Department of Health and Human Services

Centers for Medicare & Medicaid Services
IT Modernization Program

Modernizing CMS Computer and Data Systems to Support Improvements in Care Delivery

Version 1.0

December 23, 2010

Foreword

This *Modernizing CMS Computer and Data Systems to Support Improvements in Care Delivery* represents the response of the Centers for Medicare & Medicaid Services (CMS) to the Patient Protection and Affordable Care Act, §10330, which directs CMS to develop a plan to modernize the computer and data systems of CMS.

This version 1 plan is the result of extensive collaboration across CMS and the Department of Health and Human Services and focuses largely on the computer and data systems improvements. In December 2010, the Administration released two major reports that will influence CMS data and system modernization plans: *Report to the President Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward* from the President's Council of Advisors on Science and Technology (PCAST) and the U.S. Chief Information Officer's *25 Point Implementation Plan to Reform Federal Information Technology Management*.

In addition, in July 2010, the National Research Council (NRC) of the National Academies launched a study titled "Future Information Architectures, Processes and Strategies for CMS." The NRC is reviewing the current state of CMS technical infrastructure and systems architecture and will make recommendations to CMS on modernizing business processes, practices, and information systems to address current and future program innovations. The NRC released a preliminary report in mid-December 2010 and its final report is expected at the end of 2011.

CMS will update this document to align with the reports from the President's Council of Advisors on Science and Technology and the U.S. Chief Information Officer, and to include consideration of the National Research Council's final report and recommendations.

Executive Summary

The Centers for Medicare & Medicaid Services (CMS) provides health care services to approximately 100 million beneficiaries and pays benefits totaling approximately $800 billion a year. CMS ensures access to health care for many of our Nation's most vulnerable citizens—the children, the elderly, and low-income Americans—through the Children's Health Insurance Program (CHIP), Medicare, and Medicaid programs.

For years, federal health care programs have paid physicians, hospitals, and other health care providers based on the volume rather than the quality of care provided their patients. The result has been an inefficient health care marketplace that has rewarded quantity over quality. CMS is focusing efforts on two fronts: to obtain more robust analytics for quality of care in light of new health care delivery models and drive quality improvements by rewarding health care providers based on quality performance metrics. To achieve the goal of ensuring effective, high-quality health care for beneficiaries, CMS must establish an enterprise-level capability to capture and analyze data on resource utilization, health outcomes, and cost, even as the volume and scale of its programs and data rapidly increase.

The mission of **CMS is to be the major force for the continual improvement of health and health care for all Americans.** The current vision is better care for individuals, better health for populations, and lower costs (through improvement and without any harm whatsoever to individuals, families, or communities[1]).

Section 10330 of the Affordable Care Act

In enacting the Patient Protection and Affordable Care Act, commonly known as the Affordable Care Act, Congress understood the key role of data and information technology (IT) infrastructure in transforming the health care system. To that end, section 10330 of the Act requires the Secretary of Health and Human Services (HHS) to develop a plan for modernizing CMS computer and data systems. The Act directs that the Secretary shall consider how the modernized computer system could:

> "…[m]ake available data in a reliable and timely manner to providers of services and suppliers to support their efforts to better manage and coordinate care furnished to beneficiaries of Medicare programs" … and "support consistent evaluations of payment and the delivery system reforms under CMS programs."

This document provides a detailed plan for updating CMS computer and data systems for delivering 21st century health care. It describes the necessary methodology for CMS' collaboration and planning to accomplish an enterprise transformation designed to achieve the goals and objectives of the new law and the provisions of section 10330. The enterprise coordination and joint engineering of the CMS infrastructure will result in better delivery of

[1] Government Accountability Office (GAO) Report, *Medicare Fraud, Waste, and Abuse: Challenges and Strategies for Preventing Improper Payments,* GAO-10-844T, June 15, 2010, http://www.gao.gov/new.items/d10844t.pdf

quality health care services and reduced costs through reuse, less redundancy, improved quality, tighter security, enforced privacy, and interoperability with federal and state partners.

Meeting Health Modernization Needs

The Affordable Care Act contains important initiatives that will support transforming CMS from a passive payer of claims to an active purchaser of quality health care. Implicit in this transformation is a vision that CMS will break down existing information silos; acquire new data, such as quality of care assessments and clinical records; and use this data to improve payment, accuracy, and the services CMS provides to beneficiaries, providers, and the public.

The Business Case for IT Modernization

With timely, complete, and accurate integrated data made possible by the proposed IT modernization effort, CMS will obtain information and analytics to help address and solve many of today's health care challenges while ensuring the ability to support future innovations in health care service delivery.

IT Modernization will allow CMS to establish the necessary capabilities to achieve:

- **Improved Business Operations –** CMS must transition to flexible payment methods that integrate administrative claim, encounter, clinical, payment, and outcome data while maintaining its Fee-for-Service (FFS) and Medicare Advantage and Prescription Drug (MAPD) operations.
- **Effective Performance Measurement and Oversight –** CMS oversees a wide range of quality management activities and payment systems for the Medicaid, Medicare, and CHIP programs. Improved data will facilitate a more robust performance management program and enhanced oversight.
- **Enhanced Public Accountability –** CMS must streamline its program, billing, and eligibility information to make these systems and processes as informative as possible while reducing burdensome procedures, such as enrollment and claim processing, for providers. In addition, improving health outcomes involves promoting a patient-centered focus on prevention and wellness, chronic care management, and individual health responsibility. All three depend on the beneficiary and provider's timely access to critical information about coverage, eligibility, and quality of care.
- **Innovation –** To accomplish the goals of the Act and modernize its computer and data systems, CMS must offer modern, analytical IT capabilities for cost and quality, supported by reliable storage systems and fully integrated enterprise-level databases.

Health Care Data Improvement Initiative

An overhaul of CMS' data environment involves building the *enterprise infrastructure capability* to enable the needed scalability, agility, and flexibility to handle the rapidly evolving health care models for CMS. At present, CMS' data and systems should be strengthened to meet the President's health care goals, support implementation of the Affordable Care Act, or provide the data analytics needed to improve the value of health care in the United States. For example, CMS currently holds various pieces of information about providers in at least 25 different databases used for different program purposes. Multiple databases hamper care coordination efforts and obscure opportunities to improve efficiency and quality. The primary goal of the Health Care Data Improvement Initiative (HCDII) is to transform CMS computing systems and data that support the national health agenda and enable CMS' successful implementation of the Affordable Care Act.

Data Modernization – Enterprise Data Environment

The Enterprise Data Environment (EDE) is the central technical vision in CMS' Health Care Data Improvement Initiative. The EDE establishes the foundation for modernizing CMS' data systems and creates future enterprise data management while modernizing computing infrastructure to support the transformation of CMS' business and application systems. Throughout the 5- to 10-year incremental development cycles of the EDE, CMS will apply ongoing quality improvements from lessons learned in the agile approach to consolidate agency data in the EDE to create more complete, timely, and synchronized data. The technical components of the EDE and the critical, foundational capabilities enabled by the HCDII will facilitate CMS' effective contribution to achieving the vision of a national Health IT network or super highway where there is a free and secure exchange of electronic health records between providers, payers, patients, and federal partners.

The essence of the EDE core design is to improve the integration, completeness, quality, timeliness, and accessibility of CMS data. The initial information systems to leverage the modernized enterprise data platform at CMS will be *Greenfield*[2] projects—completely new installations or configurations without any requirement for integrating any existing systems with the new project. The first two of these Greenfield IT projects will provide the foundation for transforming CMS into a data-driven business and improving performance and accountability across the CMS enterprise.

New Greenfield Systems

Medicaid and CHIP Transformation – Transforming Medicaid and CHIP enterprise data is necessary to satisfy the requirements in the Affordable Care Act, eliminate and control redundant efforts in CMS and the State Medicaid and CHIP operating agencies, and to boost program integrity efforts significantly. This new environment will represent the single source of

[2] The term derives from the building industry, where undeveloped land is known as "Greenfield".

Medicaid and CHIP data to support advanced levels of internal and external controls, including far greater transparency and stakeholder involvement. It will meet the business needs of all CMS Centers, including the agency's three new centers, the Center for Program Integrity, the Center for Strategic Planning, and the Center for Medicare & Medicaid Innovation.

Encounter Data Processing System – CMS will build the Encounter Data Processing System using a Service-Oriented Architecture that will encourage reuse and provide the needed flexibility to support the rapidly evolving role of CMS in the delivery, management, and payment of health care services.

Managing the Modernization Effort

Governance

CMS recognizes that the modernization of CMS computer and data systems is a multi-faceted, multi-year program that requires comprehensive governance. CMS has designed the high-level, proposed EDE architecture for a phased implementation. Each phase will be broken down into incremental work products with usable functionality delivered every six (6) months. CMS' approach will feature sound fiscal and project management, coupled with adherence to Integrated Life Cycle requirements and best practices as well as effective communication with stakeholders.

Coordinated Funding Approach for Leveraging Several Funding Sources

Although the HCDII is the focal point for funding IT modernization at CMS, it must be supplemented by other funding sources, including the Affordable Care Act[3], the Health Information Technology for Economic and Clinical Health (HITECH) Act[4] contained in the American Recovery and Reinvestment Act (ARRA) of 2009[5], and the Predictive Modeling requirements found in the Small Business Jobs Act of 2010.[6] Each of these legislative requirements provides associated funding for IT. CMS must coordinate investments from these multiple funding sources to avoid building additional information silos or program point solutions, which would compromise the implementation of integrated, authoritative data across the CMS enterprise.

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3 Public Law 111–148, Patient Protection and Affordable Care Act, March 23, 2010, 124 Stat. 119, http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/content-detail.html http://www.healthreform.gov/health_reform_and_hhs.html

4 Public Law 111-5, American Recovery and Reinvestment Act of 2009 (ARRA), Health Information Technology for Economic and Clinical Health Act (HITECH), § 13001, February17, 2009, 123 Stat. 115, http://www.govtrack.us/data/us/bills.text/111/h/h1enr.pdf http://www.hhs.gov/ocr/privacy/hipaa/understanding/coveredentities/hitechact.pdf

5 Public Law 111-5, American Recovery and Reinvestment Act of 2009 (ARRA), February17, 2009, 123 Stat. 115.

6 Public Law 111-240, Small Business Jobs Act of 2010, 124 Stat. 2504, September 27, 2010.

Potential Cost Savings / Cost Avoidance

CMS expects that its data governance and enterprise data management policies will generate significant program savings and lower CMS' administrative costs by simplifying application development, reducing complexity in the enterprise information infrastructure, and minimizing overall information management costs and risks. CMS has identified the following general areas of potential administrative cost savings/cost avoidance:

- Reduced risk of systemic failure due to overly complex, customized systems
- Simplified infrastructure through the retirement of hardware, applications, and databases
- Sunset or retirement of systems will reduce the burden of maintaining product licenses and support costs (monitoring, upgrades, and patches) of retired systems
- Reduced labor activities related to the legacy hardware, applications, and databases (acquisition, storage, analysis, enhancement, maintenance, troubleshooting, archival, and distribution)
- Negotiation of better rates for resources that do not require special domain knowledge or expertise, which is presently required for complicated infrastructure or legacy assets.

There should be significant administrative savings beyond FY 2015 once the core infrastructure capabilities are established. As the enterprise technology systems are integrated and the data services mature during the initial phases, the agency will realize modest savings.

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1. Introduction

> "We are working to improve the quality of and access to Health Care for all Americans by supporting programs intended to enhance the health care workforce and the quality of Health Care information and treatments through the advancement of Health Information Technology (IT) and the modernization of the health care system."
>
> – **Health and Human Services Secretary Kathleen Sebelius, February 2010**[7]

The Centers for Medicare & Medicaid Services (CMS) provides services to approximately 100 million beneficiaries and pays benefits totaling approximately $800 billion a year. CMS ensures access to health care for many of our Nation's most vulnerable citizens—the children, the elderly, and low-income Americans—through the Children's Health Insurance Program (CHIP), Medicare, and Medicaid programs. As the largest single purchaser of health care services in the United States, CMS is in a unique position to support the transformation of the health care delivery system.[8]

This transformation is already underway at many levels across CMS, from efforts to improve the timeliness and accuracy of payments made to health care providers; to combating fraud, waste, and abuse in federally funded health care programs, to improving the quality of care delivered in health care settings like hospitals, physician offices, and nursing homes.

CMS payment policy, for instance, provides a significant opportunity for transformation. Historically, CMS has acted as a passive payer of claims.[9] For years, federal health care programs have paid physicians, hospitals, and other health care providers based on the volume rather than the quality of care provided. The result has been an inefficient health care marketplace that has rewarded quantity over quality. CMS is focusing efforts to obtain more robust analytics for measuring quality of care. New performance-based delivery models will drive quality improvements by rewarding health care providers with incentives for quality outcomes.

CMS is now poised to take the next leap forward in quality improvement by rewarding health care providers based on their performance on quality measurements. Now, pay-for-performance promises to align financial incentives with providing the right care at the right time. To achieve this goal of ensuring effective, high-quality health care for beneficiaries, CMS will need accurate, integrated, and timely information on provider performance and patient outcomes.

Some view CMS as working in separate Medicare and Medicaid program silos, and responsive primarily to congressional mandates or short-term initiatives that have questionable long-term

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7 HIMSS Fact Sheet, Overview of President's HIT FY2011 Budget Request, http://www.himss.org/advocacy/d/FactSheet_HITBudgetrequest_2011.pdf

8 Centers for Medicare & Medicaid Services (CMS), Healthcare Integrated General Ledger Accounting System, https://www.cms.gov/HIGLAS/

9 CMS, Hospitals Open Door Forum, https://www.cms.gov/OpenDoorForums/18_ODF_Hospitals.asp

value. Many experts believe that the "siloed" nature of how CMS provides and pays for health care contributes to perverse economic incentives that discourage collaboration and exchange across provider types and reward inefficient care practices.[10, 11]

CMS aims to break down existing program and information silos through convergent Medicare and Medicaid business operations and planning. The emphasis will be on creating enterprise-wide solutions and building capability for a flexible IT infrastructure that will accommodate future systems growth.

Table 1 depicts the alignment of the President's goals[12] for Health Care Transformation with the vision of the Administrator for the Centers for Medicare & Medicaid Services, and the Department of Health and Human Services goals.[13]

Table 1. Summary of Health Care Transformation Goals

President's Goals	CMS Vision	HHS Goals
Increase **Access**	Better **Care** for Individuals	Advance the Health, Safety, and Well-Being of the American People
Improve **Quality**	Better **Health** for Populations	Transform Health Care, Strengthen the Nation's Health and Human Services Infrastructure and Workforce, Advance Scientific Knowledge and Innovation
Lower **Costs**	Lower per capita **Costs** of Health Care	Increase Efficiency, Transparency, and Accountability of HHS Programs

To accomplish the Health Care Transformation Goals—**to enhance the individual experience of care, address the health of populations, and control per capita costs**—CMS will need to take determined and bold action to implement the Patient Protection and Affordable Care Act, commonly known as the Affordable Care Act.[14]

Figure 1 depicts the alignment of CMS' 11 Priority Program Areas to the Transformation Goals of the President and the HHS. The figure introduces the legislative drivers integral to CMS' Modernization strategy efforts, the Health Care Data Improvement Initiative (HCDII), and the Enterprise Data Environment (EDE), all of which support the CMS vision.

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10 Perverse incentives examined in new health care documentary called "Money Driven Medicine," http://www.moneydrivenmedicine.org/

11 CMS supports Comparative Effectiveness Research (CER) that is funded by the American Recovery and Reinvestment Act of 2009 (ARRA). http://www.hhs.gov/recovery/programs/cer/index.html

12 http://www.whitehouse.gov/omb/fy2010_key_healthcare/

13 Strategic Plan for Fiscal Years 2010–2015, DRAFT, http://www.hhs.gov/secretary/about/pubcomm_draft.pdf

14 In March 2010, Congress passed the Patient Protection and Affordable Care Act (P.L. 111-148) in conjunction with the Health Care and Education Reconciliation Act of 2010 (P.L. 111-152).

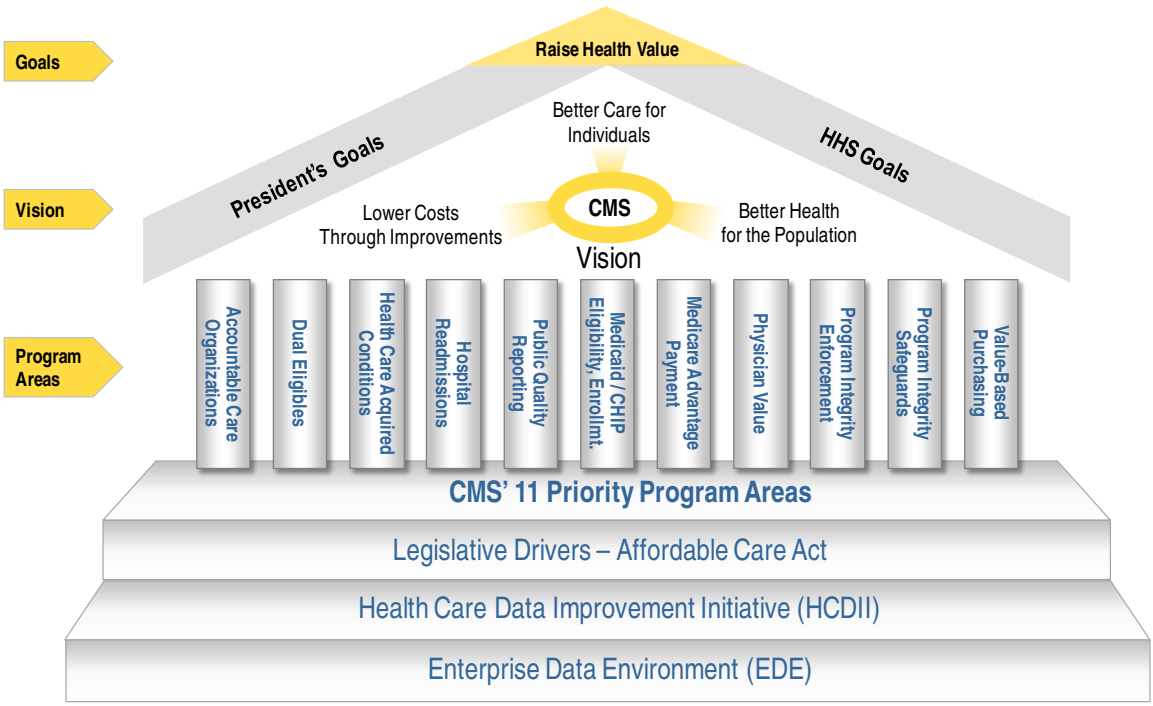

Figure 1. CMS' Primary Goals Summarized by a Shared Vision

The **CMS mission is to be a major force for the continual improvement of health and health care for all Americans.** The current vision is better care for individuals; better health for populations; and lower costs (through improvement and without any harm whatsoever to individuals, families, or communities)—in its simplest form: Better Care, Better Health, and Lower Cost.

