IBM Health Care Provider Data Warehouse General Information Manual

Content

Executive Summary

Rapid change in the health care industry is its response to pressures to reduce total costs, while simultaneously improving care outcomes for the patient population. Other industries have already gone through similar changes and health care is only now catching up. As the transformation momentum to a patient-centric and collaborative business model continues, the health care industry is expected to change to a more cost-efficient and higher quality delivery system. Legislative reforms, such as the 2009 Patient Protection and Affordable Care Act in the United States, are accelerating the pace of change.

Integrated Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and Business Intelligence (BI) systems have played a major role in enabling the business transformation in major corporations. Because the health care system is a complex and fragmented mix, ranging from individual medical practices to large hospitals, the information flow and integration problem is much more challenging than in other businesses. Privacy regulations, competition and a variety of clinical systems make it difficult to obtain a single view of patient care across multiple medical treatments and across multiple care settings. Electronic Health Records (EHRs) adoption is a good start in creating a single, longitudinal record of patient care. Clinical EHRs, integrated with resource utilization, activity-based costing, billing and claims data can provide the comprehensive analytics framework to enable historical analysis, predictive modeling and data-driven decisions to adapt quickly to consumer-required and legislatively mandated service and outcome improvement.

IBM Health Care Provider Data Warehouse (HCPDW) models provide a blueprint for comprehensive data warehouse BI applications based on data architecture best-practice principles to hasten this improvement. This executive brief discusses how the HCPDW model helps you establish a platform to gain a more complete understanding of your patients, practitioners, assets, facilities and payers, thereby helping you to choose the best strategies for:

- Aligning IT with business goals
- Offering differentiated products and services
- Streamlining operations
- Facilitating compliance measures
- Optimizing revenues and reducing costs
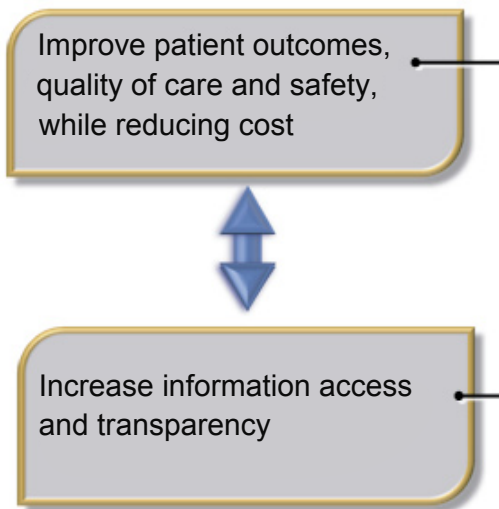- Promoting effective decision making

HCPDW supports major business and technical requirements:

- Meaningful use analysis for EHR usage incentives in the US
- Quality and compliance reporting to satisfy evolving legislative and industry standards
- Support for local and common enterprise code sets
- Support for HL7, the standard series of predefined data formats for packaging and exchanging health care data in the form of messages transmitted among disparate IT systems
- Achieving greater insight for delivering higher quality outcomes at reduced costs

Faced with so many challenges, health care providers have responded by increasing investments in upgrading their information management and business analytics systems. They are seeking to gain critical business insights by implementing enterprise data warehouses and data marts to integrate information into meaningful measurements and effective decision making.

Meeting these demands requires innovative solutions that can provide the foundation for a broad range of query-based and real-time BI activities that effectively integrate and analyze information from a wide range of data sources. The foundation needs to be robust enough to support current needs, and extensible and scalable enough to support future, possible or unknown requirements. The bottom line is that health care providers today need BI capabilities that enable them to respond to, and get in front of, anticipated and unanticipated changes in this dramatically dynamic market.

