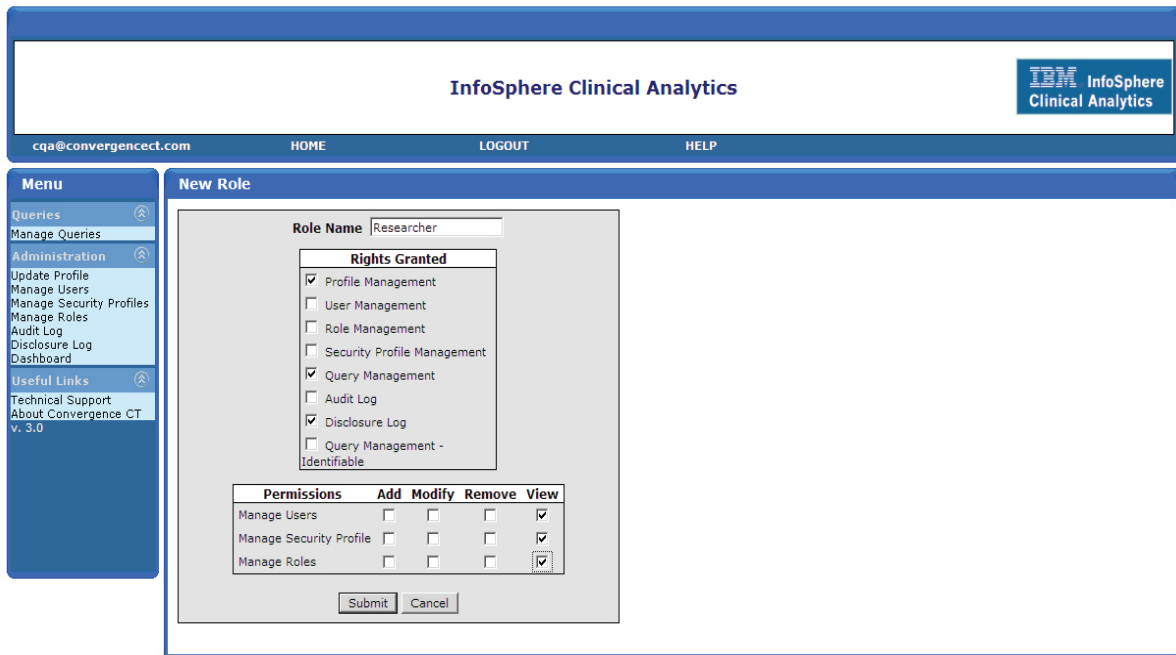


Figure 5: ICA Role Management options panel.

Each time the data in the ICA warehouse is used, the CQA server checks the validity of the user and role; only if these are valid are the data accessed. In this way, the healthcare organization can distribute sensitive data; yet still retain full control of the distribution and use of that data. Administrators can revoke the data use right at any time, even after the encrypted data have been released.

C. AUDIT LOG & DISCLOSURE TRACKING

All use of the ICA Clinical Query Application, creation of ad-hoc patient datasets and disclosures of PHI are tracked in the log files. When creating the ad-hoc patient datasets, the option is also available to set an expiration date, after which the user will no longer be able to access the data.

The ICA audit and disclosure logs are maintained in the secure repository. All audit and disclosure log data are encrypted and remain immutable after first posting.

An audit log browse capability provides viewing by date, date range, and event type selections. Only authorized roles may view the audit log. Audit log review is an action also tracked in the audit log.

The screenshot displays the 'Audit Log' section of the InfoSphere Clinical Analytics application. At the top, there is a search area with the instruction 'Please enter your search criteria and click "Search"'. Below this are two date input fields labeled 'Begin Date' and 'End Date', both with '(YYYY-MM-DD)' format hints, and a 'Search' button. Underneath the search area, it shows 'Rows Per Page' set to 50 and 'Current Page' 1 of 33. The main content is a table with the following columns: Message, Type, Timestamp, Audit Log ID, and Producer Id. The table contains 14 rows of log entries, such as 'Logout successful', 'Login failed: User credentials have expired', 'Modifying user: cqa@convergencect.com, changing password', and 'Creating user: pliew@convergencect.com'.

Message	Type	Timestamp	Audit Log ID	Producer Id
Logout successful	Authentication	2009-09-24 10:16:30.0	1	pliew@convergencect.com
Login failed: User credentials have expired	Authentication	2009-09-24 10:16:39.0	2	cqa@convergencect.com
Modifying user: cqa@convergencect.com, changing password	User - update	2009-09-24 10:16:48.0	3	cqa@convergencect.com
Login successful	Authentication	2009-09-24 10:16:48.0	4	cqa@convergencect.com
Creating user: pliew@convergencect.com	User - insert	2009-09-24 10:18:22.0	5	cqa@convergencect.com
Creating role: 0	Role - insert	2009-09-24 10:22:23.0	6	cqa@convergencect.com
Creating role: 0	Role - insert	2009-09-24 10:22:51.0	7	cqa@convergencect.com
Modifying role: 3	Role - update	2009-09-24 10:23:06.0	8	cqa@convergencect.com
Modifying user: pliew@convergencect.com, activating user	User - update	2009-09-24 10:23:11.0	9	cqa@convergencect.com
Logout successful	Authentication	2009-09-24 10:23:34.0	10	cqa@convergencect.com
Login successful	Authentication	2009-09-24 10:23:40.0	11	pliew@convergencect.com
Creating query: Test	Query - insert	2009-09-24 10:25:16.0	12	pliew@convergencect.com
executing query: Test	Query Action	2009-09-24 10:25:17.0	13	pliew@convergencect.com
Modifying query: Test, updating last execution time	Query - update	2009-09-24 10:25:17.0	14	pliew@convergencect.com

Figure 6: ICA Audit Log browse and search display.

A separate disclosure log browser provides viewing by date range or by specific medical record number. The details for patients whose information is being disclosed can be viewed only by authorized roles.

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Disclosure Log

Please enter your search criteria and click "Search".

Begin Date (YYYY-MM-DD)

End Date (YYYY-MM-DD)

MRN

Rows Per Page Current Page 1 of 1

Query Name	Producer Id	Message	Timestamp	Patient Count	Actions
Deid_patient	btanga@convergencect.com	Approved Reidentified Download Request	2009-09-28 14:48:25.0	98	View Patients
Deid_patient	btanga@convergencect.com	Approved Reidentified Download Request	2009-09-28 14:49:58.0	98	View Patients
Deid_patient	btanga@convergencect.com	Approved Reidentified Download Request	2009-09-28 15:24:17.0	98	View Patients
Test	pliew@convergencect.com	Approved Reidentified Download Request	2009-09-29 16:27:56.0	48	View Patients
Male Patient	cqa@convergencect.com	Approved Reidentified Download Request	2009-09-30 13:13:18.0	48	View Patients
TestPatientId	ntachino@convergencect.com	Approved Reidentified Download Request	2009-10-02 14:19:01.0	98	View Patients
TestPatientId	ntachino@convergencect.com	Approved Reidentified Download Request	2009-10-02 14:31:11.0	98	View Patients

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Figure 7: ICA Disclosure Log browse and search display.