Figure 2 presents a holistic map of CMS Health Care transformation goals, core business needs, and drivers to support Enterprise Modernization efforts.

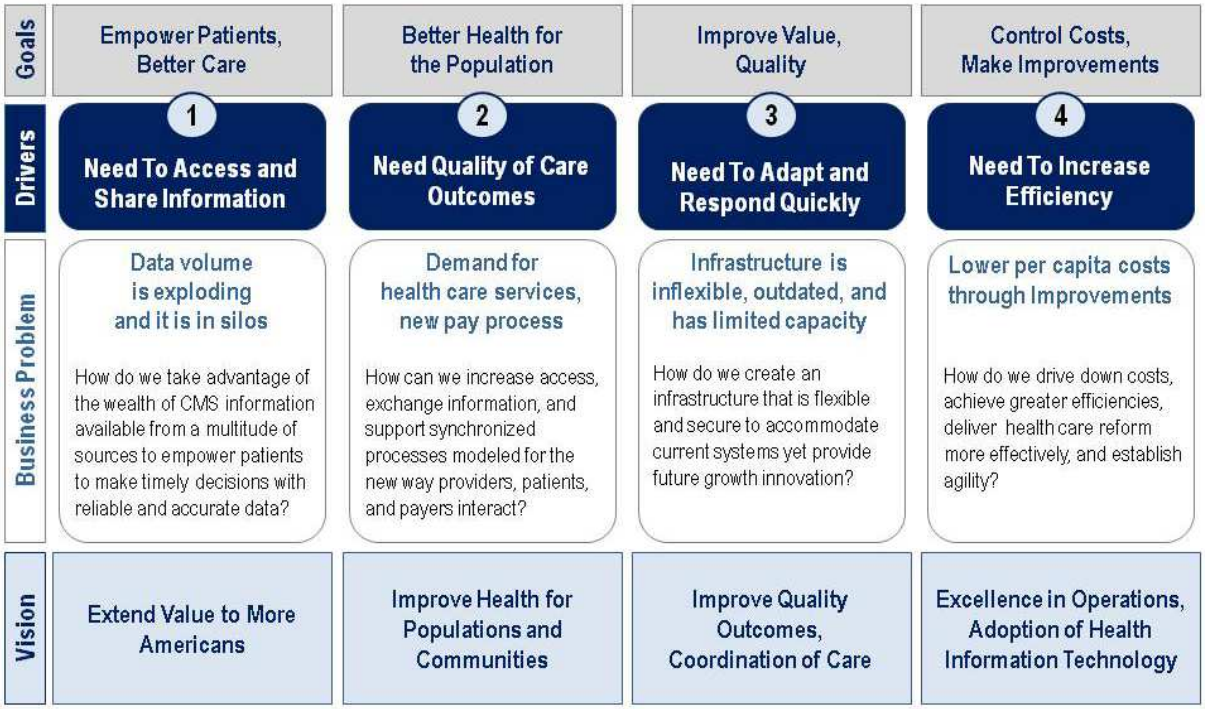

Figure 2. Health Care Transformation – Aligned Objectives

1.1 Section 10330 of the Affordable Care Act

Congress understood the key role of data and IT infrastructure in transforming the health care system. To that end, section 10330 of the Affordable Care Act requires the Secretary of HHS to develop a plan for modernizing CMS computer and data systems. The Act directs the Secretary to consider how the modernized computer system could:

> "make available data in a reliable and timely manner to providers of services and suppliers to support their efforts to better manage and coordinate care furnished to beneficiaries of Medicare programs," and
>
> "support consistent evaluations of payment and the delivery system reforms under CMS programs."

This document provides a detailed plan for updating CMS computer and data systems for delivering 21st century health care. It describes a methodology for CMS to engage in the necessary collaboration and planning to accomplish an enterprise transformation designed to achieve the goals and objectives of health care reform and the provisions of section 10330. The enterprise coordination and joint engineering will result in delivery of better health care services

and, ultimately, reduced costs, through reuse, less redundancy, improved quality, tighter security, enforced privacy, and interoperability with federal and state partners.[15,16]

1.2 Legislative Context for Information Technology Modernization

Recent federal legislation established a clear direction for improving health delivery and outcomes based on improvements in data and analytics. The American Recovery and Reinvestment Act (ARRA) of 2009's Health Information Technology for Economic and Clinical Health (HITECH) Act authorized over $20 billion to promote adoption and use of Electronic Health Record (EHR) technologies connected through a national health information network. Hospitals and physicians who "meaningfully use" EHRs can qualify for extra payments through Medicare and Medicaid. CMS has issued regulations providing definitions of meaningful use for purposes of qualifying for financial incentives.

An environment of integrated Medicare and Medicaid data will enable a clear view across all of CMS' insurance programs to support the HITECH requirements for one base incentive payment for an entire system or main provider. The future goal of the HITECH program involves collecting data across programs and using that data to improve health outcomes and support performance and quality-based payments to physicians and hospitals. The economic stimulus legislation also authorized $1.1 billion for scientific studies known as Comparative Effectiveness Research (CER). An integrated and accurate view of historical care is essential to support CER efforts effectively. The current vision for health modernization involves mining highly integrated CMS data to accelerate clinical research and apply evidence-based treatments across CMS' programs.

Meeting Health Modernization Needs

The health care sector is under constant pressure to deliver more care, more quality, more coordination, and improved timeliness. Both health professionals and patients have increasing expectations that data will be instantly available at the point of need.

In late March 2010, the President signed the Affordable Care Act, which contains initiatives that will support transforming CMS from a passive payer of claims to an active purchaser of quality health care. Implicit in this transformation is a vision that CMS breaks down existing information silos, acquires new data, such as clinical information to support quality of care, and uses this data to improve payment, accuracy, and the services CMS provides to beneficiaries, providers, and the general public.

The Affordable Care Act makes many significant changes to the private and public markets for insurance and affects the publicly financed health care delivery systems. For example, as part of the effort to combat health care fraud, waste, and abuse, section 6501 of the Affordable Care Act

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[15] Public Law 111–148, Patient Protection and Affordable Care Act, March 23, 2010, 124 Stat. 119, http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/content-detail.html
http://www.healthreform.gov/health_reform_and_hhs.html

[16] Affordable Care Act, Section 10330.

directs state Medicaid programs to terminate provider participation in Medicaid if participation is terminated under Medicare or another state plan. Other provisions of the Act (e.g., sections 6002, 10331, and 10332) require data transparency for the public and greater access to data for research purposes. Section 10332 allows the release of standardized extracts of Medicare (Parts A, B, and D) claims data to Qualified Entities to evaluate and report on the performance of providers of services and suppliers on measures of quality, effectiveness, efficiency, and resource use.

CMS has defined 11 Priority Program Areas from the Affordable Care Act. As shown in Figure 1, these 11 Priority Program Areas support the Transformation Goals of the President and the Department. These key programs or enterprise initiatives will cross organizational boundaries and enable greater operating efficiencies and information sharing.

The programs are further categorized in 11 areas to ensure that the limited resources of the CMS are applied to the highest priority sections, thereby making the greatest impact possible toward achieving transformation goals. CMS will provide holistic enterprise capability to:

- Foster cross-component exchange and collaboration to ensure a coordinated effort
- Leverage existing best practices to address bottlenecks or pain points
- Focus management attention on the highest impact, most complex initiatives
- Increase visibility into support function requirements
- Proactively manage risk through planned responses, mitigation strategies and contingency plans.

The Small Business Lending Act, which was signed into law on September 27, 2010, included an anti-fraud provision requiring that CMS implement new software with "predictive modeling," a type of analytical technology that already has been adopted in the credit card industry to identify potentially fraudulent bills. The provision requires CMS to launch a competitive bidding process by January 2011 for predictive modeling software contractors and to begin implementing the technology by July in the ten states with the highest Medicare fraud rates.

A key driver to the success of Program Integrity (PI) at CMS is data integration—across programs and across patient, provider, and plan domains. The CMS provider community often participates in several lines of business. A physician can render services and submit claims for the entire array of insurance programs: Medicare A, B, and C as well as Medicaid. Examining a physician's entire range of services provided would give PI analysts a clear line of sight across these different payment methodologies and link to an authoritative source of provider identity. Similarly, the capability to link a physician's activity in any of the 56 State Medicaid programs would substantially enhance the ability to examine a particular provider's activities on a state-to-state and state-to-federal basis. PI analysts seeking to expose trends in the vast and disparate world of data need to be able to see *all* of the data linked in a cohesive and reliable way.

A robust, integrated environment will provide CMS with the needed tools to identify and eliminate fraud and waste in CMS programs and the programs of CMS partners. Certain themes cross cut the goals of CMS and the substantive patient-centric legislation enacted over the past five years. The prevalent themes involve a reliance on the availability of integrated CMS data to manage the effectiveness of current CMS programs and the definition of new methodologies,

processes, and procedures to improve those programs. A data-centric CMS best serves patient-centric health care improvements.

CMS has organized the Health Care Data Improvement Initiative (HCDII) into three major phases. Figure 3 illustrates the evolution of the health care delivery system, which is highly dependent on the collection and analysis of authoritative data across the CMS enterprise.

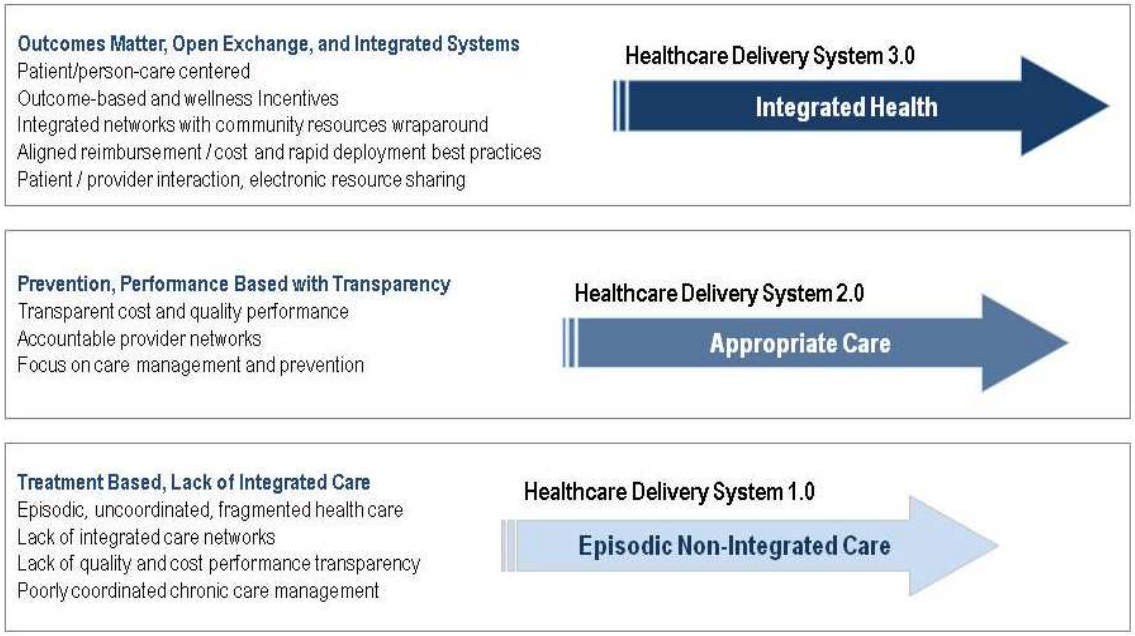

Figure 3. CMS Is Driving the Health Care System Transformation

Each phase of the health care system transformation will provide a periodic perspective on project accomplishments to help manage the progression of both internal HCDII projects and external CMS Priority Program Areas. The HCDII plan includes a 5-year roadmap and supports the milestones and timeline described in subsection 7.3 and shown in Figure 8.

1.3 Health Care Data Improvement Initiative

The CMS Plan for Data Transformation

CMS' Health Care Data Improvement Initiative defines a comprehensive Enterprise Data Environment that will be central to the CMS IT modernization strategy. It will provide the flexibility needed to support the rapidly evolving role of CMS in the delivery, management, and payment of health care services. The vision is to transform the data environment from one focused on processing claims to one with state-of-the art capabilities for data analysis and information sharing. CMS knows that its data are not sufficiently integrated to provide consistent help in program management decision making.

CMS acknowledges that real insight lies in the wealth of information held in multiple data sources across disparate agencies in unconnected systems. This situation presents complicated problems due to a proliferation of systems over the years compounded by a lack of inter-agency coordination.

CMS will address these challenges in a phased approach. CMS will not attempt to handle all integration challenges at once, but rather achieve it by taking incremental steps toward improvement through thoughtful coordination, shared learning, and partnerships. Instrumental to CMS' model for improvement is the conceptual architectural design for collecting, organizing, and integrating CMS' enormous data stores into the EDE.

An overhaul of the data environment involves building the *enterprise infrastructure capability* to enable the needed scalability, agility, and flexibility to handle the rapidly evolving health care models for CMS. The agency must provide a claims processing architecture that can address new requirements and processing models without acquiring more software or database systems. Successful implementation of the EDE involves agility and cooperation between agencies and alignment within departments to *develop an enterprise-wide vision.*

As shown in Figure 4, CMS proposes Agile Cycles through a multiple Plan, Do, Study, Act (PDSA) cycle that ramps up in FY2011 and FY2012 as CMS continues to study the data landscape and act accordingly.

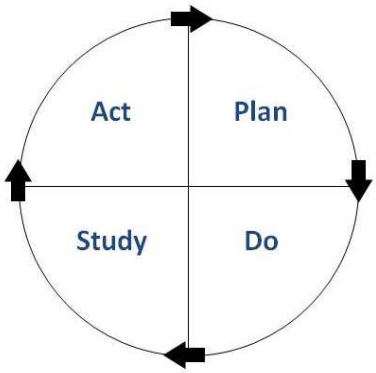

Figure 4. CMS Incremental Approach to EDE Design and Development

CMS aims to transform Medicare and Medicaid into service leaders in value-based purchasing (VBP) and to be a national resource for authoritative enrollment, payment, and high-quality health care services. The HCDII's Enterprise Data Environment is the foundation to support implementation of the following:

- Electronic Health Records
- Affordable Care Act and CMS' Priority Program Areas
- Enhanced Program Integrity
- Medicaid and CHIP transformation
- Managed Care Encounter Data for Medicare and Medicaid.

The HCDII EDE will also support a virtual data center strategy that provides improved security, modern network capabilities with additional capacity, and high availability for critical information and business continuity.

2. Challenge – Major Issues Impacting Modernization

At present, CMS' data and systems should be strengthened to meet the President's health care goals,[17] support implementation of the Affordable Care Act, and improve the value of health care in the United States. CMS will require major modernization and restructuring of its information technology platforms and staff expertise to engage in sophisticated exchange of health information and to drive major progress in heath IT transformation.

CMS has not been able to invest in the infrastructure needed for the enormous scope of its growing database and quality-of-care requirements. Congress now recognizes that CMS must upgrade its own IT systems in order to handle clinical and other performance information and to ensure program integrity, and it has begun to authorize these important upgrades.

Barriers to successful transformation include:

- Fragmented, unsynchronized program data
- Outdated systems
- Stressed data processing capacity.

For example, CMS currently holds various pieces of information about providers in at least 25 different databases used for different program purposes, which hampers care coordination efforts and obscures opportunities to reduce fraud, waste, and abuse and improve efficiency and quality.

CMS must overcome other problems that involve current infrastructure and systems limitations. These problems include, but are not limited to, the following:

- CMS systems are focused on paying claims, not providing better care (limited capabilities exist to accept and process clinical data for decision support)
- Systems restrict the ability to share and communicate information for different purposes among CMS components, other government agencies, and providers
- Data often exist in multiple places, lacking a single, authoritative data source
- Lack of enterprise services that facilitate easy access to CMS systems and data

[17] The President's Proposal, February 22, 2010, puts American families and small business owners in control of their own health care. http://www.whitehouse.gov/sites/default/files/summary-presidents-proposal.pdf
Fiscal 2010 Budget, http://www.whitehouse.gov/omb/fy2010_key_healthcare/
OMB – Health Care for All Americans http://www.whitehouse.gov/omb/factsheet_key_health_care/

- Monolithic, closed systems that were created with a single purpose in mind and implemented to support specific legislative programs have contributed to an inflexible architecture
- Lack of funding to invest in infrastructure needed to build comprehensive data repositories for analytics and operations

To enable the transformation envisioned by the Affordable Care Act legislation, CMS must address the impediments to modernization as described in the following subsections.

2.1 Fragmented, Unsynchronized Program Data

CMS has a large information supply chain where numerous data trading partners and outsourced systems manage CMS program master data, most importantly, patient (beneficiary/recipient), provider, claim, plan and payment data. Because CMS has built analytical databases around siloed program areas and separate funding initiatives, there are only limited enterprise sources of national program data.

Today, there is no single data system at CMS where the management of program data can deliver 360-degree views of patient and provider information. The agency's beneficiary and provider systems can be characterized as a fragmented patchwork. At this time, CMS cannot combine patient-based Medicare Advantage encounters, prescription drug, Medicare hospital, Medicare physician, durable medical equipment, and Medicaid data to support a longitudinal patient health care view. Each CMS stakeholder must search for the most authoritative data from a variety of systems and do his best to understand the inconsistent dictionaries, structures, data lifecycle phase, and other complexities of each system. For example, in Fee-for-Service (FFS) Medicare alone, there are more than 30 fragmented, unsynchronized sources of claims data. This situation will worsen when CMS is asked to provide national-level data integration to support Predictive Modeling Analytics, Comparative Effectiveness Research, Health Insurance Exchanges (HIE), and VBP reforms.

Medicaid presents an even more fragmented picture of data. The Medicaid recipient and provider data present significant problems as each U.S. state maintains its own uniquely formatted recipient and provider files. At a national level, there is no single Medicaid data system where CMS keeps provider and patient data secure, private, current, and complete. This negatively affects the ability of researchers to do national-level research on Medicaid data and for CMS officials to manage the program.

2.2 Outdated Systems

CMS developed the current Medicare and Medicaid systems incrementally over the past 45 years. Modifications to address immediate needs have created many fragmented and piecemeal changes to these systems. The result is a mix of systems with a patchwork of technology and data that are not well positioned to support such efforts as Pay-for-Performance (PFP), VBP, enhanced program integrity, and Comparative Effectiveness Research. The current provider, beneficiary, and payment systems do not have the technological agility or adaptability to respond to these demands in a timely fashion.

Many key personnel who are knowledgeable about the 45-year-old technology behind the systems and the workarounds necessary to keep the systems functioning are eligible to retire. Without modernization of the FFS systems, CMS will struggle to replace these specialized personnel since there is a dwindling labor market for the specific technology skills needed to support the legacy technologies and programming languages.