Key imperatives healthcare organizations are addressing

IBM HealthAnalytics PoV 2010

Improve patient outcomes, quality of care and safety, while reducing cost

Increase information access and transparency

Health care organizations around the world wrestle with common challenges

A Blueprint for Success

The HCPDW model is the core foundation of IBM solutions for health care analytics. IBM provides an integrated portfolio of products to address this overall data management challenge. The total solution covers the full range of data management areas including:
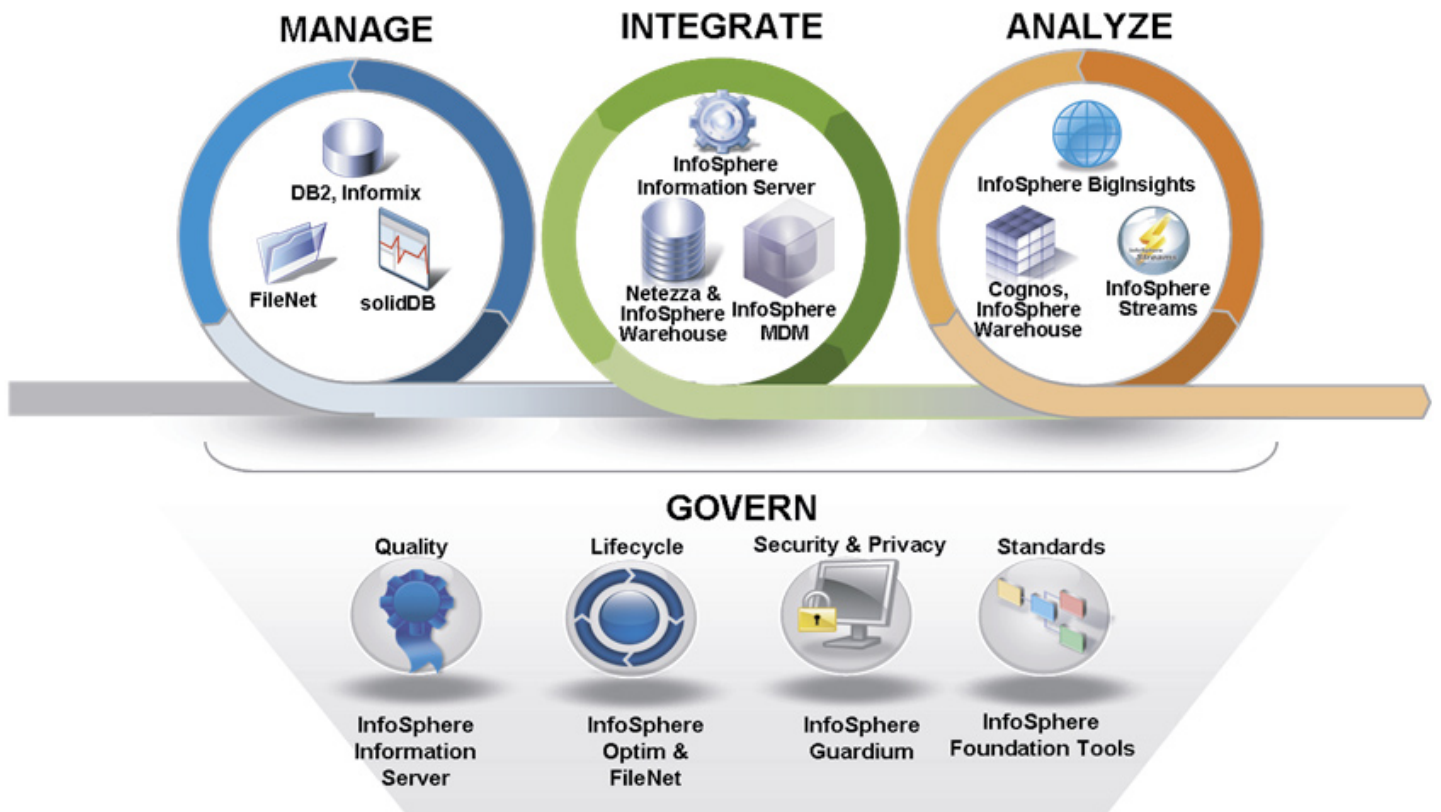
- Management of data from many different sources
- Integration of data into a single environment, covering historical data in the data warehouse and master data
- Provision of that data in a way that enables detailed analysis by business analytics applications
- Overall governance of the granular data management process
- Tracking data lineage to source systems
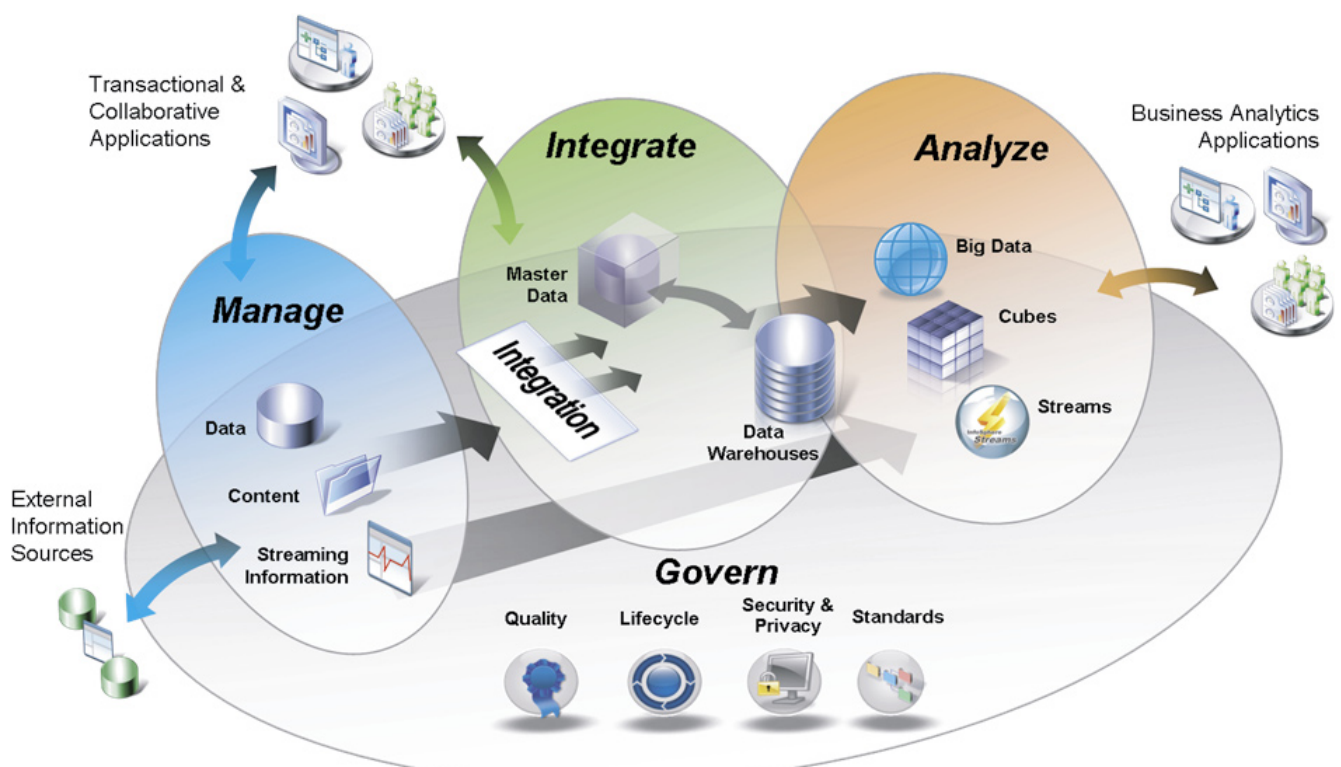
Typical data management landscape with the HCPDW