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View Query Results

View Disclosure Logs

Query Name Table Name

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Patient ID	Site ID	Participant ID	MRN	Birth Date	Gender (Standard)	Race (Standard)	Is Deceased	City	State / Province (Local)	State / Province (Standard)	Postal Code	PCP ID	Primary Facility ID
1	1	1	*	1940-05-24	3	2		WEST BROOKFIELD	45	23	015		
1	1	1	*	1940-05-24	3	2		WEST BROOKFIELD	45	23	015		
2	1	1	*	1982-07-21	4			FRAMINGHAM	45	23	017		
2	1	1	*	1982-07-21	4			FRAMINGHAM	45	23	017		
3	1	1	*	1960-05-14	4	2		SPRINGFIELD	45	23	011		
3	1	1	*	1960-05-14	4	2		SPRINGFIELD	45	23	011		
4	1	1	*	1995-09-03	3			FREMONT	59	36	030		
4	1	1	*	1995-09-03	3			FREMONT	59	36	030		
5	1	1	*	1955-08-22	3			MERRIMAC	45	23	018		
5	1	1	*	1955-08-22	3			MERRIMAC	45	23	018		
6	1	1	*	1960-05-03	4	2		COVENTRY	76	47	028		
6	1	1	*	1960-05-03	4	2		COVENTRY	76	47	028		
7	1	1	*	1949-01-25	4			ANDOVER	45	23	018		
7	1	1	*	1949-01-25	4			ANDOVER	45	23	018		
8	1	1	*	1927-08-19	3	2		CHELMSFORD	45	23	018		
8	1	1	*	1927-08-19	3	2		CHELMSFORD	45	23	018		
9	1	1	*	1941-03-26	3	2		CHELMSFORD	45	23	018		
9	1	1	*	1941-03-26	3	2		CHELMSFORD	45	23	018		
10	1	1	*	1931-01-29	4	2		TEWKSBURY	45	23	018		
10	1	1	*	1931-01-29	4	2		TEWKSBURY	45	23	018		
11	1	1	*	1943-02-05	3	1		BOSTON	45	23	021		
11	1	1	*	1943-02-05	3	1		BOSTON	45	23	021		
12	1	1	*	1956-02-22	4	2		DANVERS	45	23	019		
12	1	1	*	1956-02-22	4	2		DANVERS	45	23	019		
13	1	1	*	1964-07-26	4			ROCKPORT	45	23	019		
13	1	1	*	1964-07-26	4			ROCKPORT	45	23	019		
14	1	1	*	1976-07-24	3	2		HUNTSBURY	56	36	030		

Figure 8: ICA Disclosure – View Patient detail (columns hidden).

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USER INTERFACE AND QUERIES

The ICA user interface runs in a standard Web browser, supporting the Clinical Query Application (CQA – new in ICA 8.1), which facilitates the creation of complex structured query language (SQL) statements that are generated automatically in response to point-and-click or pull-down selection actions by the user, enabling submission of ad-hoc queries without prior detailed knowledge of SQL. Fields containing local or standard references can be searched by the code value or description text to quickly select a criteria or series to query the field with.

Queries can address the database with either the patient or the encounter as the center of the schema for relational purposes; this allows a set of patients to be searched that spans a history of encounters or for all the details and related records for a set of encounters to be searched. A 'post filter' can also be specified to limit the response to only the records that meet the exact query criteria. Normal function is to return the longitudinal history (all linked records associated with the center) for the centric schema choice that meets the query criteria.

In addition, the ICA queries themselves can be saved, retrieved for later use, exported to another user, or imported. Upon import, the query name can be changed. Users whose role includes both access to PHI data and de-identified data can choose whether PHI data is returned by the query or must be re-identified (upon approval) during download.

During execution, queries are validated for content, logged, and sent to the interface that queries the database using generated SQL. Returned record counts appear in the CQA interface. The entire process is controlled by the contents of the data dictionary that is used to compose SQL elements, formats the results, set up browser links for data drill-downs, and provide online help. For roles that require approved re-identification, the CQA interface also creates approval emails and interprets the administrator responses.

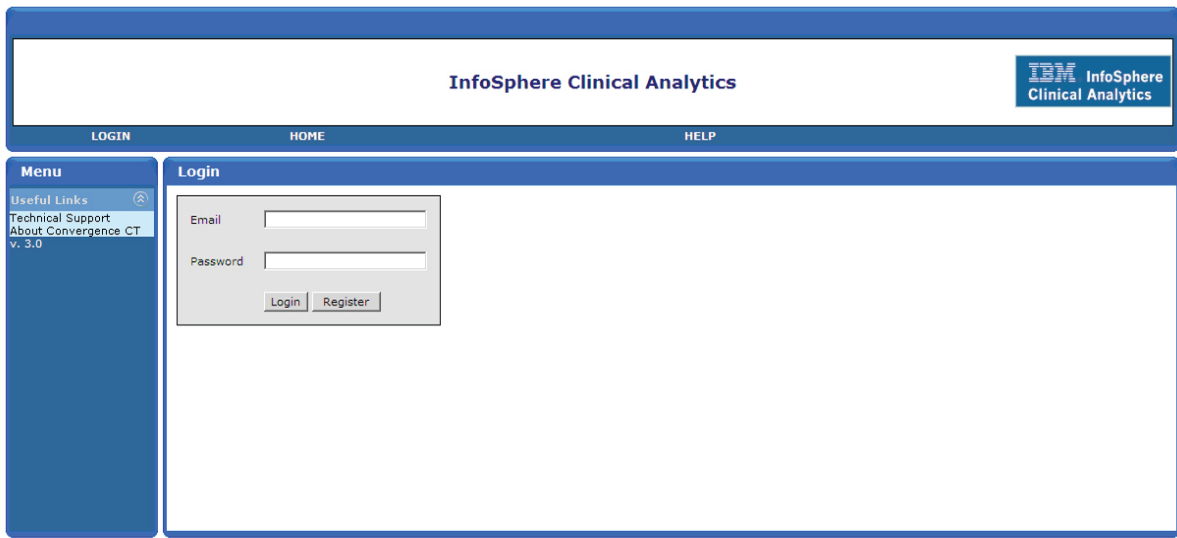
Queries are executed asynchronously in the 'background', allowing users to perform other tasks while a query executes. When the query completes, the number of records returned can be viewed asynchronously, with optional viewing of a subset of matching records on a per-table basis. During this server view, the columns (fields) displayed can be selected.