2.3 Stressed Data Processing Capacity

CMS annually disseminates more data than any other federal agency or private-sector company to researchers, policy groups, associations, medical groups, and private citizens. The agency processes and retains the largest volume of health care related data in the world, which includes:

- Part A claims (primarily in-patient, hospital claims)
- Part B claims (physician office claims, laboratory claims and durable medical equipment)
- Medicaid claims
- Medicare Beneficiary and Medicaid Recipient Data
- Data about service Providers
- National Drug Council data
- Part D claims for prescription drug plans.

Currently, there is insufficient capacity in the CMS Data Center to store the data required to support payment and program integrity operations. The CMS Data Center is stressed beyond its capacity and will be insufficient to handle future workloads, especially since many baby-boomers have already enrolled in Medicare and the expected growth will exceed capacity. Adding to the capacity problem is the inability to store new data needed for advanced program integrity and evidence-based medicine programs such as Accountable Care Organizations and VBP. The inadequate data processing capabilities of the CMS Data Center and the diminishing capacity are two of the biggest reasons why modernization of the FFS systems is essential.

3. Approach – Modernizing the Foundation

Every year, CMS works with an enormous volume of data: more than 1 billion Fee-for-Service claims, 1 billion prescription drug events, and 2 billion Medicaid claim events. The agency has maintained this data in various different files residing in disparate systems that are not well integrated. Compounding the huge business and processing demands of this data is the degree of manual manipulation required before the data can be used for analysis. For example, the information needed to produce a report may exist in different forms across many diverse systems and may require multiple searches to find the most current data. In addition to these complexities, the surge of new business requirements and proliferation of new programs has strained CMS' ability to respond rapidly to requests in recent years. It has become increasingly clear that CMS must transform itself into an information-centric organization to better deliver health care services and manage its new requirements and programmatic changes. To accomplish this transformation, the agency will need more complete and timely data, and must integrate this data using well-planned and tested methods.

CMS' modernization strategy includes an IT infrastructure that enables enterprise systems integration, data transformation, and future growth. The Health Care Data Improvement Initiative is the key to CMS' modernization strategy. The three cornerstones of this strategy to transform the CMS IT enterprise are data systems modernization, IT infrastructure modernization, and business systems modernization as depicted in Figure 5.

The primary goal of the HCDII is to provide transformed CMS computing systems and data that support the national health agenda and enable CMS' successful implementation of the Affordable Care Act. CMS envisions HCDII as a series of phased, highly interdependent initiatives to achieve data improvement, business program modernization, enhanced security and privacy support, best practice standards, and enterprise data center enhancement. The successful implementation of HCDII will make it possible to ensure complete, timely, and accurate data across programs, and meet the needs of future program innovations, workload growth, data analysis, and availability.

CMS understands that the execution of HCDII will affect several national programs. The agency has prepared the initiative to accommodate the unprecedented requirements for coordination and collaboration within CMS and HHS, and with external stakeholders such as the states. CMS will employ enterprise architecture and project management best practices to carefully plan, control, and evaluate every HCDII activity with checkpoints along the entire program life cycle.

CMS has defined 11 Priority Program Areas from the Affordable Care Act. As shown in Figure 5, the three cornerstones of Data Modernization, IT Infrastructure Modernization, and Business Systems Modernization and the services they support depend on the robust, scalable foundation of the Enterprise Data Environment. The EDE is essential to executing HCDII's business strategy to optimize managing and measuring the delivery of efficient, high-quality health care services.

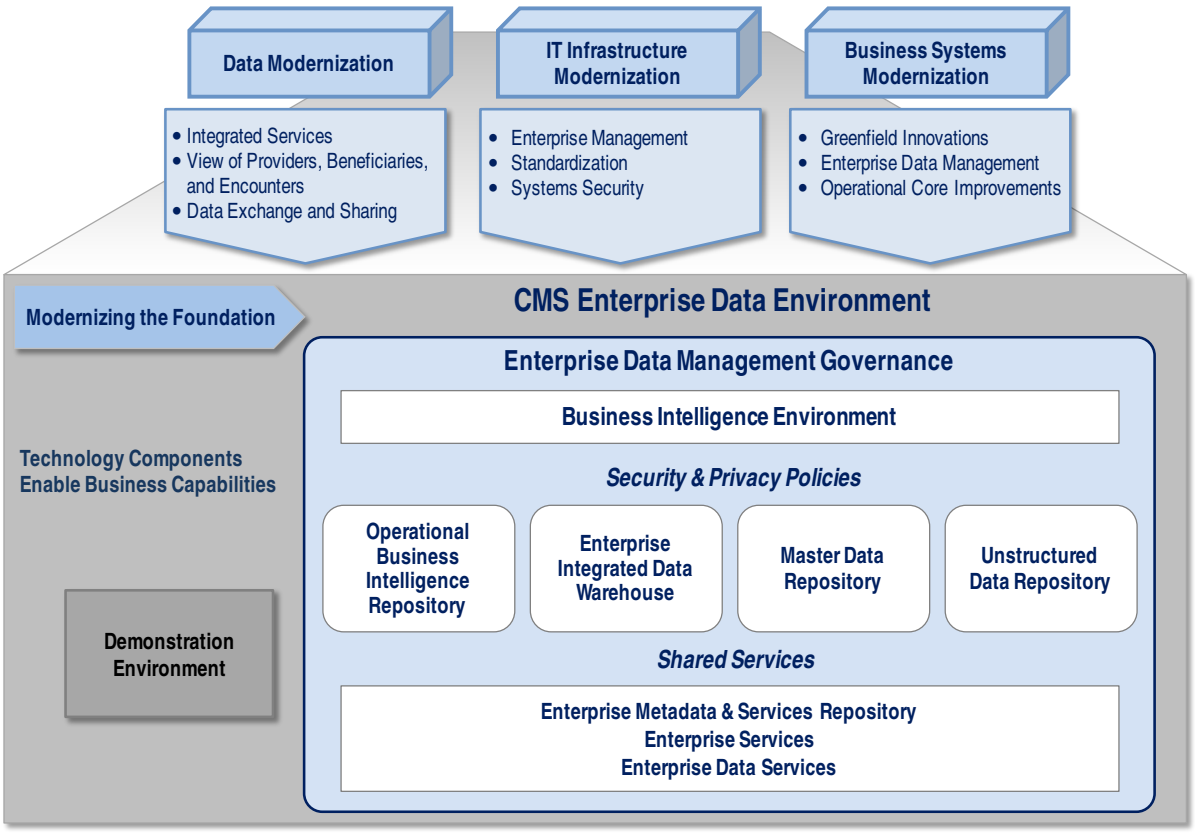

Figure 5. The Enterprise Data Environment Supports the Three Cornerstones of CMS' 11 Priority Program Areas and Business Strategy

Because of the scope of the combined data and enterprise modernization challenges demanded by the Affordable Care Act, CMS has designed the HCDII fundamentally different from previous modernization initiatives within the agency. For example, CMS will take a holistic approach to help foster cross-component collaboration and to promote coordinated efforts in agency services.

The integrated applications and enterprise data will be the basis for new services and information products planned for in the CMS modernization strategy. The Enterprise Data Environment and HCDII investments will be supported by ongoing IT governance and will undergo continuous improvement maturity cycles.

3.1 The Business Case for IT Modernization

With timely, complete, and accurate integrated data made possible by the proposed IT modernization effort, CMS will obtain information and analytics to help address and solve many of today's health care challenges while ensuring the ability to support future innovations in health care service delivery.

IT modernization will allow CMS to establish the necessary capabilities to achieve:

- **Improved Business Operations –** CMS must transition to flexible payment methods that integrate administrative claim, encounter, clinical, payment and outcome data while maintaining its massive FFS and Medicare Advantage and Prescription Drug (MAPD) operations.
- **Effective Performance Measurement and Oversight –** CMS oversees a wide range of quality management activity and payment systems for the Medicaid, Medicare, and CHIP programs. Improved data will support a more robust performance management program and enhanced oversight.
- **Enhanced Public Accountability –** CMS must streamline program, billing, and eligibility information systems to make these systems and processes as informative as possible while reducing burdensome procedures, such as enrollment and claim processing, for providers. In addition, improving health outcomes involves promoting a patient-centered focus on prevention and wellness, chronic care management, and individual health responsibility. All three depend on the beneficiary and provider's timely access to critical information about coverage, eligibility, and quality of care
- **Innovation –** CMS must offer modern analytical IT capabilities for cost and quality, supported by reliable storage systems and fully integrated enterprise-level databases.

Table 2 presents a description of the key CMS business functions along with the current and future systems requirements for achieving agency goals through the HCDII IT investments.

Table 2. Key CMS Business Functions

Key CMS Business Functions	
Business Operations CMS' central function is to make sure that beneficiaries are able to access health care. This requires a partnership with providers in the Fee-for-Service side of the program, with Part C: Medicare Advantage plans, and with Part D: Prescription Drug plans in both programs. This following mission-critical systems and requirements are essential to operate the CMS business smoothly and efficiently.	
***Current system* requirements include:**	***Future system* requirements will include:**
Manage Interactions with the states. For Medicaid, CMS uses multiple systems to collect state information, pay states, and monitor operation of state programs. One system collects summary statistics on CHIP enrollment; one system allows drug manufacturers to submit drug product information for the Medicaid Drug Rebate Program; and several different systems collect Medicaid reimbursement amounts for various drugs paid for by Medicaid. There are two systems that contain Medicaid and CHIP budget and expenditure data to facilitate payments to the states and monitor state expenditures for fraud and abuse, and two more systems to collect managed care program characteristics. Dual eligibility and enrollment information is captured in a system for one purpose while another system captures eligibility and demographic information on recipients, along with utilization and payment data. A separate system tracks the approval process for State Plan Amendments and waivers. State Survey agencies use a separate system	All *current* system requirements plus the following additional capabilities: **Manage Interactions with the states.** In order to successfully implement the Affordable Care Act and monitor quality, access, and fraud and abuse, there will be a need for both more data and for integration of the data submitted. It will be necessary to transform the data environment to create a data-driven culture. Data streams must be fully integrated and linkable across CMS programs. The systems must enable CMS to monitor compliance by the states with both their own approved State Plans and waivers and CMS regulations and guidance. Business Intelligence tools and the provision of de-identified data to the public and other interested parties will enable research that is more robust and enlarge the community of problem solvers. A modernized Medicaid and CHIP will create one national platform, one portal, and one standardized feed to eliminate process redundancies and effectively reduce the burden and effort at both the state and

Key CMS Business Functions	
for their budget and expenditure data and for collecting and analyzing survey data. A diverse group of users access these systems, including the states, CMS, the Regional Offices, drug manufacturers, external interest groups, researchers, auditors, academics, and other federal agencies. Each system collects information for a different purpose and there is no way to connect the data across systems. **Enroll providers and plans, continually maintaining and updating their information** This requires the ability to accept, store, and continually change descriptive information on their location; status as a provider or plan; and in the case of Part C and D plans, a significant amount of information on plan offerings. **Adjudicate claims and pay providers** This requires the ability to accept claims, perform the necessary edits on provider and beneficiary eligibility, and to transfer payment. This system must interface with systems for other types of claims (any inpatient, post-acute, or prescription drug information) for the provider or beneficiary, and must interface with other program integrity systems, research files, and the underlying information storage of the agency for financial accounting. **Pay plans** This system pays a per-member per-month amount to plans on behalf of beneficiaries who have chosen Medicare Advantage plans and/or Part D: Prescription Drug Plans. These capital payments are the product of information system interactions between such functions as actuarial analysis of bids, risk-adjustment calculations specific to each payment region, the incorporation of beneficiary eligibility information, and a determination that the plan is eligible for such payment. **Communicate payment or policy changes to providers and plans and receive their questions and appeals** CMS has multiple systems for communicating directly with contracted providers and plans that must be maintained to ensure a full understanding of payment policies. Appeals are handled through an entirely different system that must interface with CMS' claims payment system. **Enroll beneficiaries** For Medicare, some enrollment occurs through Social Security for initial eligibility and for beneficiaries who seek their benefits through a Part C and/or D plan through the CMS website or directly with the plan. For Medicaid, the states are primarily responsible; however, CMS must maintain an up-to-date list of eligibility status for all of its programs and must interface with the Social Security Administration (SSA), Department of Veterans Affairs (VA), states, and plans.	federal levels. CMS will use the current claims and enrollment data system as the base model to start the modernization toward a new and more comprehensive system. An initiative to design and build a system to collect, relate, and analyze program data will be undertaken and the entire modernized system will encompass an enhanced data collection, a standardized data dictionary, data integration, user portals, and business intelligence tools. **Customized payment system** One significant change will be a far more customized payment system for providers and plans. Different types of provider organizations and payment models must be defined in the enrollment systems. Individual claims must interface with numerous other provider type files as well as quality and resource use measurement systems to determine payment amounts. Example 1: In 2012, Accountable Care Organizations (ACO) will be eligible for shared savings. CMS will need to develop a new enrollment system, criteria for certification, and communication capacity for these new entities. Because they are made up of individual providers and still paid FFS, these systems must be built to interface with the systems designed to calculate shared savings that will rely on current claims processing. Example 2: Systems designed to determine eligibility for EHR Incentive Program "meaningful use" will need to interact with other quality and resource use metric systems for hospitals and physicians to determine payment for a specific claim. These calculations must also be made for health plans under the Affordable Care Act. **Accurate and up-to-date information on eligibility** This information will become even more critical. Of particular importance to effective implementation of the health insurance reforms is the ability to use this information for determining eligibility for a broad array of programs. This will require a significant increase in processing and storage capacity for the entity to receive and process information from a variety of sources employers, the Health Insurance Exchanges, insurance regulators, the federal government, etc. **Enhanced and customized communication with providers** To ensure the success of some payment innovations, such as "shared savings," providers will require data on utilization patterns from CMS to understand and continually monitor their opportunities for improving care coordination of beneficiaries. A data feed on an ongoing basis will require identification of specific beneficiary populations and providers, specification and calculation of specific key variables, and an information delivery mechanism.

Key CMS Business Functions	
	Implementation of far more granular coding systems While not required by the Affordable Care Act, CMS is also reprogramming all of its systems that rely on ICD-9 (International Classification of Disease-9) codes to be able to run on ICD-10 codes. This impacts multiple systems that directly use claims for payment and those that rely on claims for analysis and research.
Performance Oversight In addition to the normal business operations, CMS must ensure oversight of its providers and payments to ensure that the providers meet appropriate quality standards and those payments are accurate and appropriate.	
The *current requirements* for ensuring oversight of CMS providers, plans, and programs include:	***Future systems* requirements will include:**
Ensuring minimum standards of quality for providers and plans With few exceptions (most notably, physicians), all providers in the Medicare and Medicaid programs must meet quality requirements to participate in the program. For entitled conditions of participation, conditions of coverage, or plan requirements, CMS interacts on an ongoing basis with accreditation agencies and state surveyors to ensure that these requirements are met, including tracking and resolving appeals and complaints. This requires significant data storage and the interface between external and internal information systems. **Measuring quality** CMS has significantly expanded its capacity to directly collect, store, and calculate scores on quality metrics from hospitals, home health agencies, nursing facilities, dialysis providers, and all types of health plans. Currently, these systems are all separate and have minimal interaction with CMS claims payment systems or each other.	CMS will need to incorporate these oversight functions directly into the agency's business operations. Progress on these metrics may need to interface with other efforts to assess agency and departmental performance generally, and more specifically, on implementing the Affordable Care Act. **Broader interfaces among provider data systems** Systems that collect calculate and store information on performance on individual providers and plans must interface with publicly available websites, as is currently the case, and with payment systems to calculate payment rates. Planning, research, and development will be necessary to ensure a solid infrastructure and funding source for this new enterprise given its use for determining provider and plan payment levels. Multiple measurement systems such as "meaningful use" and other physician measurement systems must be coordinated closely to limit the collection of data from physicians from multiple systems and ensure the agency does not collect the same information twice.

Key CMS Business Functions	
Program integrity There are multiple prevention programs at a local or regional level. The agency has multiple systems for analyzing claims, including contractor processing of payments, to determine whether the claims are appropriate and whether any errors were made. These systems rely on large data warehouses and logic built into the claims systems. At present, claims editing is not performed within a single information system, but rather by a combination of different editing functions from different systems. Most of CMS' systems were designed for a single purpose—enrolling providers, paying Part A inpatient claims, paying and enrolling Medicare Advantage Plans, etc. They often do not interface with each either for purposes of detecting potential abuses within the program. There is no systematic process to ensure that all claims edits are maintained, updated, or managed across multiple systems.	**The new Center for Program Integrity (CPI)** CPI will enhance and expand prevention programs onto a national platform to coordinate and integrate program integrity efforts, leverage knowledge and information, increase prevention and detection. The agency plans to develop a National Improper Payment Prevention System (NIPPS) and an enhanced Provider Enrollment System. CMS plans to automate tools to pre-screen applicants during the provider enrollment process. The agency will develop and refine statistical models that predict risk for providers applying to Medicare based upon changes in referential data. CMS also must enhance capacity to conduct sophisticated, timely national analyses of enrollment databases. CPI will innovate Case Management applications, develop an integrated system with enterprise and partitioned views to exchange data with other systems in workflow, and will automate services such as auto-generated letters. **Affordable Care Act provisions require:** Increased oversight of higher-risk provider types, moratoria on enrollment, enrollment fees, suspension of payment during fraud investigations, mutual exclusions from federal programs, and extension of Recovery Audit Contractor (RAC) process used in Parts A and B to Medicare Parts C and D.
	Linking data to better detect patterns of abuse Enhancing the linkages between enrollment systems would provide CMS with valuable information about potential abuses. A specific example would be enhancing the linkages between the provider enrollment systems with the claims processing systems. This enhancement would allow CMS to highlight claims for further investigation to determine if the specialty of the ordering physician comports with what is being ordered. For example, potential reviews could include a dermatologist who is ordering durable medical equipment, home health services, or hospice; an ordering physician who practices in Florida but is ordering items for beneficiaries residing in California; and whether the ordering physician ever submitted a claim to Medicare for treating that patient. This type of information could be an edit that generates a report for further follow up. Other such linkages in systems could be enhanced such as DME claims rejected for further review if no physician order or visit is found within the Part B claims systems. Similarly, drug claims could be flagged for additional review if no physician claim is found within the Part B claims systems. **Direct feed into strategic planning** All of these systems must interface and feed into the agency's strategic planning efforts to support the necessary data mining to identify and design solutions for future issues.