The specific components of this solution landscape that are particularly relevant to the HCPDW model include:

- **IBM InfoSphere Data Architect (IDA)**
  Manages and extends the data model, and is deployed on the selected platform
- **IBM Information Server**
  Extracts, transforms and cleanses source data to feed the data warehouse
- **IBM InfoSphere Warehouse**
  Hosts and populates the data model customized to customer requirements
- **IBM Cognos**
  Generates and distributes standard and ad-hoc reports to end users requiring analytical data
- **IBM Smart Analytics System** and **Netezza** hardware platform

MANAGE
- DB2, Informix
- FileNet
- solidDB

INTEGRATE
- InfoSphere Information Server
- Netezza & InfoSphere Warehouse
- InfoSphere MDM

ANALYZE
- InfoSphere BigInsights
- Cognos, InfoSphere Warehouse
- InfoSphere Streams

GOVERN

Quality	Lifecycle	Security & Privacy	Standards
InfoSphere Information Server	InfoSphere Optim & FileNet	InfoSphere Guardium	InfoSphere Foundation Tools

Extensible, scaleable and robust data that fits a health care provider's unique environment offers significant competitive advantage. It does this by enabling you to create an analytical data store and system that connects to all your critical data, across disparate systems and formats, and incorporating diverse departments and other data providers. Such a system helps you build a dynamic analytics world, where data collected internally and externally is used to determine how to arrange, align, deploy and improve care to the patient population. This is a system that forms the foundation of a true Information-On-Demand infrastructure where trusted, relevant information is available to the people who need it, when they need it, so they can make better and timelier decisions.

In short, HCPDW provides the foundation for deeper insights, enabling you to more easily:

- Analyze population health levels based on various groupings, such as facility and practitioner
- Analyze resource utilization productivity and throughput
- Analyze operational performance related to patient flow
- Evaluate readmission rates by diagnosis groups
- Measure and identify causes for adverse events
- Monitor and track in real time compliance to regulatory and clinical guidelines across settings
- Measure patient and provider satisfaction

The HCPDW model includes the following core dimensions and subject areas integrated into a complete data model solution:

- Allergy
- Biospecimen
- Care Team and Role
- Clinical Order
- Diagnosis
- Encounter
- Eventing and Alerting
- Finding
- Groupings/Hierarchies
- Imaging
- Lab Result
- Location
- Multi-Tenancy

- Order
- Party
- Patient
- Patient Administration (ADT)
- Patient Life Event
- Patient Medications
- Person
- Pharmacist Intervention
- Practitioner
- Procedure
- Provider/Organization
- Surgery
- Unified Standard Codes

Comprehensive Data Model

The physical deployment of your data warehouse is the key enabler of your business intelligence strategy. The more you can reduce the time and cost required up front, the greater the value you can achieve. As platform-independent models, the HCPDW offering is the result of tens of thousands of hours of development effort and deep subject matter expertise to help business users and IT staff implement an enterprise data warehouse on time and on budget.

The HCPDW offering joins the market-leading IBM Industry Models portfolio for the banking, insurance, financial markets, health plan, telecommunications and retail sectors, embodying over 20 years of industry model heritage, input and use by over 500 clients.

Ultimately, HCPDW acts as a blueprint by defining the structures necessary to build an effective data warehouse. It provides health care provider managers with critical predefined requirements definitions that offer a view of their business through key performance indicators (KPIs) and other measures.

The HCPDW models make it easier to:

- Analyze cost of care more accurately
- Evaluate cost against quality of care
- Measure financial performance

The HCPDW model contains a set of integrated data models that provide organizations with the range of models for the different aspects of building a full, best-practices-based data warehouse infrastructure.

The Business Data Model (BDM) is a logical entity-relationship (ER) model that represents the essential entities and relationships of the health care provider industry, and includes common design constructs that can be transformed into separate models suitable for dedicated purposes such as an ODS, data warehouse and data marts. The BDM is a comprehensive, fully defined model with more than 300 logical entities and more than 1,000 logical attributes.

BDM is the first point at which the various business requirements are brought together in an ER format, and it enables organizations to perform the initial modeling of their business requirements. This model helps the organization to understand the various constraints, relationships and structures that can be implied in their first business requirements. This is the essential model of the business that provides the overall business context and a common basis for the downstream models that can be used in actual deployment of the physical data warehouse.