Once the exact patient population has been identified and with the appropriate authorization, the patient record data may be downloaded onto the user's workstation for further processing. The tables and fields that are to be downloaded are selected at this point, along with whether the PHI information is to be re-identified (upon approval). The downloaded data is maintained in encrypted form; a validation to the ICA server is required before the user can decrypt the download. Two workstation-executable utilities are supplied:

- *ICA-Viewer provides spreadsheet-style tabular data display and analysis functions similar to Microsoft Excel, including basic charting capabilities. Data may be displayed or, when the user has the appropriate rights, printed locally. Data cannot be saved.*
- *ICA-Export allows the download to be saved, given the appropriate rights, in a variety of common data formats suitable for importing to external applications such as Microsoft Access, Excel, SAS, or SPSS for further analysis and report generation. The download action is audit logged, however the exported data are no longer part of the CDW protected content.*

ICA SESSION & QUERIES

Following are examples of user interaction with the CQA during a prototype query and download:



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Figure 9: ICA Initial Login or Register User.

A new user will click 'Register' to create a user account request; an existing user will enter their username and password to access the system. New user requests are given a status of 'untrusted' until they have been assigned specific roles and a security profile, then approved for use by the system administrator role.



Figure 10: ICA Initial Login – Identifiable data choice.

Once login has been performed and query right confirmed, users can create, modify, and execute data queries via the Manage Queries panel:

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Manage Queries

My role allows me to access protected health information (PHI)

Please enter your search criteria and click "Search".

Name	Centric Table	Status	Last Execution Time	Actions
Male Patient	PATIENT	idle	2009-09-30 12:46:58	Modify Delete Execute Export Query View Query Counts Download Dataset
TestPatientID	PATIENT	idle	2009-10-08 10:55:32	Modify Delete Execute Export Query View Query Counts Download Dataset
SPRINGFIELD	PATIENT	idle	2009-09-30 11:37:50	Modify Delete Execute Export Query View Query Counts Download Dataset
LcSPRINGFIELD	PATIENT	idle	2009-09-30 11:38:37	Modify Delete Execute Export Query View Query Counts Download Dataset
Test507	PATIENT	idle		Modify Delete Execute Export Query
TestPatientID	PATIENT	idle	2009-10-01 17:31:40	Modify Delete Execute Export Query View Query Counts Download Dataset
TestDate3	PATIENT	idle	2009-10-01 17:31:21	Modify Delete Execute Export Query View Query Counts Download Dataset
Bug777	PATIENT	idle	2009-10-02 13:51:10	Modify Delete Execute Export Query View Query Counts Download Dataset

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Figure 11: CQA Manage Queries – Search & Select.

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New/Modify Query

Query Name:

Center of Star Schema:

Apply Post Filter:

Table	Field	Operator	Value
<input type="checkbox"/> Patient	Birth Date	Between	1954-07-15,1984-07-16
<input type="checkbox"/> 1500 Invoice Charge Detail Diagnosis	ICD DX Code (Standard)	Equals	250.00,250.02,250.10,250.1
and			
<input type="checkbox"/> Lab Result	Lab Test (Standard)	Equals	17855-8,4548-4,4549-2
<input type="checkbox"/> Lab Result	Result Numeric	Between	7,10
exclude			
<input type="checkbox"/> 1500 Invoice Charge Detail Diagnosis	ICD DX Code (Standard)	Equals	398.91,402.01,402.11,402.9
exclude			
<input type="checkbox"/> Pharmacy Clinic Prescribed	Medication (Local)	Equals	00002751001 ,0000282100

Figure 12: CQA Manage Queries – Editor with context-sensitive selectors.

When execution of a query completes, the results of each query are shown, allowing the user to further refine the search criteria or inspect a specific field. The download field in the 'Actions' sections will initiate a set of secure programs and policies (as established by each healthcare organization) that determine if the user is given permission to download the data, and whether or not the patient list is to be re-identified.

The screenshot displays the 'View Query Counts' page in the InfoSphere Clinical Analytics application. The page header includes the application name and navigation links (HOME, LOGOUT, HELP). A left-hand menu contains options like 'Queries', 'Administration', and 'Useful Links'. The main content area features a table with columns for 'Table', 'Description', 'Query Count', 'Row Count', and 'Actions'. The 'Query Name' is 'TestPatientID'. Buttons for 'Modify Query' and 'Download Dataset' are visible above the table.

Table	Description	Query Count	Row Count	Actions
Patient	This table contains information about the patient.	0	98	View
Participant	This table contains information about the healthcare entity.	0	0	View
Facility	This table contains information about a facility associated with the healthcare entity.	0	9	View
Provider	This table contains information about a provider.	0	18040	View
Clinical Diagnosis	This table contains diagnoses information as documented by the provider in a clinic note.	0	1	View
Encounter	This table contains information about a visit or encounter for clinic appointments and hospital inpatient/outpatient admissions. In the absence of the appointment information, the encounter can also be constructed from the claim invoice.	0	522	View
Imaging Order	This table contains information about an order for imaging services.	0	1	View
Imaging Order Diagnosis	This table contains the diagnosis information for the administrative order.	0	1	View
Imaging Exam	This table contains information about the imaging exam location in the hospital.	0	1	View
Insurance Location	This table contains the diagnosis information for the insurance company.	0	1	View
Patient Risk	This table contains information about the patient's location in the hospital, Procedure Supplies, Medications, Devices, & Implants, and other information documented during a clinic encounter.	0	1	View
Patient Vital	This table contains information about the patient's vital signs documented during a clinic encounter.	0	1	View
Problem List	This table contains information about the problems or diagnoses for a patient over time.	0	1	View
Provider Note	This table contains information documented by a (physician) provider during a clinic encounter.	0	1	View
Pharmacy Hospital Order	This table contains information about orders for medications during a hospital (inpatient/outpatient) encounter.	0	1	View
Pharmacy Hospital Dispensed	This table contains information about medications dispensed during a hospital (inpatient/outpatient) encounter.	0	1	View
Pharmacy Clinic Prescribed	This table contains information about a (outpatient/retail) prescription for medications.	0	1	View
Pharmacy Clinic Filled	This table contains information about the medications filled from an (outpatient/retail) prescription.	0	1	View

Figure 13: CQA Manage Queries – View Query Counts (abbreviated).

RE-IDENTIFICATION OF PATIENT RECORDS

If called for, and with the proper internal approvals, PHI can be re-created by extracting the selected patient records and re-identifying those records as part of the download right. Authorization to re-identify a patient's record will be checked against data contained within the ICA rights database at the time of the request.

Researchers will be prevented from copying the file or creating another file from this data unless expressly approved to do so per healthcare organization policy. Access expiration dates are established for each download of patient data. Download rights or CQA access may be revoked at any time by an authorized administrator.