<table>
<tr><th colspan="2">Key CMS Business Functions</th></tr>
<tr><td></td><td>Single edit module to detect and prevent improper payments
The ideal state would be a single-edit module that would apply edits uniformly throughout the country, including geographic edits where local health care practices vary based on local coverage decisions. A single-edit module would provide CMS with many advantages operationally and would enhance the agency's ability to detect and prevent improper payment. A single-edit module would allow changes to be made once, rather than changing multiple systems multiple times.
Predictive modeling for detecting fraud and abuse
Predictive modeling can work in the Medicare FFS program; however, it will take time to implement this type of tool successfully. The term predictive modeling refers to a system that uses information such as claims, demographic information, and public databases, etc. to produce models that predict behavior.
Some of the models will be simple. An example would be comparing the location where a beneficiary receives services to where the beneficiary resides. For example, it would not be a pattern when a beneficiary lives in San Diego and receives services in Los Angeles. If predictive modeling were able to identify a specific provider who has a statistically significant number of patients that fell within this pattern, this could indicate a problem that called for investigation.
Other models would be much more complex. These kinds of models use data (e.g., paid and denied claims) to predict which claims and providers look suspicious based on the patterns seen within the data. Successful implementation of a predictive modeling tool will depend on several critical activities, such as:
• Data formatting – ensuring that data elements are commonly defined across systems
• Data integrity – validating that the data is correct and up to date
• Training – ensuring that staff are trained on the predictive modeling tools
• Resources – providing adequate resources to fully monitor and investigate potential abuses identified by the tools.</td></tr>
<tr><td colspan="2">Public Accountability
In addition to internal oversight, CMS is committed to transparency of information to enhance the public's understanding how their health care dollars are spent, and for Medicare and Medicaid beneficiaries to be able to make informed choices about which program (Medicare Advantage or FFS), which plan, or which provider is best suited to meet their needs.</td></tr>
<tr><td>Current systems include:</td><td>Future system requirements will include:</td></tr>
<tr><td>Compare websites
Plans
To assist beneficiaries in making choices about plans (both Part C and Part D), CMS collects detailed information on hundreds of plans in all geographic regions, including information on premiums, benefit packages, coverage policies, quality, and access. This</td><td>Updated Compare sites, and more of them
Compare websites will continue to be updated and improved to make them even more interactive. More compare sites will be added and the agency will be challenged to consider posting information on care that may cross settings, such as care delivered through Affordable Care Organizations. The Affordable Care</td></tr>
</table>

<table>
<tr><th colspan="2">Key CMS Business Functions</th></tr>
<tr><td>information is aggregated to help beneficiaries receive customized information (e.g., beneficiaries can enter their zip code and some of their prescription needs). This requires significant system interfaces and complex calculations behind the scenes.
The design of provider websites makes it easy for beneficiaries to obtain information (both cost and quality) on specific settings in their area. These websites are available for hospitals, home health agencies, nursing facilities, and dialysis facilities.
Statistical information
CMS posts a significant amount of program statistics information in various locations on the agency website. The data required for this information typically is arrayed in a manner to serve sophisticated users.</td><td>Act directed CMS to develop plans for measuring the quality of care for additional settings of care, including ambulatory surgery centers and inpatient rehabilitation facilities, which could be used for value-based purchasing. Presumably, this requires new data collection and new websites devoted to the quality of these settings. The Act also directs CMS to create a physician compare website, which will be built on a foundation of information from hundreds of thousands of physicians. This will require a large data warehouse and the ability to verify the identifiers of both physicians and beneficiaries.
Easy access to information on program spending
CMS and HHS must build the capacity to respond to any citizen who wishes to understand how tax dollars are spent. An expected function of an agency that runs such large public programs will include easily accessible information on both Medicare and Medicaid and the population of persons who are dual eligibles. . This requires the interaction among multiple complex databases and the creation of business intelligence interfaces designed to create ready access to data.
Easy access to information on the progress of implementing the Affordable Care Act
Given the significant new congressional mandates to the agency, CMS must also provide continual progress reports on the implementation of the Affordable Care Act. This will require a far more robust data collection and analysis capacity than currently available and the application of sophisticated business intelligence tools to ensure ready access to information.</td></tr>
<tr><td colspan="2">Innovation
Currently, CMS performs research and demonstrations on its own programs and supports numerous data sets that are released to researchers to help innovate in the private sector. With the creation of the Center Medicare and Medicaid Innovation (“Center for Innovation” or CMMI) and the mandates of the Affordable Care Act, CMS anticipates a significant expansion of this capability.
CMS has one of the most valuable sets of data in the country. The value derives from the number of persons, the stability of the populations over time, and because these populations use significant health services. This means that CMS data are very valuable resources for analysts and researchers who want to better understand Medicare, Medicaid, and the broader health system. In fact, the Affordable Care Act places tremendous expectations on CMS to identify and support innovative practices that reduce costs while improving quality.
The ability to provide data for the private sector and a robust data infrastructure that can help identify, test, evaluate, and implement these innovations are important aspects of this business function.</td></tr>
<tr><td>Current system requirements include:</td><td>Future system requirements include:</td></tr>
<tr><td>Demonstrations
The development of a new demonstration entails creation of the data systems necessary for the specific demonstration. While some demonstrations build on previous efforts, no data environment exists that is dedicated to only serving the needs (which may change over the course of the demonstration) of the various demonstrations. The number of demonstrations is limited because CMS has significant constraints, both resource and legal, on which innovations to test.
Research
The budget for research is limited, and the agency has</td><td>Easy access to information on the progress of implementing the Affordable Care Act
The CMS reporting requirements concerning the implementation of the Affordable Care Act will require a far more robust data collection and analysis capacity than currently available and the application of sophisticated business intelligence applications to ensure ready access to information.
Continual innovation
The Affordable Care Act directs the agency to become a center for innovation for the country. The Act has lifted many of the legal and resource constraints,</td></tr>
</table>

Key CMS Business Functions	
very few programmers dedicated to mining CMS' own data for information to support strategic thinking. Although CMS has significant data resources, it has limited resources to develop, evaluate, and scale up promising innovations. **Information management primarily aimed at maintaining and releasing large data sets to researchers** CMS primarily focuses on maintaining data sets such as the Medicare Current Beneficiary Survey (MCBS), and the Chronic Condition Data Warehouse (CCW). The primary emphasis is on releasing information from these and other data sets to sophisticated researchers.	providing CMS with significant new flexibility. Fulfilling this level of expectation will require substantial new resources, including creation of a flexible technology environment that provides for new and innovative payment, beneficiary and provider enrollment, and test and evaluation of new models of care. Whether an entirely new data system is necessary or whether the needs of the CMMI can be met with building new applications on current systems, CMS must be able to adapt to a continually changing set of requirements. **Managing through strategic imperatives** The agency must also forecast the needs of the future for those it serves. This will require new data storage and mining capacity. Given the lack of good data on some parts of CMS programs, such as encounter data from Medicare Advantage and from Medicaid managed care plans, CMS will need new collection efforts and will work with the states to ensure data accuracy and comparability. Simply having good Medicare FFS data will not suffice in the future; too many people depend on other CMS programs. New data warehouses and interfaces among these programs will be required for accurate planning. **Private sector interaction** Innovation will require a dynamic environment in which the external world is actively encouraged to identify innovation and a mechanism, including an information system to take in, store, sift, and analyze ideas and their potential impact. **Proactive management to maximize use of CMS data** The new environment will require proactive information management that continually seeks to maximize CMS data for all types of purposes, including Comparative Effectiveness Research, community health improvement, policy analysis, and legislator and researcher questions. CMS will create additional public use files, downloadable files, and easy-to-use business intelligence applications.

4. Data Modernization – Enterprise Data Environment

The EDE is the underlying technical vision in CMS' Health Care Data Improvement Initiative. It sets the foundation for modernizing CMS' data systems. The EDE efforts establish enterprise data management while modernizing the computing infrastructure to support the transformation of CMS' business and application systems. Throughout the 5- to 10-year incremental development cycles of the EDE, CMS will apply ongoing quality improvements from lessons learned in the agile approach to consolidate agency data in the EDE to create more complete, timely, and synchronized data. CMS will implement the EDE at a CMS Enterprise Data Center to ensure the robust, cost-effective, and scalable technical infrastructure to meet CMS' future needs. The critical, foundational capabilities enabled by the EDE will facilitate CMS' effective contribution to achieving the vision of a national Health IT network or super highway where there is a free and secure exchange of electronic health records between providers, payers, patients, and federal partners.

The Enterprise Data Environment is both a conceptual architecture as well as a set of design constructs with foundational principles that are critical for successful implementation of the Affordable Care Act and other enterprise initiatives. The foundational principles of the EDE are as follows:

- Treat data as an enterprise asset
- Identify and enforce the use of authoritative data sources
- Comply with the national Health Information Technology standards.

The essence of the EDE core design is to improve the integration, completeness, quality, timeliness, and accessibility of CMS data. Establishing the EDE on these principles will promote and maintain the facile and secure exchange of information essential to accomplishing health care reform. Table 3 presents the underlying principles that support the EDE core design.

Table 3. Foundational Principles for EDE Core Design

EDE Foundational Principles		
Principle	**Source**	**Description**
Treat Data as an Enterprise Asset	Core HHS Enterprise Asset Principle	• Reuse of authoritative data sets will increase shared institutional knowledge • CMS business components require complete, timely, authoritative and integrated data • The integrity of CMS data will improve as more 'eyes' examine the same authoritative data • Maintain traceable lineage throughout entire data lifecycle (acquisition / storage / distribution / consumption / archival) • Establish governance processes such as an Enterprise Operations Board to facilitate cross-agency integration

EDE Foundational Principles		
Principle	**Source**	**Description**
Identify and Enforce the Use of Authoritative Data Stores	Office Management and Budget and Industry-Recognized Best Practice	• Enable cost savings through consolidation, reuse, and simplification • Improve operational efficiency and effectiveness demand by limiting and controlling data duplication • Facilitate less complex overall IT system footprint— easier to build, maintain, audit, and use • Create foundation for Health IT modernization • Consolidation shrinks Privacy and Security perimeter • Provide authoritative data sources feed to Enterprise Data Services
Comply with National Health Information Technology (HIT) Standards	U.S. law	• Include HIT standards compliance in the investment oversight function • Engage Office of National Coordinator (ONC) and National Quality Forum (NQF) to advance the development of improved data sets and architectures

Figures 6 and 7 show the structure and relationship of the 10 components in the EDE environment. (Figure 7 presents a comprehensive, more granular view of the EDE's technology components.) The EDE will support improvements in health care service delivery, IT modernization, IT infrastructure scalability, and a Demonstration Environment where the CMS Center for Medicare and Medicaid Innovation will develop new IT solutions to support innovation and make further improvements to the existing infrastructure. The EDE supports the three cornerstones of the HCDII—Data Modernization, IT Infrastructure Modernization, and Business Systems Modernization.

Security in the EDE:

- The EDE Infrastructure will have Security and Privacy Controls to ensure enforcement of privacy and protection and monitoring of sensitive data via roles, policies, and business processes.
- As a security principle, separation of duty will be imposed at all levels and enforced with constraints to limit the permissions that are available to a user.
- Role-based security will be developed for multiple levels, enabling access by states, CMS programs, researchers, and other individual users or group roles. Authorization and authentication procedures combined with business rules policies will enforce what data an end user may or may not see and will depend on their level of permission as captured in the Role Based Access Controls (RBAC).

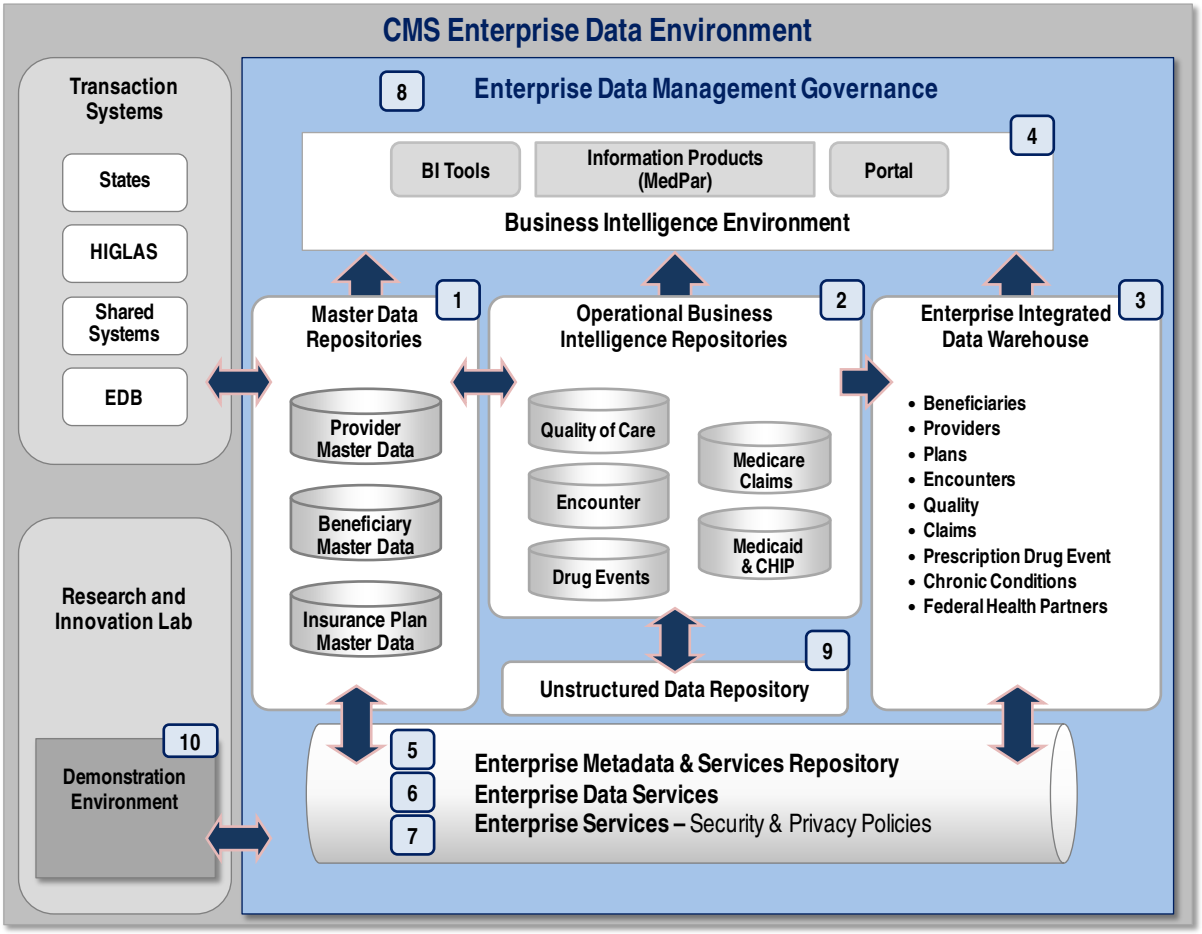

Figure 6. Technology Components of the EDE Enable Business Capabilities

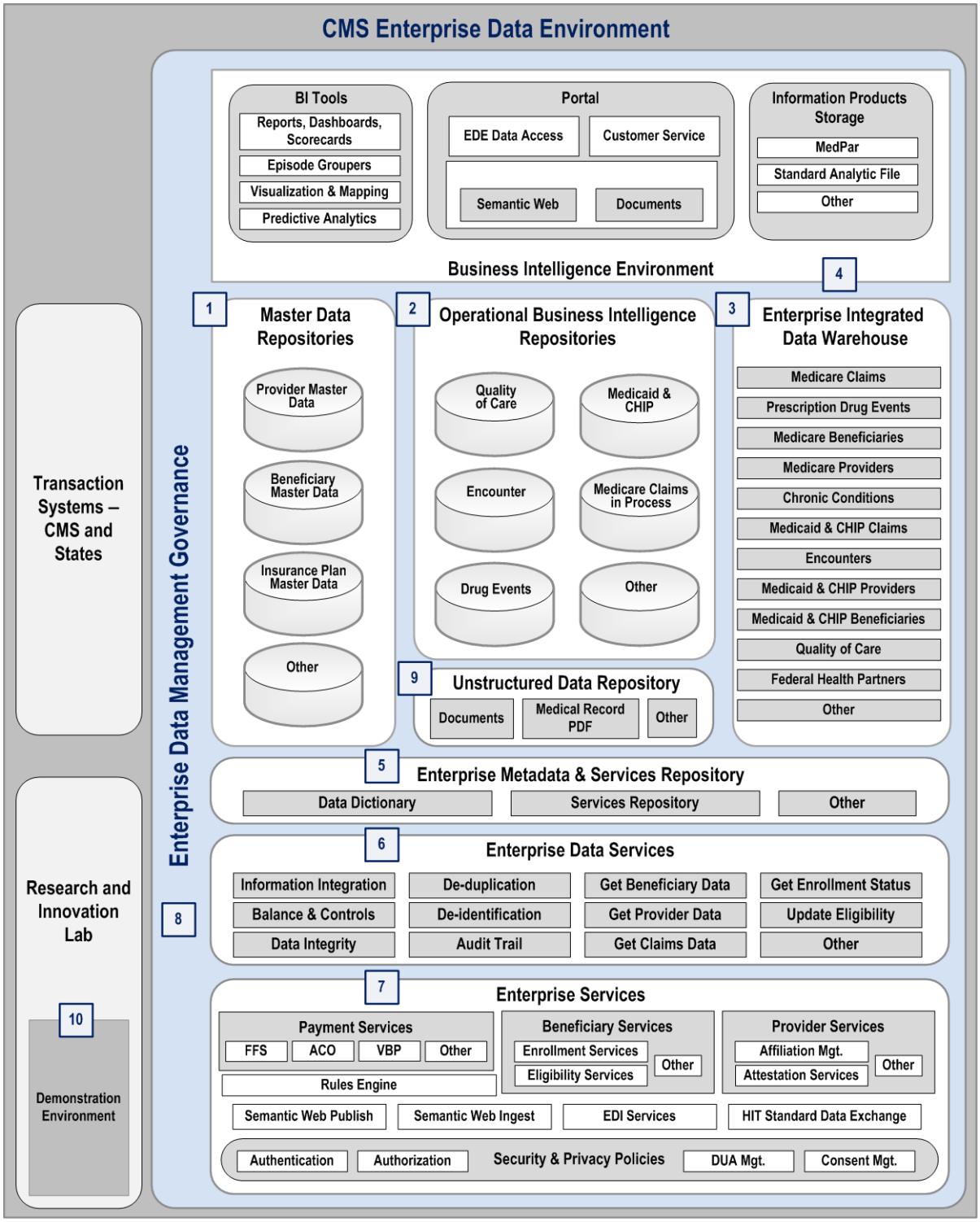

Figure 7. Comprehensive, Granular View of EDE Technology Components

4.1 Master Data Repositories (EDE Component 1)

CMS needs accurate, timely, complete, and authoritative information about persons: Medicare beneficiaries, Medicaid recipients, Providers, and Plans. This information is vital to do the following:

- Maintain core program operations
- Maintain program integrity
- Evaluate program effectiveness and performance
- Hold programs, states, and providers accountable
- Promote transparency
- Support research needs.