The BDM is not intended as an implementation model. Instead, the BDM includes common, logical constructs that can be transformed into the physical structures suitable for dedicated purposes such as an ODS and warehousing. These derived models are implemented as installed data repositories. The key data concepts of the BDM are based on IBM's experiences, achieved over almost two decades of developing industry models in multiple industries, and customizing them to suit the exact needs of hundreds of individual clients.
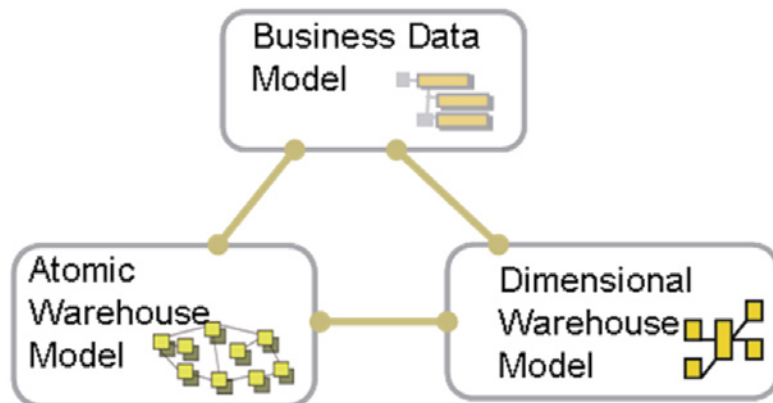
Atomic Warehouse Model

The Atomic Warehouse Model (AWM) is a logical, specialized model of the BDM, optimized for a data repository that needs to hold long-term history, usually across the entire enterprise.

The AWM provides the data design support needed to create a uniform model of the enterprise-level business requirements defined by the BDM into specific, flexible and efficient structures dedicated to the long-term storage of historical facts. Usage of key concepts, such as Role Player and Agreement that are independent of any eventual query usage gives the AWM a high degree of flexibility. The AWM history structures have been developed over two decades of warehouse design and give the efficient storage construction required.

Intended to be the central consolidated store of enterprise data needed for all analytical purposes across multiple business areas, the AWM is a fully defined logical model with more than 300 logical entities and more than 3,200 logical attributes.

Dimensional Warehouse Model

The Dimensional Warehouse Model (DWM) is a physical model of the BDM for an optimized data repository that needs to support analytical queries. The DWM provides the data design support needed to model uniformly the enterprise-level business requirements by the BDM into business-specific and efficient structures dedicated to the design of a dimensional data repository. This repository holds sufficient and complete data to meet the needs of business-user-required analyses. The DWM is a fully defined model with more than 120 logical entities and 2,500 logical attributes.

Using either the AWM or the DWM is a valid option for your enterprise data store, depending on your needs. You can use either for the lowest level of data granularity that supports your solution requirements. Collectively, the HCPDW models help to mitigate the risk of implementing a data warehouse, while considerably reducing development time and cost.

Key benefits include:

- Enabling business users to scope and customize their own requirements more easily
- Facilitating step-by-step, business-focused development, rollout and throughput
- Delivering regularly updated business, technical and regulatory content
- Managing definitions and standards in complex IT environments
- Setting the foundation for a real-time analytics model
- Providing data architecture based on data modeling best practices

Get flexible

With their strong business and IT orientation, the HCPDW models can be customized to reflect the exact needs of every company using them, including the areas that are specific to their business and unique competitive advantages.