InfoSphere Clinical Analytics

cqa@convergencect.com
HOME
LOGOUT
HELP

Menu

- Queries (8)
- Manage Queries
- Administration (8)
- Update Profile
- Manage Users
- Manage Security Profiles
- Manage Roles
- Audit Log
- Disclosure Log
- Dashboard
- Useful Links (8)
- Technical Support
- About Convergence CT v. 3.0

Download Dataset Request

Please enter the following information concerning your download.

Purpose

CQA Interface example

Permissions

Viewing

Printing

Copying

For Days

Tables

- Organization
 - Org ID
 - Org Code
 - Org Name
 - Country (Standard)
 - Start Date
 - Close Date
- Consolidation Group
- Site
- Site Group
- Participant
- Participant Association with Organization
- Consolidation Grouping of Participants
- Participant Grouping with Site Groups
- Facility
- Department Unit
- Provider
- Insurance Payor
- Patient
- Clinical Diagnosis
- Encounter
- Imaging Order
- Imaging Order Diagnosis
- Imaging Exam
- Imaging Exam Diagnosis
- Imaging Exam Supplies
- 1500 Invoice
- 1500 Claim
- 1500 Claim - Detail Lines
- 1500 Claim - Detail Lines Diagnosis
- 1500 Claim - Payment Adjustments
- 1500 Invoice Charge Detail
- 1500 Invoice Charge Detail Diagnosis
- 1500 Payment Adjustments
- UB92 Invoice
- UB92 Claim
- UB92 Claim - Additional Data
- UB92 Claim - Detail Lines
- UB92 Claim Diagnosis
- UB92 Claim Procedure
- UB92 Invoice Charge Detail
- UB92 Invoice Charge Detail Diagnosis
- UB92 Invoice Diagnosis
- UB92 Payment Adjustments
- UB92 Hospital Procedure
- Lab Order
- Lab Result
- Medication Administration Record
- Medical Device
- Microbiology
- Microbiology Isolate
- Microbiology Susceptibility
- Nursing Note
- O.R. Case
- O.R. Procedure
- O.R. Medication
- Patient Insurance
- Patient Location
- Patient Risk
- Patient Vital
- Problem List
- Provider Note
- Pharmacy Hospital Order
- Pharmacy Hospital Dispensed
- Pharmacy Clinic Prescribed
- Pharmacy Clinic Filled

Figure 14: CQA Manage Queries – Download Dataset Request, allowing table and field selection.

HEALTHCARE INTELLIGENCE DASHBOARD (HID)

An out-of-the-box presentation layer with extensible templates, the Healthcare Intelligence Dashboard (HID) is a component of the ICA product, realized using the IBM Cognos8 Business Intelligence Toolset.

The templates used to define the dashboard panels, as well as the metadata package of business measures and dimensions, may be modified or extended by authorized authors or administrators of the HID.

Data in the ICA data warehouse are summarized and presented in a concise, visual format that nonetheless draws upon the same underlying central source of truth and permits drill-downs to more detail and drill-through to display record-level contents from the ICA.

The Healthcare Intelligence Dashboard is organized as a series of interactive charts and tables that highlight actionable measures and conditions.



Figure 15: The Healthcare Intelligence Dashboard is organized as a series of interactive charts and tables that highlight key performance indicators and provide actionable information.

The ICA HID main panel incorporates items that are pertinent for operations and quality management and provides guided drill-paths to actionable information. The main panel of the HID includes:

- A quality scorecard for two Surgical Care Improvement Project (“SCIP”) measurement sets with drill-downs to CMS/JCAHO-specified surgical types. In all, the quality scorecard addresses 16 CMS/JCAHO SCIP-related measures for internal quality management use. The scorecard displays a Status comparison to national norms, a Trend indicator comparison to the previous month and result comparisons to prior periods, which track improvements in compliance performance.
- Hospital volume trend analysis and also patient demographics with drill-downs to county and postal code levels, subject to HIPAA restrictions.
- Patient readmission volumes with guided drill-paths to patient level details.
- Hospital-acquired conditions, e.g. infections and falls.

Using the left-hand navigation link menu, additional reports, dashboards, and charts may be accessed, for example the Patient Profile Dashboard and Patient Volume Dashboard, shown below. For a complete description of all HID elements, please see the Dashboard Content User Guide. Details of the templates and measures are also available in the CDW HID Templates v1.4 OEM document on the distribution medium.

The front page of the Patient Profile Dashboard displays the following metrics to assist the medical facility further understand its patient base by segmenting specific patient attributes:

- Patient demographics for the medical facility, e.g. gender, ethnicity and age group.
- Patient mix by discharge diagnostic group and by principal diagnosis.
- Geographic distribution via an interactive map.

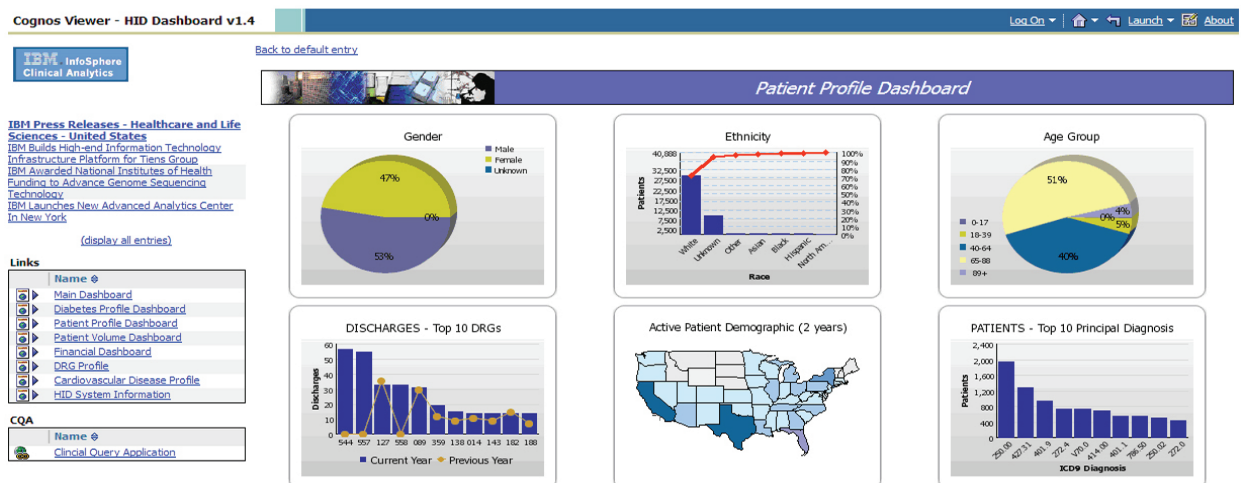


Figure 16: The front page of the Patient Profile Dashboard displays Patient demographics, Patient mix, and Geographic distribution.