The EDE defines an overarching plan for managing CMS' master data. **By managing data as an enterprise asset, CMS achieves an integrated view of providers and beneficiaries.**

Master Data Management (MDM) is the disciplined process in which IT specialists engage business experts in the development and maintenance of consistent and accurate lists of an enterprise's most critical information. An MDM methodology focuses on eliminating redundancy, inconsistency, and fragmentation by having a single, synchronized, comprehensive authoritative source of master information. For example, almost every CMS business owner and researcher uses Provider and Beneficiary Data, and these data impact every operational and analytical system CMS relies on to do its daily work.

An Enterprise Master Person Index (EMPI) will be a core sub-system of the MDM system. The EMPI will uniquely identify Providers and Beneficiaries within all EDE data components, including transaction systems, and will allow CMS to exchange data with data trading partners using modern health IT tools and standards. Table 4 presents a description of Master Data Management and the business capabilities enabled by this EDE technical component.

Table 4. Master Data Management: Description and Business Capability

#	Technical Component	Description	Business Capability
1	**MDM**	**Master Data Management (MDM)** is a proven industry best practice. CMS will implement MDM to enable reliable and consistent data with integrated 360-degree information views of (at least) providers, beneficiaries, and insurance plans. MDM is a key technology concept and component of the EDE.	Integrated data views of providers, beneficiaries, and plans. **MDM enables:** • Improved business operations; fast, reliable decision making; trusted data sources • Accurate, consistent, up-to-date information on eligibility or enrollments • Performance oversight—common services and interfaces among provider systems • Advanced fraud and abuse programs

Medicaid and CHIP will be the first major programs to leverage the Healthcare Data Improvement Initiative's MDM Program capability with systems design, business re-engineering, and data governance activities beginning in FY 2011. CMS' MDM Program intends to capture and manage all-important data about persons receiving CMS program benefits offered by Medicare, Medicaid, or Children's Health. CMS is establishing funding, contracts, and organizational strategies to support the planning phase of CMS' MDM program in FY 2011.

The MDM Program is critical to CMS' support for the Federal Office of Dual Eligibility established by the Affordable Care Act. The creation of this office underscores the crucial importance of advocating actively and meaningfully for the CMS dual-eligible population in the new health care arena. Because of their entitlement to both Medicare and Medicaid benefits, dual eligibles are often deemed the most frail and vulnerable of CMS' beneficiaries. One would expect that since CMS manages both programs at the federal level, the agency would have ready access to all data needed for the management of the care of duals. Unfortunately, this is not so. CMS' state partners often cannot find the Medicare data needed to pair with their state data. Information is unreliable and not linked across the myriad systems and data repositories. Likewise, Medicare cannot complete its dual population picture since the states' Medicaid data vary widely in specificity and completeness. The EDE's MDM discipline aims to provide the kind of data parity across disparate systems to provide the most current and reliable information.

A typical dual-eligible beneficiary is one who (a) has aged into the Medicare program and is receiving services under that benefit structure, and (b) is living and receiving care in a long-term nursing home that is paid for by the State's Medicaid program. If these two programs cannot reliably share and access data across these care spectrums, it makes service provisions and accurate payments nearly impossible. These administrative loopholes spawn opportunities for fraud and greatly hamper effective management of the patient's care and needs. In establishing the Federal Office of Dual Eligibility, the administration clearly mandates an environment for helping these most vulnerable beneficiary populations more efficiently and thereby more effectively. CMS is mindful of the effect of programs on the patient; to strive always to minimize patient suffering; and to maximize the ability for caregivers to help provide the best, most reliable, and most effective care in the world. By helping the Medicare and Medicaid programs see clearly across the administrative data spectrum and authoritatively connect the data "dots," the EDE will play a major role in realizing the shared Vision of CMS and assist beneficiaries in achieving a better quality of life.

Data Services to One Centralized MDM Instance (see EDE Component 6)

The EDE vision consists of core foundational capabilities such as a Master Data Management domain that enables trusted and secure information sharing and exchange.

Traditional data interfaces, such as for claims and encounter data, will be developed and others will sunset as many interfaces are rerouted using the MDM system. Emerging data exchange architectures, such as those involving EHRs, will be developed by leveraging lessons learned from other programs at CMS. MDM services will come on line in a phased approach as part of a service catalog offering. Overall, MDM will help control the costs of maintaining expensive interfaces in multiple systems to multiple data stores. As new data services come on line, the old interfaces will be rerouted to the new centralized MDM hub and others may be decommissioned, thus saving hardware or software maintenance costs.

The re-engineered data exchange architecture between CMS and the states will significantly reduce the number of interfaces that CMS and the states must maintain. Eventually, source application interfaces will be rerouted to the centralized MDM hub. Several application interfaces will be decommissioned or sunset as the level of maturity of services progresses for the HCDII MDM programs. The agency will realize cost savings from the reduced overall maintenance (upgrades, patches, etc.) and retirement of hardware systems.

4.2 Operational Business Intelligence Repositories (EDE Component 2)

The EDE will establish a category of data stores that will serve as the authoritative source of near-real time and/or historic data for individual CMS programs, the Operational Business Intelligence Repositories (OBIR). Whereas the Enterprise Information Data Warehouse (EIDW) is CMS' enterprise solution for creating highly integrated information products, subject-based OBIRs will allow for timelier, consistent, and dedicated operational support. The OBIR relieves the receipt and control demands on the EIDW because only one extract of data from the OBIR will be sent to the EIDW for integration. For example, program integrity requires access to more timely and complete Fee-for-Service claims data. The *Claims in Process* OBIR will capture FFS claims data much earlier in the claims process so this data can undergo pre-payment analysis. The EDE will work with the FFS Transformation team to develop data feedback loops that could potentially inform the FFS pre-payment functions looking at Fraud, Waste, and Abuse. The EDE will also deliver an enterprise-class *Quality of Care Data* OBIR to manage all quality of care assessment and quality measure data. The EDE plan calls for the migration of the Continuity Assessment Record Evaluation (CARE), HITECH, and other quality of care data-driven initiatives from stove-piped solutions to this enterprise solution. CMS has found that the business and operational cycles of programs such as Part D payment reconciliation and Part C risk adjustment calculations are best handled in dedicated, subject-specific data systems such as the ones described in the OBIR.

Table 5 presents a description of Operational Business Intelligence Repositories and the business capabilities enabled by this EDE technical component.

Table 5. Operational Business Intelligence Repositories: Description and Capability

#	Technical Component	Description	Business Capability
2	**OBIR**	The EDE will establish a category of operational data stores that will serve as the authoritative source of near real-time and/or historic data for individual CMS programs. OBIRs provide near real-time data used to support operational activities. The OBIR will include such data as Quality of Care, claims-in-process, Managed Care Encounter Records, Medicaid and CHIP, and Prescription Drug Events.	**OBIR enables:** • Operational analysis and reporting • Historical analytics (audit trails) Authoritative subject area data domains

4.3 Enterprise Integrated Data Warehouse (EDE Component 3)

CMS' health care role is changing from a passive payer of claims to a purchaser of quality health care outcomes. CMS is implementing programs for assuring health care quality and is progressing toward new payment models based on the quality of care. The successful transition into a care management role will require integrated data across all CMS programs. The EIDW will provide this centralized data repository to support data management and analytical needs for CMS.

The EIDW will use the MDM identity data and sophisticated algorithms to integrate Claims, Encounters, Drug Events, and Quality of Care data. CMS envisions the EIDW as consisting of the Chronic Condition Warehouse (CCW) and the Integrated Data Repository (IDR).

Table 6 presents a description of the Enterprise Integrated Data Warehouse and the business capabilities enabled by this EDE technical component.

Table 6. Enterprise Integrated Data Warehouse: Description and Business Capability

#	Technical Component	Description	Business Capability
3	**EIDW**	The EIDW will provide a centralized repository of highly integrated data to support the management and analytical data needs for CMS.	Integrated Analysis and Reporting Historical Analytics (audit trails) **EIDW enables:** • Most elaborate level of data integration; all services provided to a patient with a medical problem within a specific period across a continuum of care in an integrated system • Data mining to better detect patterns of abuse • Innovation – Proactive analysis to maximize the management of CMS programs

The development of CMS' data systems over the last few decades has limited the amount of built-in data integration between CMS data systems and sources. As a result, it is exceedingly difficult and complex to analyze provider or beneficiary information across Medicaid, CHIP, and Medicare Parts A: Hospital Insurance, B: Medical Insurance, C: Medicare Advantage Plans and D: Prescription Drug Plans. Most CMS business units require value-added operational data integration services. Some examples include the identification of all records for a beneficiary or provider, the creation of episodes of care for chronic conditions, medication histories, and other custom data products such as a personal health records.

The existing CMS Integrated Data Repository and the Chronic Condition Warehouse will be the cornerstones of the EIDW, the agency's data analytical environment. Joint strategies for data integration techniques will be developed under a best-of-breed approach. The IDR was originally intended to support the programmatic needs of CMS while the CCW focused on serving the needs of external researchers.

Together, the IDR and the CCW will offer CMS and the country an unparalleled information storehouse that will support researchers as well as payment reform. VBP payment approaches

will rely to a great degree on data warehouse-supported analytics. These analytics will help CMS fully understand health outcomes and attribute cost, savings, and outcomes to a provider.

The EIDW will be the authoritative source of integrated data and integrated information products such as episodes of care and medication histories. Although the IDR has primarily supported program integrity, it will take on additional functions to support the ARRA HITECH's Meaningful Use payment incentive determination and major aspects of health care reform such as VBP.

The new Medicaid and CHIP Data System will include modern workflow capabilities. The combination of these workflow capabilities and more structured data will significantly automate program data processes.

The EIDW will integrate Medicaid and CHIP data with Medicare data, using data matching algorithms. The data matching and integration methods will be well described and used consistently in the EDE's two major Enterprise Integrated Data Warehouses—the IDR and CCW. These matching and integration algorithms will be published along with the data dictionary, model, and business rules, providing the states, CMS programs, and researchers supporting documentation to maximize data understanding.

4.4 Business Intelligence Environment (EDE Component 4)

The data in the EDE exists in raw form, and does not reveal the trends and comparisons that CMS needs to make mission-critical decisions. To meet these and other vital data access needs, CMS is implementing an enterprise-wide Business Intelligence Environment (BIE) that provides essential operational analytics and reports—the front-end query, advanced analytics, and reporting solutions—that will help CMS use its data to inform important decisions and offer greater confidence in those decisions.

The EDE's BIE will be the foundation for data access and analytics. By utilizing the CMS suite of BIE tools and services available via a browser-based BIE portal, the public, CMS, other government agencies, and external business partners will have secure, dynamic, on-demand access to data from the EDE. Once admitted within the BIE portal, users will be able to conduct analyses and quickly create such interactive reports as charts, graphs, dashboards, maps, matrices, or tables. A Medicaid and CHIP Data Portal will provide easy access to data for internal and external data consumers via a unified, web-based user interface. The EDE will provide the portal infrastructure. The EDE Portal will centrally manage information products developed by a cross-section of CMS and state health data informaticists. A wide array of modern BI tools will support executive dashboards, ad hoc reporting, data mining, and other modern data analyses.

The EDE serves a critical function to effectively reduce the time, burden, and effort at both the state and federal level to process and exchange information. The EDE supports a single conceptual platform with shared services, having a common interface or portal to access multiple views of the data. Standardization of data and processes will generate significant cost savings while providing for clean data that are integrated with Medicare data and readily integrated with other federal source data.

Table 7 presents a description of the Business Intelligence Environment and the business capabilities enabled by this EDE technical component.

Table 7. Business Intelligence Environment: Description and Capability

#	Technical Component	Description	Business Capability
4	**BIE**	The EDE's BIE will be the foundation for data access and analytics enabling authorized consumers to have access to integrated CMS data products and Business Intelligence tools through safe and secure portals	Operational Analysis and Reporting **BIE enables:** • Public Accountability • Easy access to information on program spending and progress on implementation of CMS' 11 Priority Program Areas under the Affordable Care Act • Innovation – Facilitates managing through strategic imperatives • Performance oversight – Direct feed into strategic planning

CMS envisions that the BI tools will allow increased access to critical data that can be synthesized in multiple ways and displayed dynamically in various formats. Data and information accessed through desktop applications will provide CMS users with insight into program and policy effectiveness and address analysis needs related to core business functions. Standardized data formats and measure definitions will ensure data quality. The implementation of the BI tools will permit display notes or metadata to support the appropriate interpretation of the data.

4.5 Enterprise Metadata and Services Repository (EDE Component 5)

The metadata and enterprise data services repositories manage and store all information about CMS data such as data models, data exchange layouts, data definitions, data lineage, data integrity rules, operational metrics, and data services under configuration management. The Enterprise Metadata and Services Repository (EMSR) will support data analysts in better understanding the historical analytics of CMS data by enabling traceability of information assets. It also provides the capability to view impacts and analyze system dependencies. A metadata-tagged environment and standardized vocabulary will enable CMS to receive complex data from multiple sources and greater flexibility in quality assessments.

Table 8 presents a description of the Enterprise Metadata and Services Repository and the business capabilities enabled by this EDE technical component.

Table 8. Enterprise Metadata and Services Repository: Description and Capability

#	Technical Component	Description	Business Capability
5	**EMSR**	Enterprise Metadata and Services Repositories store data about data, including data models, data exchange layouts, lineage, definitions, and an operational metrics data dictionary.	Authoritative, clearly defined, universally applied data definitions, standardized vocabulary, and tagged data elements. **Enterprise Metadata and Services Repository enables:** • Capability for data lineage • Centralized data dictionary

4.6 Enterprise Data Services and Enterprise Services (EDE Components 6 and 7)

CMS will manage services as a library of reusable software building blocks that can be combined in ways specific to each application's need. There are two types of EDE services: Enterprise Services and Enterprise Data Services (EDS). Enterprise Services are business-oriented services that can be used across the enterprise or services provided by Commercial Off-the-Shelf (COTS) products. Enterprise Data Services are technically oriented services that interact with the database directly and can be aggregated or combined to support the specific needs of an organization. EDS are a subset of the ES and typically supply information to users or applications.

Medicare Membership Services are Enterprise Services that will provide an enterprise solution to manage Entitlement, Eligibility, and Enrollment as part of the overall Master Data Management initiative. As Enterprise Services, these Medicare Membership Services could be reused by Medicaid, CHIP, and Health Insurance Exchanges. BI tools enable users to be self sufficient by providing interactive content through a Service-Oriented Architecture (SOA). A SOA separates functions into distinct services that can be combined and reused to create business applications. These services communicate with each other by passing data from one service to another, or by coordinating an activity between two or more services.

In the Encounter Data Processing System (EDPS), Enterprise Services will be developed for the key processing functions such as pricing, eligibility, coverage, and provider validation. Lower-level Enterprise Data Services will provide the data access to support these Enterprise Services.

Table 9 presents a description of the Enterprise Services and Enterprise Data Services and the business capabilities enabled by this EDE technical component.

Table 9. Enterprise Data Services and Enterprise Services: Description and Capability

#	Technical Component	Description	Business Capability
6	**EDS**	Enterprise Services are business-oriented services that can be used across the enterprise. Enterprise Data Services are a subset of the Enterprise Services and typically supply information to users or applications. EDS enable a catalog of consumable Enterprise Services with a library of reusable software components that are distributed enterprise-wide and managed by governance procedures with security and processing rules.	Enables CMS to be able to respond rapidly to changing business needs **Enterprise Services enable:** • Reusable tools, interfaces • Consistency • Standard data access methods • Agility, flexibility • Scalability

The Physician Quality Reporting System project team, in partnership with such other CMS projects as HITECH, is examining the numerous data submission channels a physician can utilize to send quality of care data to CMS. These channels include data sent via the Continuity of Care Document standard generated by Electronic Health Records. A CMS Data Submission Architecture will be developed jointly as an Enterprise Data Service to allow reuse of the service across the board by all CMS systems.

4.7 Enterprise Data Management and Governance (EDE Component 8)

Data governance is critical to ensure the establishment and adoption of the EDE by the entire CMS organization. At a minimum, data governance will address standards, organizational readiness, budgetary capitalization of shared enterprise data assets, enterprise data engineering and planning, and business transformation. Foundational data architecture principles and Data Reference Architecture manuals will guide the development of the EDE as follows:

- CMS data will be treated as an Enterprise Asset in accordance with core HHS Enterprise Architecture mandates
- Authoritative data stores will be identified and their usage enforced in accordance with Office of Management and Budget (OMB) and industry best practices
- The EDE will be developed in compliance with U.S. law, which requires that all new health data exchanges adhere to national health information technology, Medical Code standards, and the International Classification of Diseases (ICD).

Table 10 presents a description of Enterprise Data Management and Governance and the business capabilities enabled by this EDE technical component.

Table 10. Enterprise Data Management and Governance: Description and Capability

#	Technical Component	Description	Business Capability
8	**EDMG**	Enterprise Data Management and Governance provides the management and governance for ongoing data quality and stewardship of CMS data	Data Governance **EDMG enables:** • Innovation, ongoing quality, security, compliance, and data stewardship • Proactive management to maximize the use of current or archived CMS data • Data provenance activities, common data definitions, and service capabilities

4.8 Unstructured Data Repository (EDE Component 9)

CMS, like most large organizations, generates and processes millions of unstructured data objects a year. This unstructured data includes paper records, electronic documents, emails, and multimedia (video, audio, images, etc.). These data objects are found throughout CMS, making it difficult to identify, classify, organize, process, and keep track of important and sensitive data. The business processes associated with the generation and processing of these objects are manual, time consuming, and inefficient.

Table 11 presents a description of Unstructured Data Repository and the business capabilities enabled by this EDE technical component.

Table 11. Unstructured Data Repository: Description and Capability

#	Technical Component	Description	Business Capability
9	**UDR**	Unstructured Data Repository provides enterprise-level storage and management of unstructured data, such as paper records, emails, multimedia, and electronic documents. A centralized repository allows the contextual organization and management of unstructured data through unified classification schemes or hierarchies of information that are easily searched and retrieved.	Paper reduction, process improvement, reduced mailing costs, search ability, reduced storage **UDR enables:** • Retrieving information from unstructured data • Sharing information externally via standard exchange formats • Faster search and retrieval mechanisms

An Unstructured Data Repository system allows the organization and management of unstructured data through unified classification schemes. Once unstructured data are classified in taxonomies or ontology relationships, the data can be searched, viewed, reported on, tracked, modified, stored, archived, and analyzed—in short, the means to track unstructured data within a single business process, between multiple business processes within an organization, or across an entire enterprise. UDR allows implementation of streamlined, manageable business applications that integrate with the organization's unstructured data.

4.9 Demonstration Environment (EDE Component 10)

The flexibility of the EDE infrastructure offers the potential for reconfiguration in novel ways—sometimes using EDE production data and systems "as is" and sometimes using a Demonstration Environment (DE) or EDE "Sandbox" where experimentation can take place without impacting the production environment. This Demonstration Environment could support the work of the Center for Medicare and Medicaid Innovation.