Even more importantly, the models are flexible enough to evolve with the ever-changing requirements of the health care provider industry. Unlike proprietary or application-specific solutions, the open-standards-based HCPDW models solution makes it easy to build additional features as needed and readily accommodate extensions.
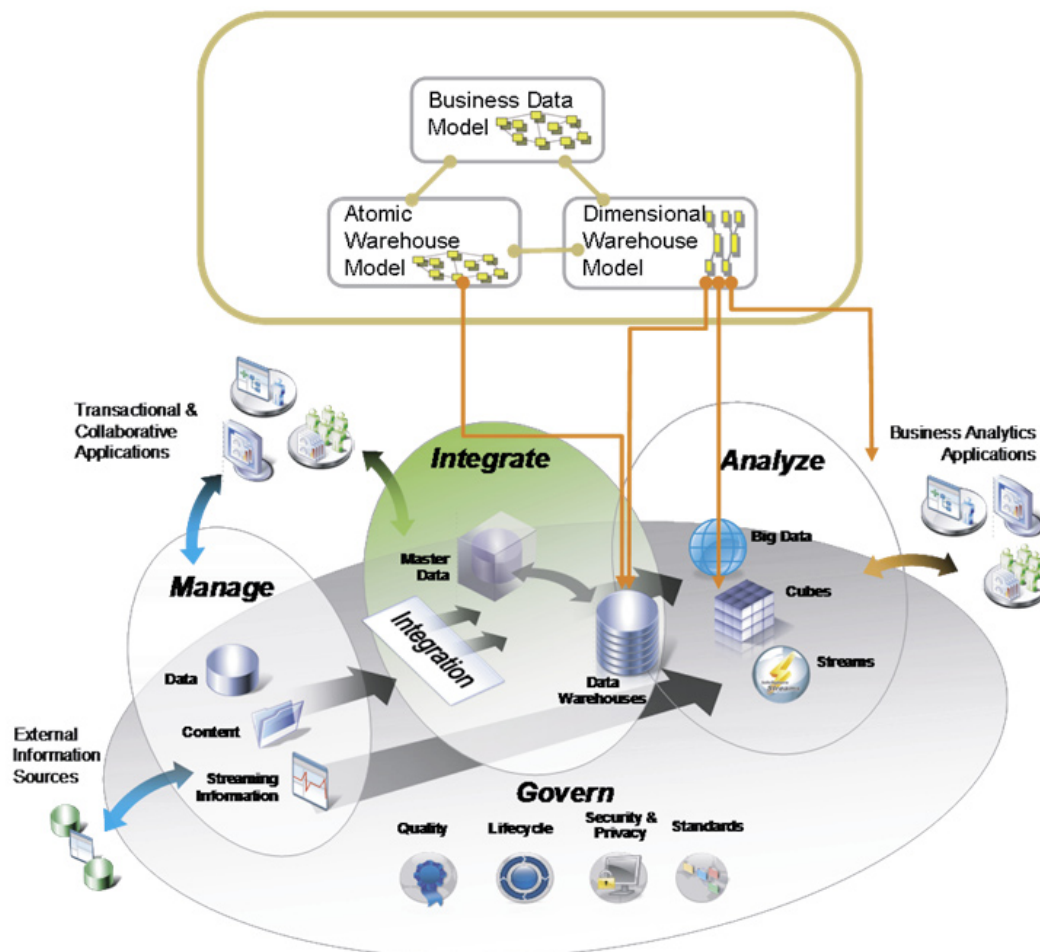
Business Solution Templates

Business Solution Templates (BSTs) are a collection of business-oriented representative measures and dimensions that provide a logical basis for BI solutions. BSTs can be implemented in a number of ways including Database Management System (DBMS) tables, views or in a BI tool framework.

Business Rule Event Analysis - Pharmacists and infection preventionists have the ability to create clinical rules and receive notifications when patients meet the conditions of these rules. This data allows the user to obtain information regarding the history of patients meeting the clinical rules and notifications generated.
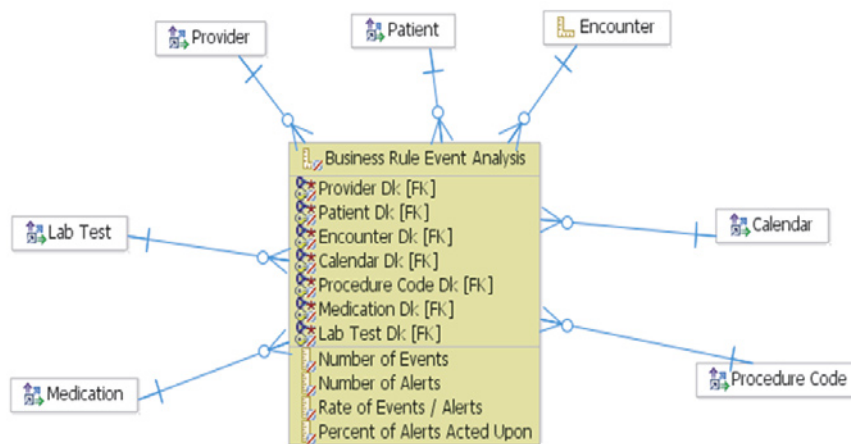
Lab Results Analysis - Pharmacists and infection preventionists review historical lab data in order to monitor organism and resistance trends within the facility. This data can be used to determine metrics for stewardship and targeted prevention activities, provide information for internal administrative reporting, and monitor organism trends in the patient population.