The Patient Volume Dashboard incorporates items that are pertinent for operations and provide guided drill-paths to facilitate an understanding of the medical facility's business.

- Admissions
- Discharges
- Discharges and Average Length of Stay by Specialty
- Admissions from the Emergency Department



Figure 17: The Patient Volume Dashboard displays Admissions, Discharges, Average Length Of Stay, and Admissions from the Emergency Department.

The Diabetes Profile Dashboard (expanded in ICA 8.1) provides a high-level view of patients within this disease group, along with reports summarizing care delivery at the specialty and provider (physician) level as well as detailed historical charts of HbA1C, LDL-C, and Retinal Eye Exams on a per-patient basis (detail charts shown):

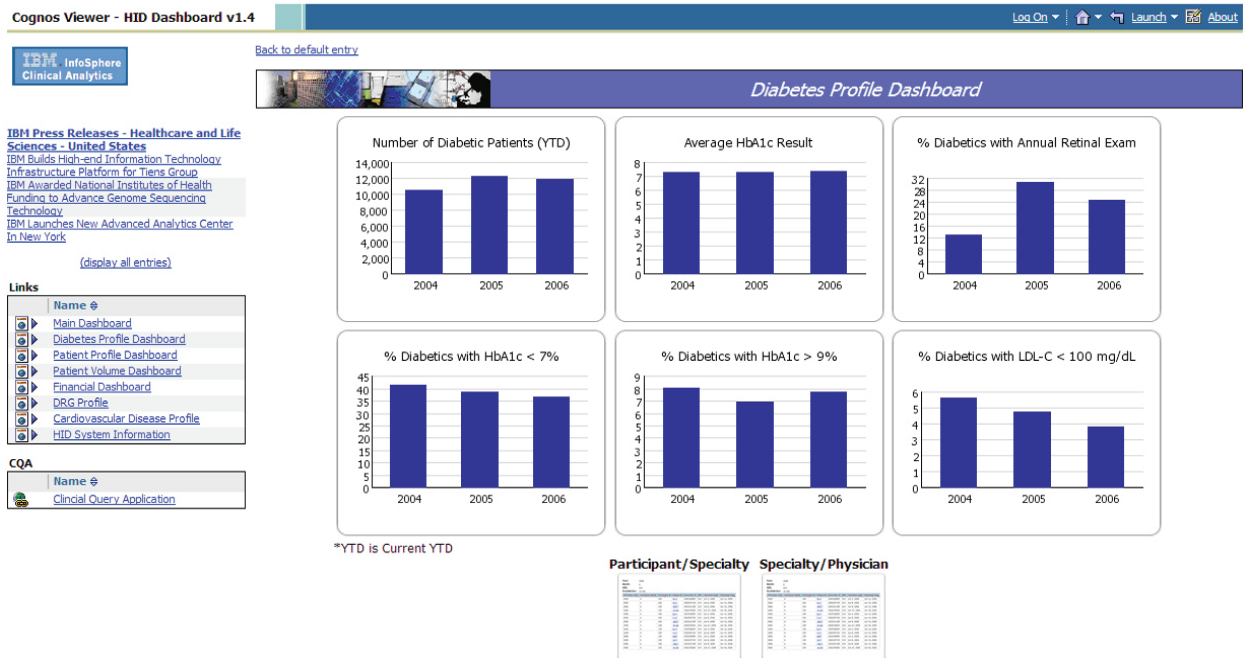


Figure 18 : The Diabetes Profile Dashboard provides a high-level view of patients within this disease group.

Diabetes Summary - Specialty/Physician

Year: 2006

Specialty	Physician	HbA1c Tested				HbA1c < 7%		HbA1c 7% - 9%		HbA1c > 9%		LDL-C Tested		LDL-C < 100 mg/dL		Retinal Eye Exam	
		Qualified Patients	# of Patients	% of Qualified Patients	Average HbA1c %	# of Patients	% of Qualified Patients	# of Patients	% of Qualified Patients	# of Patients	% of Qualified Patients	# of Patients	% of Qualified Patients	# of Patients	% of Qualified Patients	# of Patients	% of Qualified Patients
Allergy	NEWBILL M	1	1	100	7.30	0	0	1	100	0	0	0	0	0	0	0	0
Anesthesiology	KARIM T	2	2	100	6.10	2	100	0	0	0	0	0	0	0	0	0	0
Anesthesiology	LABSON B	2	1	50	9.50	0	0	0	0	1	50	0	0	0	0	0	0
Anesthesiology	LAM JE	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Anesthesiology	RUDY C	3	1	33.33	8.20	0	0	1	33.33	0	0	1	33.33	1	33.33	1	33.33
Cardiology	ALVAREZ P	12	2	16.67	6.75	1	8.33	1	8.33	0	0	0	0	0	0	2	16.67
Cardiology	BART D	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Cardiology	GELLMAN M	3	2	66.67	7.45	1	33.33	1	33.33	0	0	0	0	0	0	1	33.33
Cardiology	KAT W	2	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Cardiology	KANE T	1	0	0		0	0	0	0	0	0	1	100	1	100	0	0
Cardiology	MA GAB	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Cardiology	MALARIK M	1	1	100	7.50	0	0	1	100	0	0	0	0	0	0	0	0
Cardiology	NAPIER O	3	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Cardiology	OLSEN L	2	1	50	6.90	1	50	0	0	0	0	0	0	0	0	0	0
Cardiology	PUTHAM E	19	16	84.21	6.98	9	47.37	7	36.84	0	0	2	10.53	1	5.26	1	5.26
Cardiology	RAFILE	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Cardiology	RAHMAN Y	9	7	77.78	6.66	3	33.33	4	44.44	0	0	0	0	0	0	3	33.33
Cardiology	RUBIN C	10	4	40	7.60	2	20	1	10	1	10	0	0	0	0	1	10
Cardiothoracic Surgery	ERICKSON K	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Colon & Rectal Surgery	PARK A	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Dermatology	ENDICOTT J	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Dermatology	GANEL J	1	1	100	6.60	1	100	0	0	0	0	0	0	0	0	1	100
Dermatology	HAACK M	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Dermatology	LAU B	2	1	50	6.70	1	50	0	0	0	0	0	0	0	0	0	0
Dermatology	MAGTIRE M	1	1	100	6.50	1	100	0	0	0	0	0	0	0	0	1	100
Dermatology	MANNING M	1	0	0		0	0	0	0	0	0	0	0	0	0	1	100

Figure 19: The Diabetes Profile Dashboard historical tables of HbA1C, LDL-C, and Retinal Eye Exams on a per-MD and specialty basis.