The CMMI requires a dedicated IT infrastructure that supports prototypes, demonstrations, and simulations for a wide variety of administrative, medical management, and claims processing innovations. The Center will have access to the entire range of data and services offered by the EDE.

For example, the Demonstration Environment will support payment and service model simulation and prototypes. Emerging topics will be considered, such as improving Episode of Care Groupers[18] to better fit CMS data. Episode of Care Groupers are important integration methods used by the EIDW.

Perfecting groupers will improve the data products of the EIDW, and thereby improve CMS analytics required for Program Integrity, Value-Based Purchasing, and Comparative Effectiveness Research.

[18] CMS intends to develop a transparent grouper logic and software for episodes of care that are specific to Medicare beneficiaries. http://www.cignagovernmentservices.com/partb/pubs/news/2009/1009/cope10918.html

Table 12 presents a description of the Demonstration Environment and the business capabilities enabled by this EDE technical component.

Table 12. Demonstration Environment: Description and Business Capability

#	Technical Component	Description	Business Capability
10	**DE**	A Demonstration Environment supports new Greenfield innovations, continuous improvement of infrastructure capabilities, and agile program cycles to determine what works, what doesn't, and why not. In the context of IT Modernization, a "Greenfield" deployment is a brand new installation or configuration where none existed before and without the requirement of integrating any existing systems. The term derives from the building industry, where undeveloped land is known as "Greenfield."	Fosters innovation, rapid prototypes, agility **The DE enables:** • Rapid Prototype Environment facilitating Research & Development • Continual innovation

5. Business Applications Modernization

CMS will build the transformation to a shared, integrated data and service model in incremental steps. CMS must sustain its existing systems to continue its day-to-day business operations while preparing them for the new environment. The agency will employ a coordinated approach that includes short-term investments to sustain the existing systems and longer-term business changes that utilize authoritative data and new analytical techniques to support new payment methods.

The modernization of CMS business applications will entail Greenfield Systems, as described in subsection 5.1, and Core Business Systems Modernization, as described in subsection 5.2. In the context of IT modernization, a *Greenfield* deployment is a brand new installation or configuration where none existed before and without the requirement of integrating any existing systems. Derived from the building industry, the term refers to undeveloped land as "Greenfield." The Greenfield Systems will involve strategic IT projects for Medicaid and CHIP Transformation and Medicare Encounter Data Processing. The modernization of Core Business Systems will entail claims processing for Medicare Fee-for-Service systems, and Enrollment for Medicare Parts A, B, C, and D.

5.1 Greenfield Systems

CMS will gradually realize the EDE vision by applying the foundational principles to IT projects that require new development activities:

CMS has planned construction of two strategic Greenfield projects starting in FY 2011: (1) Medicaid and CHIP Transformation and (2) Medicare Encounter Data Processing.

The following subsections provide a description of each Greenfield project from the perspective of advancing the utility and value of the Enterprise Data Environment through the adoption of new technologies.

5.1.1 Medicaid and CHIP Transformation

Transforming Medicaid and CHIP enterprise data is necessary on several fronts. It is essential to completing the requirements in the Affordable Care Act, to eliminating redundant efforts in CMS and the state Medicaid and CHIP operating agencies, and to boosting program integrity efforts significantly. This new environment will represent the single source of Medicaid and CHIP data to support advanced levels of internal and external controls, as well as far greater transparency and stakeholder involvement. It will meet the business needs of all CMS Centers, including the three new Centers for Program Integrity, Strategic Planning, and Medicare & Medicaid Innovation. Eliminating redundant information in both CMS and the state operating agencies will help boost program integrity efforts significantly and improve the ability to share and exchange data across the CMS enterprise and with its partners. The transformed environment will provide a change management structure to assure equal access to resources and concept adaptation.

Currently, CMS approves Federal Financial Participation for 51 different Medicaid and CHIP systems across the country. The design of these systems does not include common structures to provide for effective communication and comparison of data. Successful implementation of the

EDE will enable a fully integrated environment and infrastructure capability for future data needs. It will support the system demands of both federal Medicaid and CHIP programs and their partners.

The transformed Medicaid and CHIP system will be essential to creating a new data-driven culture at CMS, enabling information sharing across administrative agencies. The transformation will require the collection of additional and new data elements as well as redesigns of the Medicaid State Plan, the CHIP plan, and the 1115 demonstration application. It will include engagement of entrepreneurial leaders in IT and data applications and will move CMS into closer alignment with health care industry standards and state-of-the-art data solutions.

5.1.1.1 Medicaid and CHIP Transformation Design

To support a new data-driven culture at CMS, the data streams will be fully integrated and linkable across all CMS programs and with other administrative agencies. CMS will collect the basic data needed to perform CMS business functions. The transformation may necessitate additional and new data elements as well as redesigns of the Medicaid State Plan, the CHIP plan, and the 1115 demonstration application. CMS may also collect provider information and state-provided reference files. The new business model of the transformed Medicaid and CHIP system will require documented policies, standardized data definitions, transparent work processes, published business requirements, and a master data dictionary. Once in place, the transformed Medicaid and CHIP data environment will foster leadership within CMS, with state partners, and within the health care marketplace. It will include engagement of entrepreneurial leaders in IT and data applications and will move CMS into closer alignment with health care industry standards and state-of-the-art data solutions.

Data from the Medicaid and CHIP Data System will be sent to the EDE's Enterprise Integrated Data Warehouse environment to be matched and integrated into powerful new information products. The EIDW will integrate Medicaid and CHIP data with Medicare data, using data-matching algorithms developed collaboratively by a team of select data engineers and data architects from across the agency and private industry. The data matching and integration methods will be well described and used consistently in the EDE's two major Enterprise Integrated Data Warehouses—the IDR and the CCW. CMS will publish these matching and integration algorithms along with the data dictionary, data model, and business rules to provide the states, CMS programs, and researchers with all supporting documentation to maximize data understanding.

A Medicaid and CHIP Data Portal will provide easy access to data for internal and external data consumers via a unified, web-based user interface. The EDE will provide the portal infrastructure that will centrally manage information products developed by a cross-section of CMS and state health data informaticists. A wide array of modern BI tools will support metrics for consistently evaluating Affordable Care Act reforms, Executive Dashboards, ad hoc reporting, data mining, and other modern data analyses.

5.1.1.2 Transformation Phase Activities

The Transformation phase identifies activities and tasks that move CMS toward the "to-be" state where data processes provide for increased reliability, accuracy, and timeliness within the Enterprise Data Environment. The Transformation phase will be implemented by 2014 and, at a

minimum will provide CMS with standardized Medicaid and CHIP operational and program data. The tasks in this phase include developing a user interface, portal, and the application of BI tools as well as developing improved mechanisms/processes for collecting eligibility, provider, and health plan data while pursuing an identity management data strategy. Training and technical assistance will also be provided as CMS implements Transformation. After 2014, CMS will work to integrate clinical and quality of care data (in line with implementation of Electronic Health Records and Health Information Exchanges) as these areas become more defined. The Transformation will provide CMS an opportunity to realize a data-driven, patient-centered health care system.

This component of the Medicaid & CHIP Greenfield project will start in the first quarter of calendar 2011 and will leverage existing work already underway to develop a comprehensive data dictionary, business rules, and data model design. A State Advisory Panel will be convened to address Medicaid and CHIP Data Processing, Submission, Sharing, and Improvement. The panel will formulate and reach consensus on recommending a data strategy that considers lessening the financial and reporting burden on states and other stakeholders while meeting the CMS need for the standardization of data elements and processes. The first meeting of the panel will be scheduled by April 1, 2011, with a plan to deliver recommendations to CMS leadership by the beginning of the fourth quarter. Early adopters of the recommended data standards and submission processes should begin transmitting data to CMS by 2013 with technical assistance provided to these states in 2012. CMS and the early adopting states will map implementation issues and incorporate improvements to the full implementation rollout (to be completed by 2014). The cost of this Transformation phase includes infrastructure improvements, software development (for portal and BI applications), technical assistance to the states, data matching/modeling/business rules, and the development of implementation guides.

5.1.1.2.1 Key Activities: MDM Capability

The Medicaid & CHIP Transformation will be the first major programs to leverage the Healthcare Data Improvement Initiative's Master Data Management Program capability with systems design, business re-engineering, and data governance activities beginning in FY 2011. The CMS MDM Program will capture and manage all-important data about persons receiving CMS program benefits offered by Medicare, Medicaid, or Children's Health.

The CMS MDM phase involving Medicaid & CHIP Eligibility and Enrollment data transformation will consist of two tracks:

- **Track 1** expands the data dictionary, data model, and business rules for Eligibility and Enrollment data. This expanded data will come to CMS via a CMS defined interface as part of the Operational data system build.
- **Track 2** will establish a Master Data Repository and an Enterprise Master Person Index network with the states. The current Medicaid and CHIP systems do not collect detailed characteristics on providers. Insufficient provider data are a major problem at CMS.

5.1.1.2.2 Key Activities: Implementing a Unique National Identifier for Health Plans

Identifying providers is a universal problem for federal data systems. Providers have complex and hierarchical corporate structures with parent companies, subsidiaries, branch offices, etc. CMS will need additional provider information to better connect the providers authorized to

serve the Medicaid and CHIP populations with those actually providing the service. Implementing a unique national identifier for health plans would allow CMS and states to correctly identify and match beneficiaries to health plans (both staff and open model), encounter data, and contracted providers to health plans (open model managed care arrangements). By implementing a national identifier, CMS and the states would have improved clarity regarding health plan management in terms of capitation rates and service delivery patterns. The states would be able to apply and use actual operational data to develop capitation rates. CMS would gain the ability to track state verification and monitoring of health plan contract requirements. Once the Quality of Care (clinical) data stream is developed and implemented, CMS would also be able to more fully understand clinical outcomes in a managed care environment.

5.1.2 Encounter Data Processing System

CMS will use a Service-Oriented Architecture approach to build the Encounter Data Processing System. This approach will encourage reuse and provide the necessary flexibility to support CMS' rapidly evolving role in the delivery, management, and payment of health care services across and beyond the enterprise.

In developing the design of the EDPS, CMS will focus on reusability and organizing systems around services. The current design of the FFS systems does not provide the necessary flexibility, interoperability, and scalability to meet future processing needs for the rapidly evolving health care models of CMS. Unlike the existing FFS model, CMS does not directly pay the Encounters. The agency decided to utilize a services-based architecture for the design and implementation of the EDPS.

Future designs and processing models must be sufficiently flexible to accommodate new requirements for claims processing. The current systems were designed to handle simple rules and small volumes of claims. Patchwork changes to the FFS systems over the years have resulted in systems that are difficult and expensive to maintain. The FFS systems architecture has tightly integrated code that limits flexibility when updating the systems to address new requirements or processing needs. As a result, changes in one part of a FFS system may adversely affect other areas and modifications are a challenge because of complex dependencies.

5.1.2.1 EDPS Technology Considerations

The EDPS will utilize a service-oriented architecture, business rules engine, operational data warehouse, and an integrated data warehouse to address the shortcomings of the FFS systems. CMS will apply the following technologies in the EDPS to address its current and future needs:

- **Service-Oriented Architecture –**The key components in implementing SOA are software services and an Enterprise Service Bus that provides the infrastructure for utilizing these services. In the EDPS, services will be developed for the key processing functions such as pricing, eligibility, coverage, and provider validation. The ESB will provide the infrastructure for coordinating the accessing of these services to accomplish a business goal. One or more of the underlying services will be called to accomplish these goals. In a services-based system, the processing flow for the FFS claims and Encounter data would utilize the same underlying services, except that the payment service would not be called when processing the Encounter.

The use of services and the ESB provides CMS the following benefits:

- *Scalability*: Services are scalable to meet the growing volume of claims processing.
- *Maintenance*: The business functions implemented within services are not intertwined (tightly coupled) with other functions. This supports a more efficient and responsive system because updates can be localized to a particular service, which reduces the resources required for implementing and testing the changes.

- **Business Rules Engine –** The EDPS architecture relies on the integration of a business rules engine and repository. The architecture allows the development, maintenance, and implementation of business rules used by the EDPS services. By encapsulating the business rules within these tools, updates to the rules can be implemented without the direct modification of code. For example, if a business rule updates an eligibility requirement, the business analyst or systems maintainer can update the business rule within the rules repository. The update does not directly update the code and allows for timelier updates that are easier to test and verify.
- **Operational Data Warehouse –** In an effort to provide more accurate, timely, and consistent data for providers, the EDPS will limit the need for copying and disseminating data to CMS contractors and providers. A centralized Operational Business Intelligence Mart will provide a single version of the truth. Instead of copying the data, users will be given access to the centralized data repository, thus minimizing maintenance and storage costs.
- **Integrated Data Warehouse –** As CMS progresses from a passive payer of claims to a purchaser of quality-coordinated health care, the agency must construct an integrated view of the health services provided to individuals. This integrated view will provide CMS with the knowledge and insight to guide policy to assure the most efficient and beneficial health care to our beneficiaries. The Enterprise Integrated Data Warehouse will provide a single integrated source all of operational and program data to provider's managers, researchers, and policy makers with an integrated view for decision making and reporting.

5.1.2.2 EDPS Business Process

Encounter data will be received at CMS from Medicare Providers via an X12 837 transaction. The 837 record will be received by the Encounter Data Front End System (EDFES) where common edits will be applied, checking for the appropriate EDI (Electronic Data Interchange) information and any other common edits that are required. Any errors are reported to the submitting providers. Once verified, the file is sent to the EDPS for further processing. Additional common edits may be applied before processing. The initial implementation will make use of the Common Edits Module for simplifying CMS' transition to services. Not all edits will be completely implemented in the first release of the system; the edits contained in the common edits modules will be reused until these edits can be fully integrated in services as appropriate.

The EDPS will apply the edits and then use the Enterprise Service Bus and the underlying services to process the Encounter data. The processing of Encounter data will utilize multiple

services accessible from the ESB. For example, typical processing of an Encounter data will include execution of the following services:

- **Provider Check –** To validate the provider information as accurate on the encounter record.
- **Beneficiary Eligibility –** To validate the beneficiary's Medicare eligibility.
- **Coverage –** To verify the beneficiary's coverage.
- **Pricing –** To price the Encounter claim according to CMS criteria.

The Business Rules Engine and Rule Repository will be utilized with the services for applying the business rules. A status of the record will be reported to the providers through EDFES. The completed record will be stored in the Encounter Data OBIR. The data store will support operational and research needs for the Encounter data. Some or all of the Encounter Data will then be integrated into the EIDW to provide program managers, policy makers, and researchers with an integrated view of a beneficiary's health services.

5.2 Core Business Systems Improvement

The CMS modernization strategy calls for significant improvements in CMS' core business systems for claims processing (transformation of Medicare Fee-for-Service), and enrollment in Medicare Parts A, B, C, and D. The main improvements will involve FFS Transaction Systems, linkage of data to better detect patterns of abuse, and a customized payment system for Medicare Parts A, B, C, and D.

5.2.1 Claims Processing, Medicare Fee-for-Service

Transaction Systems

CMS oversees a vast complex of transactional systems that support core business operations such as beneficiary and provider enrollment, accounting, claims processing, and payment. The FFS Shared Systems are an example of Online Transaction Processing (OLTP). These systems adjudicate Medicare Part A: Hospital Insurance, Medicare Part B: Medical Insurance and Durable Medical Equipment claims through a network of Medicare Administrative Contractors all across the country. Other CMS programs such as Medicaid, Managed Care, and Prescription Drug, each have large transaction-based systems that process enrollment and claims-related data.

For the most part, Insurance Transaction Systems manufacture the data that are used downstream for analytics. Since transaction systems are the origination point for much of CMS enrollment and claims data, an important element of the modernization strategy is ongoing data stewardship, governance, and data quality program management.

As CMS shifts its payment approaches, the role and architecture of these legacy systems must adapt where possible. CMS developed these standalone transaction systems to fit a specific need. Integrating them within a larger data ecosystem was not a consideration (nor was funding available to accomplish this) when these systems were developed. It is to CMS' advantage, however, to integrate these legacy systems within the EDE. The EDE will offer an adaptable environment for this purpose. The EDE enables a Business Intelligence platform with a series of feedback loops that provide checks and balances to prevent fraud before making payment. CMS

will need improved analytic capability to assure 360-degree views of beneficiaries and providers, and to perform the complex data processing required for Value-Based Purchasing.

Linking Data To Better Detect Patterns of Abuse

Most of CMS' systems were designed for enrolling providers, paying Part A: Hospital Insurance inpatient claims, paying and enrolling Medicare Advantage Plans, etc. They often do not interface with one another to detect potential abuses within the program. Enhancing the linkages between these systems would provide CMS with valuable information about potential abuses.

Integration offers an example of how the new infrastructure capabilities might solve the problems of abuse. In the new environment, linkages will exist between the provider enrollment systems and the claims processing systems.

Medicare Sustainability

The needed transformation of the FFS systems will extend over multiple years. CMS must invest in the existing systems to sustain them during the transformation. The necessary changes cannot be accommodated in the ongoing system releases that are implemented each year. Similarly, the systems that support Part C: Medicare Advantage plans and Part D: Prescription Drug plans will require corrective maintenance to protect and ensure business continuity over this period. CMS will design these sustainability efforts to better position the systems to work successfully in a modernized infrastructure and data environment.

Fee-for-Service Transformation

A critical factor for controlling costs is having computer systems that are sufficiently flexible and agile to support the new payment models, health care delivery models, and benefit enhancements. CMS must modernize the current FFS computer systems to support increasing claims volume.

For example, today's FFS Medicare has an established network with connectivity to the vast majority of Medicare-enrolled providers. CMS must evaluate its options for utilizing this network to exchange HIPAA Claims Attachments, Quality Assessments, and Quality Measures in relation to the EDE data stores. Transforming to shared data and services is a formidable challenge and must be completed in incremental steps as the infrastructure capability matures.

The FFS Transformation strategy replies on the following key components:

- **System Infrastructure and Capacity**

  CMS must upgrade the foundational infrastructure of the FFS systems to handle anticipated higher volumes and emerging business needs.

- **Consolidated FFS Data**

  The current FFS systems were designed to optimize bulk claim processing. Integration and consolidation of provider and beneficiary data will occur in collaboration with the EDE Master Data Management initiatives. The EDE Claims in Process operational data mart will provide a near real-time, consolidated store of Medicare FFS data with feedback loops between the Claims in Process data mart and the FFS Adjudication system.

- **Claims/Benefit Management**

  CMS must streamline and reengineer the core adjudication process to simplify maintenance, increase agility, and support advanced capabilities required by health care reform.

- **Web Enablement**

  A secure and consistent Internet gateway will allow Medicare business partners timely access to information and promote a reduction in paper-based transactions.

- **Improved Decision Support**

  Operationally focused analytics will provide essential support for early fraud detection and tracking trends in health care support (such as public health events).