Organism Acquisition Analysis - Pharmacists and infection preventionists review historical lab data to monitor organism and resistance trends within the facility. This data can be used to determine metrics for stewardship and targeted prevention activities, provide information for internal administrative reporting, and monitor organism trends in the patient population.

Meaningful Use Analysis - In order for practitioners and hospitals to be eligible to receive payments under the incentive programs provided through the Centers for Medicare and Medicaid Services, they must be able to demonstrate meaningful use of a certified EHR system. The 25 measures defined here constitute the initial set of measures required to demonstrate EHR meaningful use.

Operational Performance Analysis - Providers need to monitor and understand the incoming patient flow, patient stay, admission and discharges. Common questions include: How many patients are we seeing? What is the average length of stay? How may outpatient surgeries did we do, what is the trend? What is my bed utilization and what is the trend?

Patient Screening Analysis - In order to limit the spread of multi-drug resistant organisms (MDRO), many infection preventionists are required to track compliance with MDRO screening tests. This data assists the clinician in tracking screening compliance. Some hospitals and states also require screening compliance be monitored for payer organizations providing reimbursement. The percent compliance is tied to reimbursement percentages.

Pharmacy Intervention Analysis - The intervention data allow the pharmacists to retrieve any intervention data that has been input into the system by clinical or staff pharmacists in an effort to show increased patient intervention, utilization of the monitoring tool and provide a tool to measure the value of the pharmacist in the clinical workspace.

Pharmacy Utilization Analysis - Pharmacists review Drug Utilization by specific order or administration to determine which patients or units within their facility have received specific medications. They may also monitor overall drug utilization using the DDD/DOT report to determine utilization trends and in order to decrease specific drug utilization (e.g., high cost medications, resistance). Interventions are clinical data utilized by pharmacists to track their interactions with other health care professionals in regards to recommendations to drug therapy.

Surgical Safety Analysis - Infection preventionists are responsible for tracking SSI for HAI reporting as well as assisting the quality department in complying with SCIP measures. This data enables the clinician to gather details about procedures needed for root cause or trend analysis of SSI and track/report surgeon compliance with SCIP recommendations for antibiotic administration.

Susceptibility Analysis - Pharmacists and infection preventionists review historical lab data in order to monitor organism and resistance trends within the facility. Patients can be assigned to Cohorts using Patient Tags. This data can be used to determine metrics for stewardship and targeted prevention activities, provide information for internal administrative reporting, and monitor organism trends in the patient population.

Value Proposition Summary

The HCPDW helps to reduce the risk of implementing a data warehouse, while considerably reducing time and cost.

Key Benefits:

- Enables business users to easily scope and customize their own requirements.
- Facilitates regularly updated business, technical and regulatory content.
- Manages definitions and standards in a complex IT environment.
- Standardizes data architecture based on data modeling best practices.
- Updated regularly to reflect changes and trends as they occur in the health care industry.

The HCPDW solution reaches far beyond simple data gathering. It offers a significant competitive benefit through the ability to define the data continuum from patient information to medical care utilization, and transform it into input for information-led business initiatives. By unlocking information contained in individual multi-vendor or inhouse applications and making it readily available to the people and processes that need it, the products of the HCPDW models get you many steps closer to a true Information-On-Demand infrastructure.

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IBM Industry Models

http://www-01.ibm.com/software/data/ips/products/industrymodels/