Diabetes Physician Details

Participant: 100
 Physician: PUTNAM E
 Year: 2006

Participant ID	Patient ID	MRN	Last Name	First Name	Birth Date	Gender	Ethnicity	Diabetes Type	HBA1C Test Date	HBA1C Result	LDLC Test Date	LDLC Result	Retinal Exam Test Date
100	1692	1692			31 Mar 1953	F	White	2			19 Sep 2006	74	
100	2845	2845			21 Oct 1936	M	White	2	22 Dec 2006	5.8			
100	3437	3437			27 May 1941	M	White	2	15 Jun 2006	5.8			
100	4749	4749			9 Jun 1941	M	White	2	5 Jun 2006	8.7			31 Jul 2006
100	7856	7856			20 Dec 1931	F	White	2	13 Aug 2006	7.1			
100	10580	10580			21 May 1928	M	White	2	9 Sep 2006	7			
100	10815	10815			26 Jun 1925	F	Unknown	2	11 Sep 2006	7.9			
100	11449	11449			23 Jun 1927	M	Unknown	2	21 Jun 2006	6.7			
100	14514	14514			19 May 1929	M	White	2	28 Aug 2006	6.3			
100	15847	15847			8 Mar 1938	M	White	2	26 Sep 2006	8.4	1 Jul 2006	103	
100	17179	17179			17 Nov 1940	M	White	2	26 Jul 2006	6.2			
100	19875	19875			25 Aug 1931	F	White	2	2 Jun 2006	8.7			
100	21258	21258			13 Jun 1927	M	White	2	1 Jan 2006	5.6			
100	21907	21907			7 Sep 1933	M	White	2	18 Jun 2006	7.3			
100	25083	25083			1 Jun 1943	F	White	2	5 Feb 2006	6.7			
100	30128	30128			16 Jul 1949	M	White	2					
100	35144	35144			22 Nov 1943	M	White	2	12 Nov 2006	6.9			
100	36601	36601			9 Jun 1943	M	White	2	6 Jun 2006	6.5			
100	39291	39291			22 Jul 1952	F	White	2					

Figure 20: The Diabetes Profile Dashboard detailed Physician (MD) table summarizes patient information for the primary care physician's panel. Further drill-down is available by selecting individual MRNs.

Diabetes Patient History

Participant: 100
 MRN: 15847

Participant ID	Patient ID	MRN	Last Name	First Name	Birth Date	Gender	Ethnicity	Diabetes Type
100	15847	15847			8 Mar 1938	M	White	2

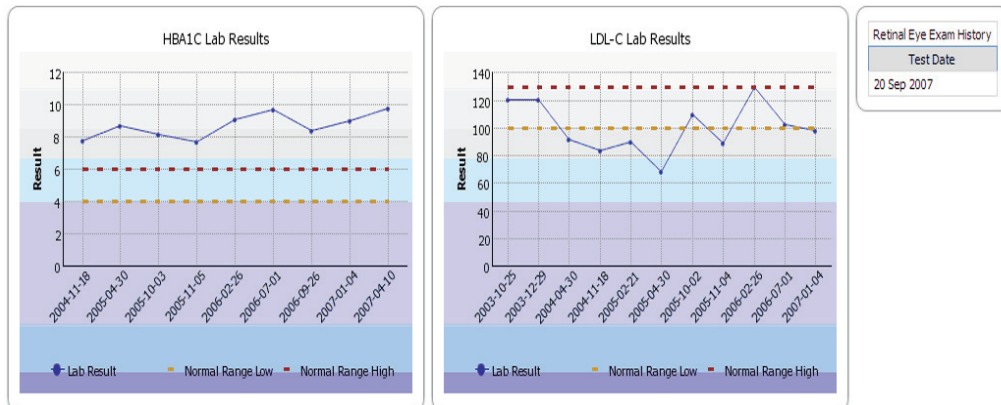


Figure 21: The Diabetes Profile Dashboard detailed historical charts for HbA1C, LDL-C, and Retinal Eye Exams for an individual patient.

The Financial Dashboard includes templates for Medical and Surgical Supply Usage and an Evaluation & Management Summary with selection (drill-down) to higher levels of detail, e.g. evaluation and management coding profiles at the specialty and physician level.

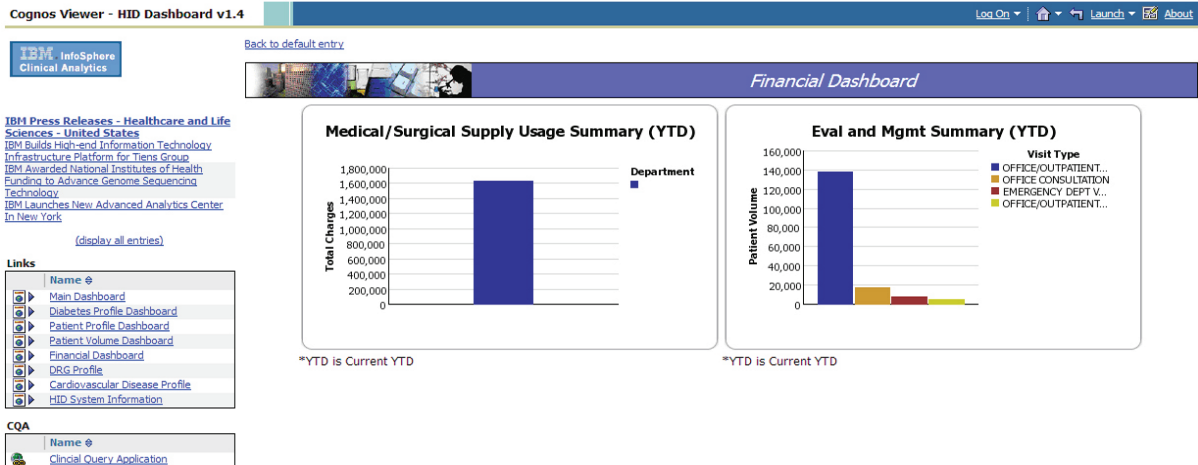


Figure 22 : Financial Dashboard overview chart with selection for detail.

The DRG Profile Dashboard (new in ICA 8.1) includes templates for comparative analysis of DRG performance along with the ability to drill-down to higher levels of detail.