5.2.2 Enrollment, Medicare Parts A, B, C, and D

Enrollment Systems – Customized Payment System

Health care reform will involve a significant change in a far more customized payment system for providers and health plans. Different types of provider organizations and payment models must be defined in the enrollment systems. Determining payment amounts will require that individual claims interface with numerous other provider-type files as well as quality and resource use measurement systems.

In 2012, Accountable Care Organizations will be eligible for shared savings. CMS must develop a new enrollment system, criteria for certification, and communication capacity for these new entities. Because ACOs consist of individual providers and are still paid FFS, these new systems must be built to interface with the systems designed to calculate shared savings that will rely on current claims processing.

Systems designed to determine eligibility for "Meaningful Use" incentives[19] must interact with other quality and resource use metric systems for hospitals and physicians to determine payment for a specific claim. These calculations are also required for health plans under the Affordable Care Act.

[19] Meaningful Use – Medicare and Medicaid EHR Incentive Programs, https://www.cms.gov/EHRIncentivePrograms/

6. IT Infrastructure Modernization

The pace of change in the arena of health IT is outpacing CMS' ability to support new programs. ARRA, HITECH, and the Affordable Care Act force the agency to respond to change in faster, more complex ways; however, the current Provider, Beneficiary, and payment systems are not sufficiently agile or adaptable to answer these demands in a timely fashion. The Enterprise Data Environment will improve CMS' capabilities to respond effectively in health care reform. CMS must first adjust and expand its technical architecture and carry out substantial enhancements in the agency's enterprise computing infrastructure (Enterprise Data Centers) and systems security.

CMS processes and retains the largest volume of health care-related data files in the world. At over 40 billion records a year, CMS disseminates more data than any other federal agency or public company. The agency already consumes significant industry-provided data center capacity to support the processing of Medicare and Medicaid claims. Claims processing demands will continue to grow as the beneficiary population increases to a projected 50 million by 2013. To execute its health care reform initiatives as a data-driven agency, CMS must ensure an efficient, responsive, scalable, redundant, and secure IT infrastructure equal to the tasks. Providing solutions for proactive fraud protection, dashboards, and clinical and quality measures will require a more robust infrastructure that can support the high-availability EDE and minimize outages, reduce cost, and mitigate risk.

CMS has steadily responded to legislative mandates, including the Medicare Prescription Drug, Improvement and Modernization Act (MMA) of 2003, which placed new IT requirements on CMS to successfully support the application hosting and information services associated with new Medicare benefits and FFS contracting reform requirements. The Office of Information Services (OIS) has addressed the MMA and E-Government legislation requirements, as well as improvements to the Medicare FFS processing environment, IT infrastructure and security, and data management and data warehousing. With the implementation of the CMS Technical Reference Architecture (TRA), CMS has established an enterprise-wide set of standards that provide guidance, control, and confidence in services and system design, development, acquisition, and operations.

CMS has not yet finalized its target technology architecture. It will continue, however, to emphasize adequate and appropriate protection of patient and data privacy, security access, and authorized use of information in all of its operations. The TRA and CMS IT Strategic Plan will establish a sound direction and guidance for implementation of a robust, secure architecture to support the EDE.

6.1 Data Centers

CMS is fast approaching physical capacity in the Baltimore Data Center. CMS will need more network and data management capacity to support the current environment and significantly more capacity to embrace such new business programs as Value-Based Purchasing.

Supporting services such as MyMedicare.gov, web-enabled enrollment, and public access to quality metrics require 24/7 access to CMS data. This high-availability data environment must ensure rapid recovery from system failure. The completion of a modern IT infrastructure will help CMS vastly reduce the need to access data outside of the CMS security perimeter. By

analyzing data within the EDE, CMS will cut costs, mitigate risk, and improve privacy control. CMS modernization is based upon extensible commodity data center technologies, reliable storage systems, and a flexible distributed computing infrastructure.

The HCDII EDE will support a virtual data center strategy that provides improved security, modern network capabilities with additional capacity, and high availability for critical information and business continuity. CMS will consider all approaches, including a modular approach, to improve operating efficiencies by leveraging such enabling technologies as virtualization or shared services (e.g., Cloud Computing Services, Infrastructure-as-a-Service, Web services). Any approach adopted will, of course, comply with security and privacy laws and regulations.

6.2 Systems Security

CMS data management requires modern, risk-based security and identity management infrastructure. New business programs will greatly expand public access to CMS data. Initiatives such as Comparative Effectiveness Research and the CMS Medicare Dashboard require secure data access. By adopting and implementing enterprise-wide identity management, CMS will ensure secure, timely access to its national databases as new access channels, such as self-service Internet access, or mobile devices are developed. Security and Privacy are not synonymous. CMS will consider each area as an essential part of the EDE design process.

CMS will prescribe and apply Separation of Duties, policies, and measures to secure the data and to protect the privacy of providers or beneficiaries against the deliberate or accidental access of unauthorized persons. For example, repositories containing private information will be identified. Access to repositories will be restricted, controlled, and audited through applicable policies and rule sets.

The EDE will implement best practices and security standards, including:

- Enforced Privacy Services and Data Use Agreements
- Separation of Duties for users at all levels (access to information, applications, databases)
- Authorization, Authentication, and Role Based Access
- Compliance checklists and auditing support with database activity monitoring
- Internal privacy and security access controls, with audit standards
- Implement Roles and Rule-based security to reduce risk to HIPAA covered entities [20, 21]
- Secure Data Exchange Methods, such as Masking, Runtime Aliasing, and Encryption.

[20] Public Law 111–148, Patient Protection and Affordable Care Act, March 23, 2010, 124 Stat. 119, http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/content-detail.html http://www.healthreform.gov/health_reform_and_hhs.html

[21] Affordable Care Act, Section 10330.

7. Managing the Modernization Effort

The success of CMS' modernization of computer and data systems in response to section 10330 of the Affordable Care Act depends on rigorous governance, highly integrated management, and a detailed, practical execution plan that ensures disciplined budget and cost management over this multi-year, enterprise effort. The effectiveness of CMs' three-phase approach will depend in turn on the degree to which CMS achieves a set of success factors, including improvements made by agile development cycles and the delivery of incremental milestones every six (6) months. The following subsections address these issues and CMS' planned approach to managing the computer and data system modernization efforts.

7.1 Governance

CMS recognizes that the modernization of CMS computer and data systems is a multi-faceted, multi-year program, and requires comprehensive governance that covers all of the budget allocations, project progress against plan, adherence to Integrated Life Cycle requirements and best practices, and effective communication with stakeholders.

The critical governance facets of this large-scale IT modernization effort involve CMS' investment management, the CMS Integrated IT Investment and System Life Cycle Framework (the CMS ILC), and data governance. CMS organizations will support these governance functions as follows:

- **Investment Management –** The CMS IT Investment Review Board (ITIRB) provides leadership and IT policy direction to ensure that the business drivers guide the agency's IT budget, operations, and development. The goal of the ITIRB is to promote integrated planning and collaboration among CMS programs, IT systems, and business processes. The ITIRB operates within the framework of the agency's Enterprise Architecture (EA), acquisition management requirements, capital planning requirements, and other administrative regulations. The ITIRB has the authority to plan, develop, and direct projects within the scope of its responsibility.
- **CMS Investment Life Cycle –** The ILC integrates the Capital Planning and Investment Control processes with Enterprise Architecture and systems development. By defining activities, work products, and participating roles and responsibilities, the ILC connects CPIC, EA, project management, and engineering to define the processes to ensure that agency investments satisfy CMS business needs, and to assure consistent management of agency investments from concept through development, operations and maintenance, and finally to disposition.
- **Data Governance –** The Data Governance Board supports the management and protection of CMS data and sets the strategic vision for data use, integration, consolidation, quality, sharing, privacy, and security. This board reviews data governance practices and structure and proposes options for change. It will provide clear, consistent principles-based direction on the collection, protection, use, and sharing of data assets in support of CMS' strategic objectives.

The CMS modernization strategy comprises a data governance strategy that promotes well-defined processes for ongoing data stewardship and quality. In addition to business value, the CMS data governance strategy will generate the following benefits:

- Simplified infrastructure as legacy hardware, applications, and databases are retired
- Less complex acquisition, maintenance, and distribution of master data and metadata
- Solid foundation for enterprise information scalability
- Less complicated security and compliance through a single, centralized information system
- Higher customer satisfaction through better data quality, improved alignment of solutions delivery to business requirements, and reduced time-to-delivery response.

The program management team for CMS IT Modernization will leverage the existing governance structures and expand or modify the existing processes to support the ongoing modernization efforts.

7.2 Modernization Management

In order to address the management challenges presented by the CMS modernization strategy and HCDII, the agency will create a framework that encompasses project management best practices, technological advances, data requirements, and a blend of methodologies from change management, business process reengineering, and IT application implementation.

The CMS modernization strategy represents a multi-year investment of funds and human resources that engage the entire CMS enterprise. Successful implementation will require integration and consolidation activities that bridge CMS' traditional organizational boundaries. CMS will work proactively with partners outside CMS, including the Office of Consumer Information and Insurance Oversight (OCIIO), Community Living Assistance Services and Supports (CLASS), the Internal Revenue Service, SSA, DOD, VA, states, and others, to ensure interoperability of data and optimal use of reusable services among these organizations.

CMS' health care reform strategy, as executed through the HCDII, will inform and enhance decision making throughout CMS and will require extensive preparation and collaboration. History has proven that the "big bang" approach in IT rarely works; therefore, CMS will proceed with manageable, incremental changes that afford far more opportunities for success. Toward that end, CMS has designed the high-level, proposed EDE architecture for a phased implementation. Each phase will be broken down into incremental work products with usable functionality delivered every six (6) months.

7.3 HCDII Five-Year Plan Overview

CMS has organized HCDII into three major phases to ensure a periodic perspective of project accomplishments as well as a clear depiction of relationships to internal HCDII projects and external CMS Priority Program Areas. CMS will execute the HCDII plan in accordance with a 5-year roadmap that supports the milestones and timeline schedule as shown in Figure 8 (see subsection 7.3.4).

CMS has organized the HCDII plan as follows:

Phase I: 1/2011 – 9/2012

Phase II: 10/2012 – 9/2014

Phase III: 10/2014 – 9/2015

CMS will execute a series of initiatives under the plan. Each initiative will consist of multiple projects and milestones. Table 13 provides a brief overview of the initiatives.

Table 13. Initiatives

Initiative	Goals	Scope
Encounter Data Processing System (EDPS)	CMS will collect Part C utilization and cost data from Medicare Advantage plans. Encounter data will enhance CMS' ability to measure and price utilization in the managed care sector.	The EDPS will have similar characteristics and structure as Medicare Fee-for-Service Systems. Therefore, it is a candidate to benefit from the data profiling, management, and access improvements designed as part of the EDE. It will also utilize Service-Oriented Architecture principles in design and development, which will be leveraged throughout other HCDII projects.
Data Innovation and Governance	• Enterprise coordination and joint engineering • Significant architectural analysis incorporating modern data management and design principles • Beneficiary and provider data and identity management • Enterprise Master Person Profiles	This initiative includes the core set of technologies, architecture, databases, repositories, and engineering that comprise the EDE. Development activities will be planned and designed to create centralized resources that provide common utilities to various projects internal and external to HCDII.
Data Improvement – Medicaid & CHIP	These CMS Program areas require data improvement outcomes to meet certain parts of the Affordable Care Act. Requirements include capabilities to report expanded sets of data elements as well as coordination of provider and beneficiary data across Programs.	Similar to the EDPS project, the Medicaid and CHIP projects will gain efficiencies toward achieving their required objectives by coordinating with the principle ideas and entities supporting the EDE. Conversely, the Enterprise resources will benefit from the contributions that the Medicaid and CHIP Programs make as early implementers of the EDE principles.
Membership Management Transformation	Medicare FFS Operations will realize technology and efficiency upgrades related to improved beneficiary and provider data access and management, processes, and services.	Membership management projects will prepare for Phase II utilization of EDE components by completing tasks designed to make immediate impact and transition to Enterprise benefits. These projects include data modeling, impact analysis and transition planning, process re-engineering, and local database development.
Modernize IT Infrastructure	The Data Center environments will accommodate the EDE technology and resource requirements though detailed assessment, planning, and procurement.	Enterprise Data Center Group infrastructure will support the majority of stated improvements attributed to the HCDII plan.

The following subsections present a description of planned accomplishments for Phases I, II, and III.

7.3.1 Phase I Planned Accomplishments

CMS will accomplish the following milestones in Phase I:

- **Encounter Data Processing System (EDPS)**
  Development completed on:
  - EDPS common edit modules
  - Data dictionary and modeling
  - Business rules
  - EDPS primary system
- **Data Innovation and Governance**
  - Data administration repository modernization
  - Enterprise Data Environment (EDE) systems engineering plans completed
  - Medicare Master Data Management (MDM) systems development initiated
- **Data Improvement – Medicaid & CHIP**
  - Data dictionary, modeling, business rules, and implementation guide completed
  - Program data business process re-engineering
  - Pilot projects initiated:
    - Dual eligible data project
    - Medicaid program and operational data matching project
    - Medicare drug data access for states project
- **Membership Management Transformation**
  Development completed on:
  - FFS Beneficiary dataset models & profiles
  - FFS Master Beneficiary database
  - FFS Beneficiary service identification
- **Modernize IT Infrastructure**
  - EDE infrastructure improvements procured and environment available
  - Enterprise Data Management utilities for software services procured and established

7.3.2 Phase II Planned Accomplishments

CMS will accomplish the following milestones in Phase II:

- **Encounter Data Processing System (EDPS)**
  - Enterprise data store integrated into Enterprise Integrated Data Warehouse (IDR/CCW)
  - Enterprise Service Bus (ESB)
  - Enterprise services enabled

- **Data Innovation & Governance**
  - Medicare MDM systems developed
  - Unified Medicare/Medicaid/CHIP Beneficiary System for Beneficiary, Provider and Care Plan information initiated
- **Data Improvement – Medicaid & CHIP**
  - Medicaid/CHIP Master Data systems built (enrollment and eligibility, provider, health plan)
  - Operational and Program data systems built
  - Program and Operational data integration
  - Medicaid, CHIP and Medicare data integration initiated
  - Medicaid and CHIP provider and beneficiary data integration initiated
  - States and public EDE portal developed
- **Membership Management Transformation**
  - FFS Beneficiary database and services integrated with EDE components
  - FFS Provider dataset models & profiles initiated
  - FFS Master Provider database initiated
  - FFS Provider service Identification initiated

7.3.3 Phase III Planned Accomplishments

CMS will accomplish the following milestones in Phase III:

- **Data Innovation & Governance**
  - Unified Medicare/Medicaid/CHIP Beneficiary System for Beneficiary, Provider and Care Plan information developed and operational
- **Data Improvement – Medicaid & CHIP**
  - Medicaid, CHIP and Medicare data integration continued
  - Business Intelligence (expanded analytics and insight)
  - Medicaid and CHIP provider and beneficiary data integration continued
  - States and public utilization of EDE via portal operational
- **Membership Management Transformation**
  - FFS Provider dataset models and profiles completed
  - FFS Master Provider database developed
  - FFS Provider service identification completed
  - FFS Provider database and services integrated with EDE components

7.3.4 Timeline for Modernization Roadmap

Figure 8 presents the detailed timeline, by Phases I, II, and III, for execution of the CMS modernization strategy.

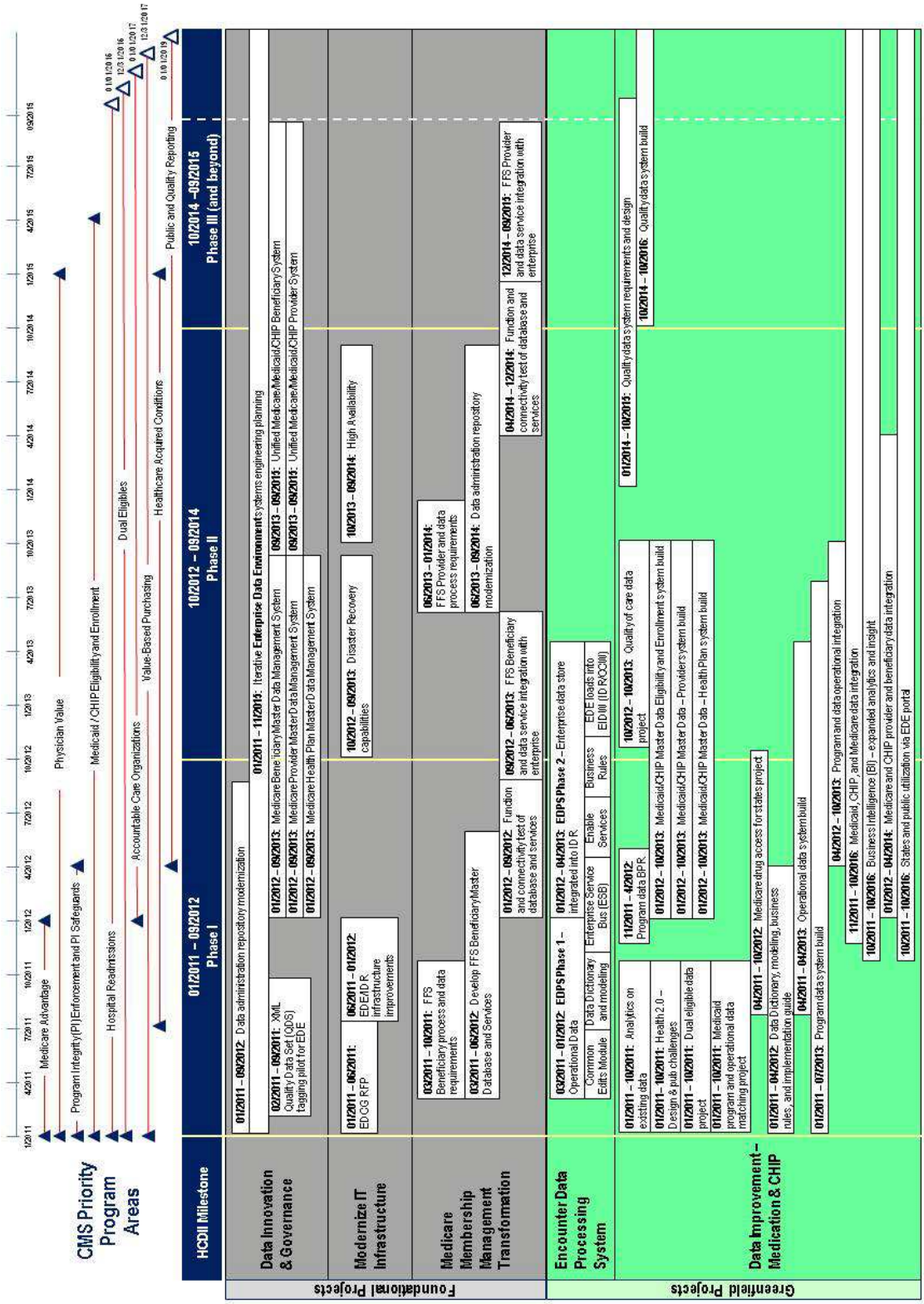

Figure 8. CMS Modernization Roadmap: 5-Year Plan (2011–2015) for HCDII

7.4 IT Modernization Budget Considerations

The current CMS computer and data systems not positioned to achieve a fully successful implementation of the Affordable Care Act. Any attempt to implement the Affordable Care Act without a holistic approach to enterprise transformation planning will result in costly, disjointed, stand-alone, and potentially redundant systems with limited functionality. By necessity, the Affordable Care Act IT funding focuses specifically on operational implementation of the legislation. Based on the significant architectural analysis undertaken by the HCDII initiative, CMS understands and can apply the mandates of the Affordable Care Act—and any future modifications—through the lens of modern data management and EA principles. The HCDII helps the agency set a sound course for CMS modernization by implementing common, optimized IT services that can support the Affordable Care Act and other strategic initiatives.