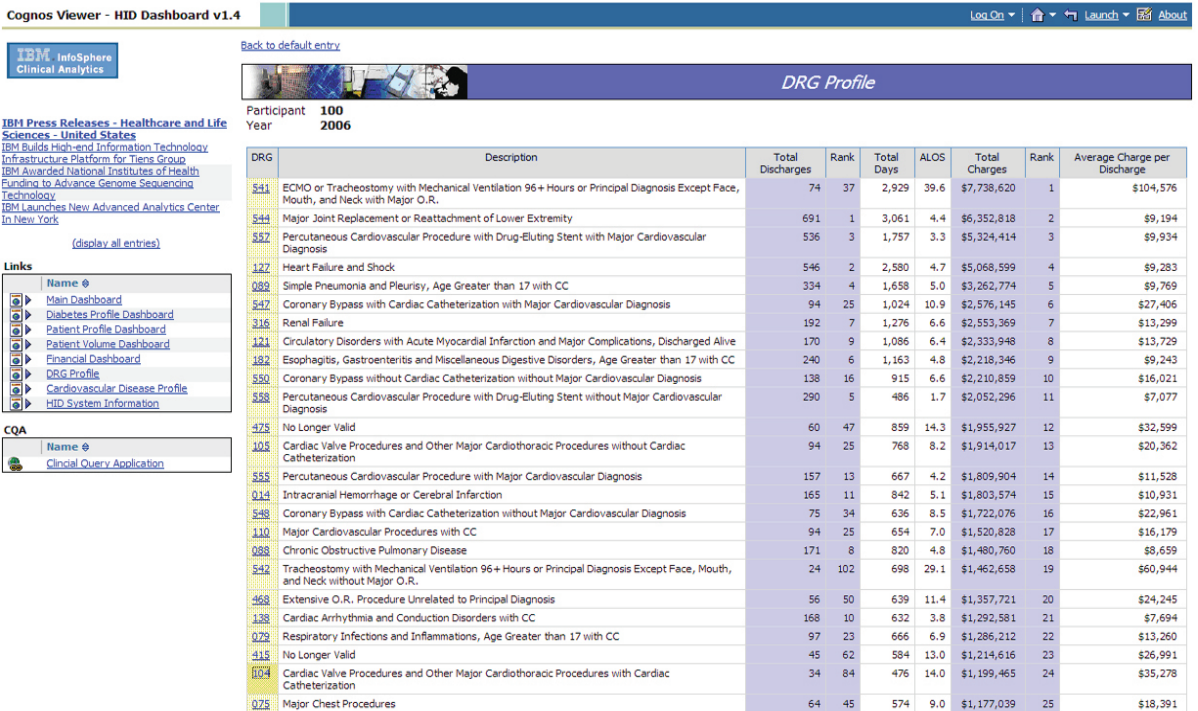


Figure 23: DRG Profile overview chart with selection for detail.

The Cardiovascular Disease Profile Dashboard (new in ICA 8.1) includes charts, templates, and measures for analysis of this disease group along several dimensions along with co-morbidities for the key contributing constituents of Coronary Artery Disease, Acute Myocardial Infarction, and Congestive Heart Failure.

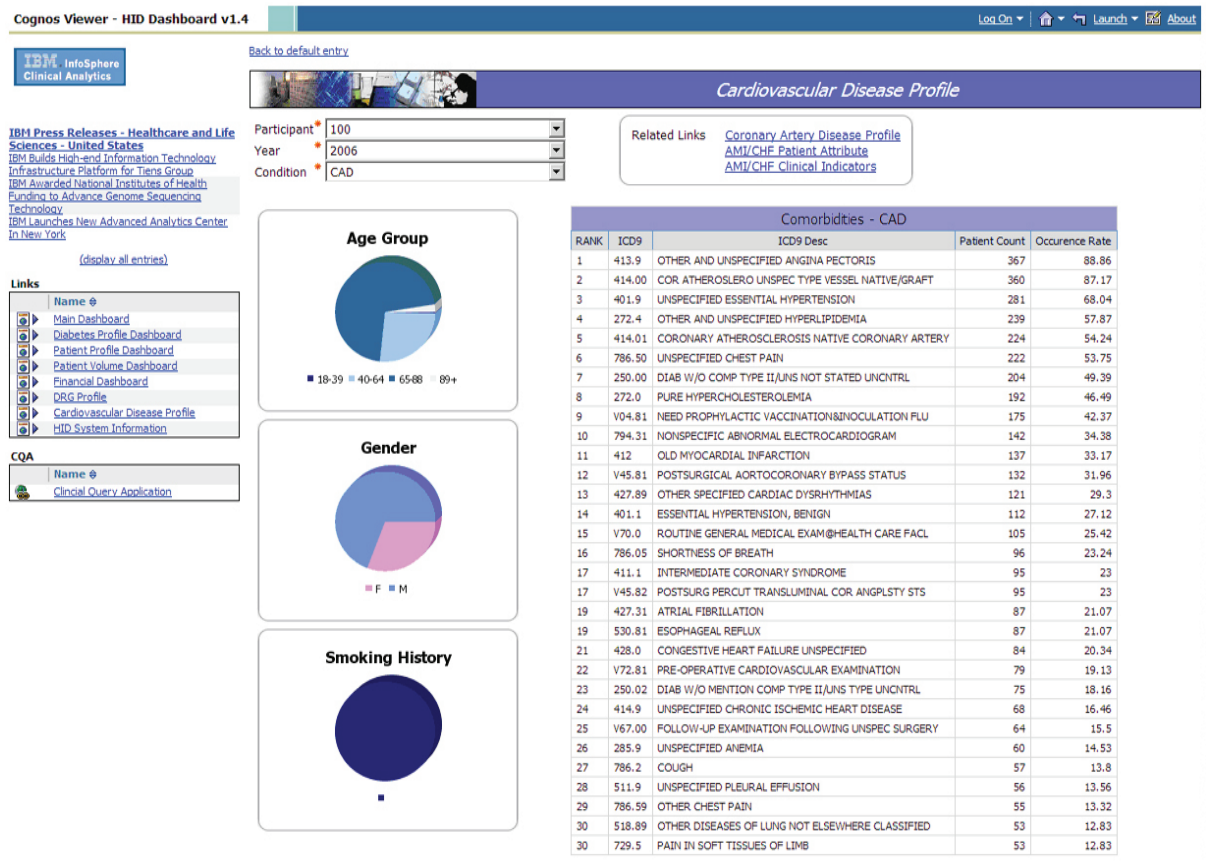


Figure 24: Cardiovascular Disease Profile Dashboard overview chart with selection of related conditions for greater detail.

Additional components, not shown here, include many more detailed patient and encounter details, time series, and system information about the HID configuration. There is also a direct link to the Clinical Query Application (CQA), described earlier in this manual.

For a complete description to all HID panels, reports, charts, and template elements, please see the ICA Dashboard Content User Guide.

SYSTEM PLATFORM

The ICA product is designed to execute within the IBM InfoSphere Warehouse Edition, a relational data warehouse that resides on a packaged server configuration such as the IBM Balanced Warehouse. Specific RAM, CPU, and disk storage requirements will be determined during the pre-installation assessment based upon the volume of data stored and anticipated usage.

ICA will run on several platforms. IBM InfoSphere Warehouse (DB2) is supported on the following hardware:

- *X86 (Intel Pentium®, Intel Xeon®, and AMD) 32-bit Intel and AMD Architecture*
- *X64 (64-bit AMD64 and Intel EM64T processors)*

The supported operating system releases for Linux include:

- *SuSE Linux Enterprise Server (SLES) 9 Service Pack 2*
- *SuSE Linux Enterprise Server (SLES) 10 Service Pack 1*
- *Red Hat Enterprise Linux (RHEL) 4 Update 4*
- *Red Hat Enterprise Linux (RHEL) 5*

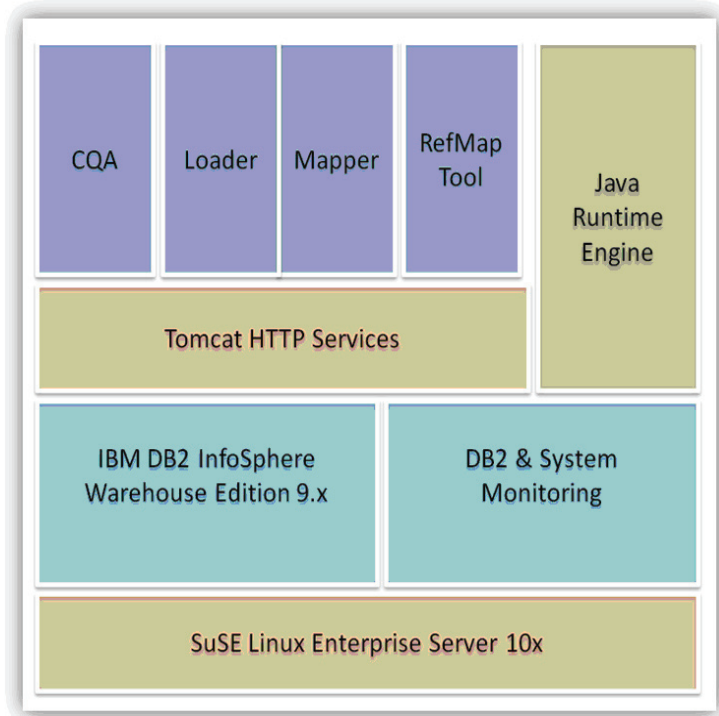


Figure 25 : ICA Software Stack - Linux

Due to IBM Cognos dependencies on the Windows OS for the Framework Manager and Cognos Administration components, a separate system is used for Analytics and the Dashboard. This system should be sized to meet the anticipated customer Analytics usage, with an IBM x3650 system being specified as a starting point.

The supported operating system releases for Windows include:

- *Windows Server 2003 Service Pack 2 – Cognos BI Server 8.3 or 8.4*
- *Windows Server 2008 Service Pack 1 – Cognos BI Server 8.4*

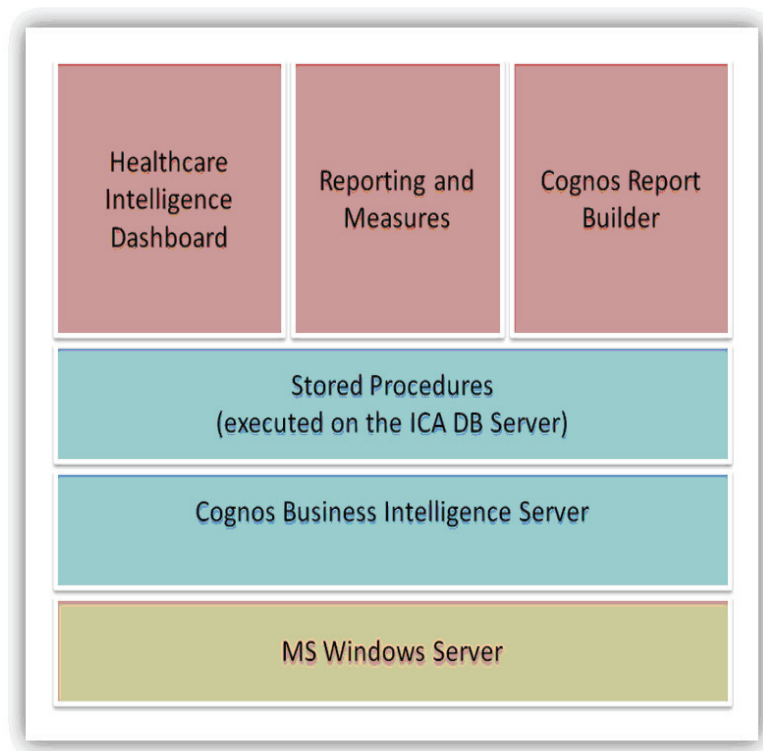


Figure 26: Analytics Server - Windows

ETL flow development and testing most commonly occur with the Design Studio client on a separate system from the database server or Analytics server systems. In many cases, a standard workstation or laptop can accommodate this application.

The ETL workstation will connect to and upload the completed flows to the database server for execution.

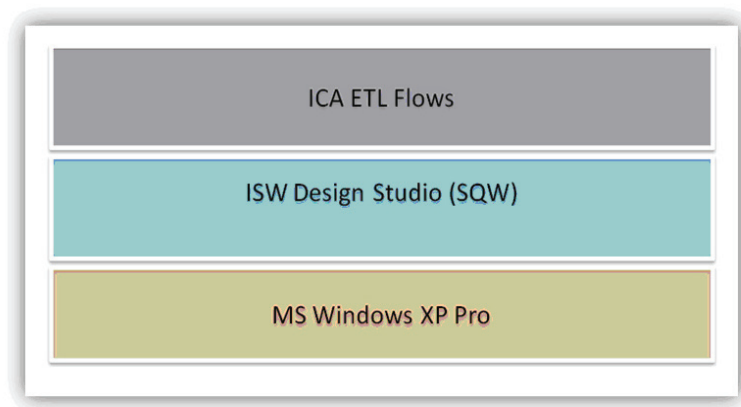


Figure 27: ETL Workstation – Windows or Linux

SYSTEM INSTALLATION

The ICA database is built by drawing upon the various source systems within a healthcare organization, then normalizing and validating the necessary elements to form the provider-centered source of truth. Since organizations may have customized or extended their original source systems, detailed data discovery and concept mapping is provided as part of the installation process, along with linking of different systems together using a customer-provided common index as part of the standard installation. Addition of a new master patient or provider indices, additional description mapping or inclusion of supplemental data may require an extended install work plan and additional implementation resources.



RELATED PUBLICATIONS

The following documentation is available for the InfoSphere Clinical Analytics product:

- *ICA Quick Start Guide for Linux*
- *ICA HID Installation Instructions v14*
- *CDW Administrator's Manual*
- *CDW Clinical Query Application Users Guide*
- *CCTLOADER Quick Start Manual*
- *ICA Heuristic Mapping Manager v2.2 Guide*
- *ICA REF Management Tool*
- *ICA Dashboard Content User Guide v14*