The HCDII will provide the following benefits to support the Affordable Care Act and future initiatives:

- Enterprise coordination and joint engineering will generate reuse, reduce redundancy, improve quality, tighten security, enforce privacy, promote interoperability with federal and state partners, and reduce costs over the long run.
- Proper linkage of data through CMS' data exchanges with data trading partners. Beneficiary and Provider Identity Management under the HCDII will advance widespread adoption of Enterprise Master Person Profiles and other modern tools with CMS data trading partners (e.g., federal, state, and private sectors).

7.4.1 Synchronized Budget Strategy

CMS has carefully synchronized its modernization strategies for the HCDII and the Affordable Care Act. The HCDII focuses on creating reusable IT assets applicable across multiple systems for Affordable Care Act purposes and the CMS enterprise at large. The HCDII, however, will not fund specific changes to systems for the Affordable Care Act. Therefore, CMS' IT budget request for the Affordable Care Act focuses on: (1) enterprise planning for Affordable Care Act implementation and (2) implementation of specific sections (e.g., specific system modifications and new systems development).

7.4.2 Coordinated Funding Approach for Leveraging Several Funding Sources

Although the HCDII is the focal point for funding IT Modernization at CMS, it must be supplemented by other funding sources, including the Affordable Care Act, HITECH, and the Predictive Modeling requirements found in the Small Business Lending Act. Each of these legislative requirements provides associated funding for IT. CMS must coordinate investments from multiple funding sources to avoid building additional information silos or program point solutions, which will compromise the implementation of integrated, authoritative data across the CMS enterprise.

7.4.3 Potential Cost Savings / Cost Avoidance

CMS expects that its data governance and enterprise data management policies will generate significant program savings and lower CMS' administrative costs by simplifying application

development, reducing complexity in the enterprise information infrastructure, and minimizing overall information management costs and risks. CMS has identified the following general areas of potential administrative cost savings / cost avoidance:

- Reduced risk of systemic failure due to overly complex, customized systems
- Simplified infrastructure through the retirement of hardware, applications, and databases
- Sunset or retirement of systems that reduces the burden of maintaining product licenses and support costs (monitoring, upgrades, and patches)
- Reduced labor activities related to the legacy hardware, applications, and databases (acquisition, storage, analysis, enhancement, maintenance, troubleshooting, archival, and distribution)
- Negotiation of better rates for resources that do not require special domain knowledge or expertise, which is now required by complicated infrastructure or legacy assets.

There should be significant administrative savings beyond FY 2015 once the core infrastructure capabilities are established. As the enterprise technology systems are integrated and the data services mature, CMS will realize modest savings during the initial phases.

CMS' IT modernization efforts will directly support the implementation of the Affordable Care Act Priority Program Areas. Consequently, CMS expects program savings attributable to the implementation of these important provisions through FY 2019. The savings attributable to the Affordable Care Act will accrue in the following categories:

- Linking Payment to Quality Outcomes in the Medicare Program
- Encouraging the Development of New Patient Care Models
- Improving Medicare for Patients and Providers – Part C
- Medicare, Medicaid, and CHIP Program Integrity.

CMS will continue to refine out-year budget and savings estimates in the coming months as IT modernization and Affordable Care Act funding and implementation details become available.

7.5 Critical Success Factors

The keys to effectively leveraging the HCDII as a springboard within CMS' modernization strategy will be to coordinate people, financing, governance processes, and technology to transform CMS into a data-driven, information-centric organization. Managing and financing CMS' data assets as a centralized resource will require a cultural change within the agency. CMS has identified success factors for this enterprise modernization effort that include, but are not limited to, the following:

- **Solid executive and business sponsorship –** A successful program requires strategic planning and vision plus executive sponsorships and buy-in of key stakeholders. These modernization efforts should be business-led initiatives with supporting Office of Information Services assets.

- **Centralized guidance for HCDII initiatives –** Execution of the CMS modernization roadmap will demand the participation of IT infrastructure, EDE, and business transformation teams to finalize a project plan for 2011 and all outlying years.
- **Incrementally retiring legacy applications –** Transitioning to an information-centric architecture will allow CMS to better leverage new and existing IT investments and corresponding funding sources. An iterative approach to legacy system retirement helps CMS offset any new architecture costs while supporting new business requirements and managing risk.
- **Acceptance of a CMS enterprise-wide information approach –** The institutional acceptance of a centralized and coordinated policy toward governing data and systems will lead to more cross-component collaboration and fewer opportunities for siloed program initiatives.
- **Agile response to new business demands –**CMS data are natural targets for any emerging legislative and regulatory compliance requirements and HHS initiatives. As an information-centric enterprise, CMS will respond more rapidly to the changing regulatory landscape and internal business demands. The virtual data center strategy is essential to achieving agile response through improved security, modern network capabilities with additional capacity, and high availability for critical information and business continuity. The phased, modular approach of the strategy will improve operating efficiencies through adoption of technologies that enable virtualization and shared services.
- **Comprehensive resource planning –** For the CMS modernization strategy to succeed, CMS management must ensure the deployment of dedicated resources for the IT Modernization initiatives. This commitment is complicated by a retiring workforce that possesses the business knowledge of CMS legacy applications.

CMS will engage internal stakeholders to finalize its plan for implementing an integrated tactical approach to achieving the goals of the CMS modernization strategy once funding for FY 2011 is resolved.

Appendix A. CMS' 11 Priority Program Areas under the Affordable Care Act

Table 14 describes CMS' Eleven Priority Program Areas of the Affordable Care Act and correlates each to underlying Enterprise Data Environment (EDE) impacts.

Table 14. CMS' 11 Priority Program Areas

#	Program	Description – Affordable Care Act	Section	Effective Date	EDE Impact
1	**Accountable Care Organizations**	Allows State Option to Provide Health Homes for Enrollees with Chronic Conditions. State Medicaid plans provides medical homes for coordinating care for patients with chronic diseases, and requires states to develop a payment methodology for the medical home model; grants to states for medical home models.	2703	1/1/2017	The EDE would provide the needed tools for CMS to link data between provider, claims, and quality data. This would allow CMS to provide actionable data to the Affordable Care Organizations (ACO), allow the program to analyze quality, and determine shared savings to eligible organizations.
		Allows qualifying pediatric providers to be recognized and receive payments as ACOs under Medicaid as a Demonstration Project. Requires the Secretary of HHS to establish a Medicaid demonstration project to allow pediatric providers to be recognized as ACOs under Medicaid and to share in savings for services that are provided at a lower cost by the ACO.	2706	1/1/2012 to 12/31/2016	See EDE Impact for section 2703.
		Rewards ACOs that meet quality of care targets and reduce the costs of care for their assigned Medicare beneficiary population over time by giving them a share of savings they achieve for the Medicare Program.	3022	1/1/2012	See EDE Impact for section 2703.
		Improvements to Medicare shared savings.	10307	1/1/2012	
2	**Dual Eligibles**	Establishes 5-year period for demo projects.	2601		The EDE aims to provide the kind of data parity across sources and the connecting identifiers that will link the disparate data.
		Establishes a Federal Coordinated Health Care Office within CMS to (1) more effectively integrate benefits under Medicare and Medicaid, and (2) improve coordination between the federal government and states for dual eligibles.	2602	The office must be established no later than 3/1/2010.	

#	Program	Description – Affordable Care Act	Section	Effective Date	EDE Impact
3	**Healthcare Acquired Conditions**	Develops a list of health care-acquired conditions for Medicaid based on those defined under Medicare as well as current State practices; prohibits Medicaid payment for services related to a health care-acquired condition.	2702	7/1/2011	The EDE would provide the ability for CMS to analyze data required for reporting purposes. By using technology like the EDE, CMS could increase the validity of reporting and speed up the frequency required for actionable reports to hospitals and reporting on a CMS website for beneficiaries.
		Reductions in pay. Starting in FY 2015, hospitals in the top 25th percentile of rates of hospital-acquired conditions for certain conditions would get a payment reduction; report to Congress by 2012 on how to establish a similar policy for other providers.	3008	1/1/2012	See EDE Impact for section 2702.
4	**Hospital Readmissions**	Adjustments in pay. In 2013, adjust payments for hospitals under the Inpatient Prospective Payment System (IPPS) based on the occurrence of potentially preventable Medicare readmissions for three conditions with risk adjusted readmission measures currently endorsed by NQF.	3025	10/1/2012	The EDE would provide the ability to connect multiple data sources in order for CMS to analyze data required for reporting purposes.
		Provides funding to hospitals and community-based organizations that furnish evidence-based care transition services to Medicare beneficiaries at high risk for readmission.	3026	1/1/2011	See EDE Impact for section 3025.
5	**Public & Quality Reporting**	Develops a set of quality measures for Medicaid-eligible adults similar to the quality measurement program for children enacted in the CHIPRA of 2009.	2701	1/1/2014	
		Establishes a quality reporting program for psychiatric hospitals beginning in Rate Year 2014.	10322	1/1/2014	
		Extends Provider Quality Reporting through 2014; informal appeals and feedback processes for participating professionals; requires payment reductions in 2014 for providers that do not participate in Physician Quality and Reporting System (PQRS).	3002	1/1/2014	
		Establishes a quality reporting program for long-term care hospitals, inpatient rehabilitation facilities, and hospice providers by FY 2014; providers who do not successfully participate in the program would be subject to a payment reduction.	3004	10/1/2012: Publication of measures applicable with respect to rate year 2014.	
		Establishes a quality measure reporting program for Prospective Payment System-exempt cancer hospitals beginning in FY 2014.	3005	10/1/2012: Publication of measures applicable with respect to fiscal year 2014.	

#	Program	Description – Affordable Care Act	Section	Effective Date	EDE Impact
5	**Public & Quality Reporting**	Establishes new Quality Measurement provisions. Provides $20 million to support the endorsement and use of endorsed measures by the HHS Secretary for use in Medicare, reporting performance information to the public, and in health care programs.	3014	3/1/2012	
		Improves Physician Quality Reporting System – Also see section 3002.	10327		
		Establishes public reporting of performance information.	10331		
		Develops Outcome Measures.	10303		
6	**Medicaid and CHIP Eligibility and Enrollment**	Medicaid coverage for lowest income.	2001	1/1/2014	An EDE would provide CMS staff the tools to track states' progress, compare results among states, and guide any refinement in CMS policy and regulations to better meet the strategic goals of the Affordable Care Act.
		Establishes income eligibility for nonelderly determined using modified gross income.	2002		See EDE Impact for section 2001.
		Disclosures to carry out eligibility requirements for certain programs.	1414		
		Enables enrollment simplification and coordination with state health insurance exchanges.	2201	1/1/2014	See EDE Impact for section 2001.
		Allows consumers immediate information to identify affordable coverage options.	1103	7/1/2010	
		Streamlines procedures for enrollment through an Exchange and State Medicaid, CHIP, and health subsidy programs.	1413		See EDE Impact for section 2001.
		Premium Tax Credit and Cost-Sharing Reduction Payments are not counted as income in determining eligibility for Federal and Federally-Assisted Programs.	1415	1/1/2011	
7	**Medicare Advantage Reform**	Reduces excessive payment levels to Medicare Advantage Organizations over time; creates performance bonus payments based on a plan's level of care coordination and care management and achievement on quality rankings.	3201	1/1/2012	When the EDE is fully implemented, it would allow the program to better trend cost data and provided reporting capability to the program in order for better monitoring of activities to support spikes in coverage cost.
		Establishes authority to deny plan bids.	3209	1/1/2011	See EDE Impact for section 3201.

#	Program	Description – Affordable Care Act	Section	Effective Date	EDE Impact
8	**Physician Value**	Expands Medicare physician resource use feedback program to provide for development of individualized reports by 2012; reports will compare the per capita utilization of physicians to other physicians who see similar patients.	3003	1/1/2012	The EDE will enable linking data between claims and multiple quality sources in order to analyze consolidate and deliver actionable information.
		Requires the development and implementation of a budget-neutral payment modifier that will provide for differential adjustments of Medicare physician payments based on the quality and cost of the care physicians deliver during a performance period phased in over a 2-year period beginning in 2015.	3007	1/1/2015	See EDE Impact for section 3003.
9	**Program Integrity Enforcement**	Requires CMS to include in the integrated data repository (IDR) claims and payment data from Medicare, Medicaid, CHIP, VA and Department of Defense health programs, SSA, and IHS.	6402		Examining a physician's entire range of services provided would give PI analysts a clear line of sight across these different payment methodologies and linked to an authoritative source of provider identity. Likewise, the ability to link a physician's activity in any of the 56 State Medicaid programs would provide great gains in the ability to examine a particular provider's activities State to State and State to Federal.
		Terminates provider participation under Medicaid if terminated under Medicare or other state plan.	6501		
		Excludes participation from Medicaid relating to certain ownership, control and management affiliation.	6502		
10	**Program Integrity Safeguards**	Exempts certain pharmacies from accreditation requirements.	3109	1/1/2011	
		Screens for providers and other enrollment requirements under Medicare, Medicaid, and CHIP.	6401		
		Requires physicians who order items or services to be Medicare-enrolled physicians or eligible professionals.	6405		
		Ensures requirement for physicians to provide documentation on referrals to programs at high risk of waste and abuse. The Center for Program Integrity's (CPI) mission is "to ensure correct payments are made to legitimate providers for covered, appropriate and reasonable services for eligible Medicare beneficiaries and Medicaid recipients." (Source: CPI Industry Day presentation)	6406		

#	Program	Description – Affordable Care Act	Section	Effective Date	EDE Impact
11	**Value-Based Purchasing**	Establish a Hospital Value-Based Purchasing program for section 1186(d) hospitals starting in FY 2013.	3001	3/23/2012	The EDE would provide the ability for CMS to analyze data required for value based purchasing purposes. Having this capability internally rather than relying on separate contracts for each activity will allow program savings to CMS and increase the data reliability.
		Requires the Secretary to develop plans to implement value-based purchasing programs for payments in skilled nursing facilities and home health agencies, and to submit a report to Congress by 10/1/2011 containing such plans.	3006	10/1/2011	See EDE Impact for section 3001.
		Requires the Secretary to develop a value-based purchasing program plan for payments under the Medicare Program for Ambulatory Surgery Centers (ASC) based on the quality and efficiency of care delivered in ASCs; the Secretary must submit to Congress a report on this plan not later than 1/1/2011.	10301		See EDE Impact for section 3001.
		Test value-based purchasing programs for inpatient rehabilitation facilities, inpatient psychiatric hospitals, long-term care hospitals, certain cancer hospitals and hospice providers by 2016; may expand starting 2018.	10326		See EDE Impact for section 3001.

Acronyms

ACO	Accountable Care Organization
ARRA	American Recovery and Reinvestment Act of 2009
ASC	Ambulatory Surgery Centers
BI	Business Intelligence
BIE	Business Intelligence Environment
CARE	Continuity Assessment Record and Evaluation
CCW	Chronic Care Warehouse
CDS	Clinical Decision Support
CER	Comparative Effectiveness Research
CHIP	Children's Health Insurance Program
CHIPRA	Children's Health Insurance Program Reauthorization Act
CLASS	Community Living Assistance Services and Supports
CMS	Centers for Medicare & Medicaid Services
CMMI	Center for Medicare and Medicaid Innovation (Center for Innovation)
CMCS	Center for Medicaid, CHIP & Surveys
CPI	Center for Program Integrity
CPIC	Capital Planning and Investment Control
CSTB	Computer Science and Telecommunications Board
DE	Demonstration Environment
DME	Durable Medical Equipment
DOD	Department of Defense
EA	Enterprise Architecture
EDC	Enterprise Data Center
EDE	Enterprise Data Environment
EDFES	Encounter Data Front End System
EDI	Electronic Data Interchange
EDMG	Enterprise Data Management and Governance
EDPS	Encounter Data Processing System
EDS	Enterprise Data Services
EHR	Electronic Health Record

EIDW	Enterprise Integrated Data Warehouse
EMPI	Enterprise Master Payment Index
EMSR	Enterprise Metadata and Services Repository
EPD	Enterprise Provider Database
ESB	Enterprise Service Bus
FFS	Fee-for-Service
HCDII	Health Care Data Improvement Initiative
HHS	U.S. Department of Health and Human Services
HIE	Health Information Exchange
HIPAA	Health Insurance Portability and Accountability Act of 1996
HIT	Health Information Technology
HITECH	Health Information Technology for Economic and Clinical Health
HL7	Health Level 7
HSPD	Homeland Security Presidential Directive
ICD	International Classification of Diseases
ID	Identity, Identifier
IDR	Integrated Data Repository
ILC	CMS Integrated IT Investment Lifecycle Framework
IPv6	Internet Protocol version 6
IT	Information Technology
ITIRB	Information Technology Investment Review Board
MedPAC	Medicare Payment Advisory Commission
MACPAC	Medicaid and CHIP Payment and Access Commission
MAPD	Medicare Advantage and Prescription Drug
MDM	Master Data Management
MDR	Master Data Repository
MMA	Medicare Prescription Drug, Improvement and Modernization Act of 2003
MMIS	Medicaid Management Information Systems
MSIS	Medicaid Statistical Information System
NRC	National Research Council
NQF	National Quality Forum
O&M	Operations and Maintenance

OACT	Office of the Actuary
OBIR	Operational Business Intelligence Repositories
OCIIO	Office of Consumer Information and Insurance Oversight
OIS	Office of Information Services
OLTP	Online Transaction Processing
OMB	Office of Management and Budget
ONC	Office of National Coordinator
P.L.	Public Law
PCAST	President's Council of Advisors on Science and Technology
PDSA	Plan, Do, Study, Act
PFP	Pay for Performance
PI	Program Integrity
PPS	Prospective Payment System
PQRS	Physician Quality and Reporting System
RBAC	Role Based Access Control
SOA	Service-Oriented Architecture
SoD	Separation of Duty
SSA	Social Services Administration
UDR	Unstructured Data Repository
VA	Department of Veterans Affairs
VBP	Value-Based Purchasing
WAN	Wide Area Network
XML	eXtensible Markup Language

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