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SNOMED CT Case Studies



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Case for Investment Case Studies

Business Transformation

VistA

VistA Cost Benefit Analysis

1 VHIE

Veterans Health
Administration



U.S. Department of Veterans Affairs
Veterans Health Administration

SNOMED
International

In the mid 1990's, CEO Dr. Ken Kizer set out to transform the VHA "from a hospital system to a health care system". Technology use was a key component of the transformation, leading at that time, to the world's largest deployment of an integrated clinical information system (VistA), including SNOMED CT.

The SNOMED CT–embedded VistA clinical information system and patient portal was custom-developed and implemented at a cost of USD\$3.6 billion. VistA is currently used in 1,250 health care facilities, has over 450,000 users, and routinely has had the highest user satisfaction levels among U.S. clinical information systems.

A cost benefit analysis for the VistA deployment was completed for the period 2004-2007:

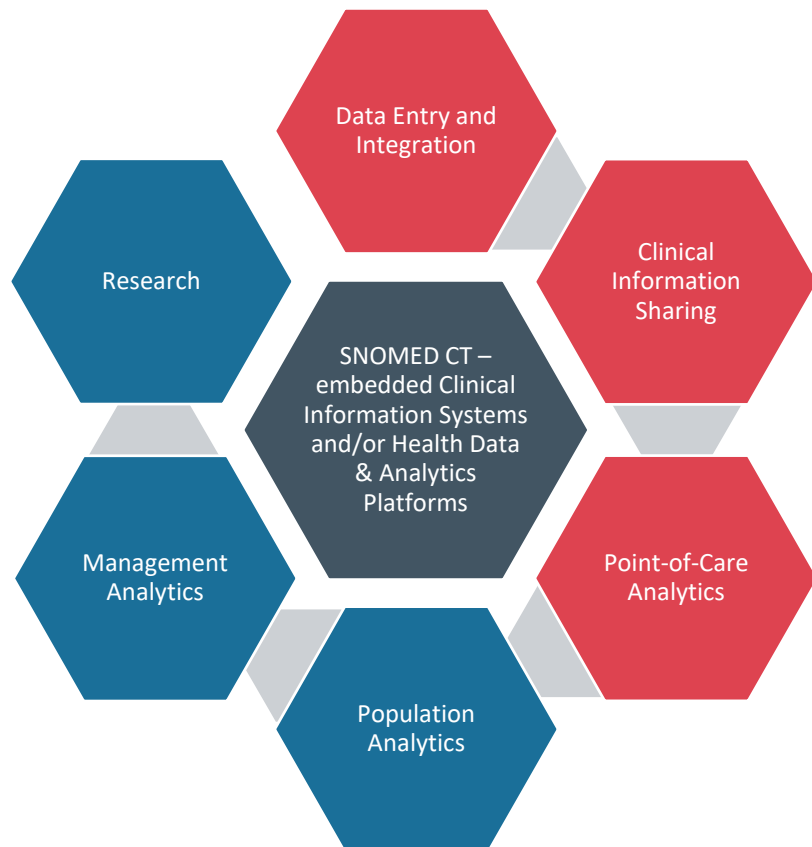
- **Adoption and Use** – Near 100% adoption and use of the SNOMED CT–embedded VistA EHR across all VHA facilities.
- **Benefits** – Benefits realized were primarily due to the reduction of **adverse drug events** (65%) and **duplicate testing** (27%) and **productivity gains** (e.g. elimination of chart pulls, reduction in order processing time).
- **Net Value** – The breakeven point for the VistA EHR investment occurred in 2003. By 2007 the net value exceeded \$687 million per year, with **annual benefits being three times greater than annual costs**.
- **Comparative Performance** – the VHA out-performed the U.S. private healthcare system in the **control of diabetes**, including **glucose testing compliance** (15% higher), **cholesterol control** (17% higher), and **more timely retinal exams**.

The Veterans Health Information Exchange (VHIE) was deployed to enable **care coordination** via system interoperability, using SNOMED CT–supported Continuity of Care documents that are shared among 220 participating providers nation-wide. The VHIE has resulted in an **eight-fold increase in the allergy documentation rate**, a **reduction in travel** for veterans to receive immunizations, and a **reduction in CBC & renal profile ordering, liver tests and imaging orders**.

For the detailed Veterans Health Administration Case Study see Appendix 2 [here](#)

Case Study #1

A Clinical Information System and Health Information Exchange



VA



U.S. Department of Veterans Affairs

Veterans Health Administration

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Case Study #1

VistA: A Clinical Information System

United States – U.S. Department of Veterans Affairs, Veterans Health Administration, Washington DC

- The Veterans Health Administration (VHA), one of three administrations within the Department of Veterans Affairs (VA), is the largest integrated health system in the United States. The VHA is a form of nationalized healthcare service that provides health care benefits and services to military Veterans. As a result all the medical facilities that are part of the VHA are owned by the US Government and all the doctors and workers at the facilities are paid by the government.
- In 2020 the VHA employed approximately 350,000 people including over 150,000 medical professionals who provide or support care at 1,255 health care facilities, including 170 medical centers and 1,074 outpatient clinics, serving 9 million enrolled Veterans each year. The 2020 VHA budget is USD\$85 billion.
- In 1996, the Veterans Health Care Eligibility Reform Act enabled the VHA to be restructured “from a hospital system to a health care system,” as directed by then Under Secretary for Health, Kenneth W. Kizer, MD. Dr. Kizer changed the organization from the previously independent and often competing large hospital medical centers to 22 integrated service networks providing patient-centred care¹.
- Change in Care Settings - the transformation facilitated shifting care from the hospital to ambulatory-care facilities and the home environment, allowing a **reduction of authorized hospital and long-term care beds** from approximately 92,000 to 53,000, with a concomitant **decrease in hospitalizations and an increase in ambulatory-care visits and home care services**.
- Increase in Patient Throughput - From 1996 to 2003, the **number of veterans treated annually increased by 75%** from approximately 2.8 to 4.9 million, but only with a **~5% annual increase in budget** over the same period.

1. Kizer, K., “Journey of Change” Washington, DC: Department of Veterans, 1997.



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- As part of this major transformative effort Kizer and the VHA made significant enhancements to its existing **SNOMED CT**-embedded (e.g. **problem list, anatomic pathology, health summary**) system called VistA. VistA is very comprehensive and supports all clinical, administrative, and financial functions across the VHA for over 450,000 users.
- Clinically, VistA provides a single patient record across all VHA health care facilities and with new CPOE and clinical decision support capabilities implemented in the late 1990's, **94% of all pharmacy orders throughout the VHA were electronically entered directly by the prescriber**. In addition, the VHA in the early 2000s introduced *My HealthVet* that allows veterans to access and update their personal health record, refill prescriptions, schedule appointments, as well as port their health records to institutions outside the VHA health system or keep a personal copy of their health records.
- VistA is a custom built solution that consists of 180 clinical, financial, and administrative applications integrated within a single transactional database. **Over 65% of all physicians trained in the U.S. rotate through the VHA and use VISTA**, making VistA the most familiar EHR in the U.S. It has continually won awards and in **2014, and again in 2016, national surveys of over 15,000 physician users of EHRs rated VistA with the highest overall satisfaction rating in the U.S.²**
- The VistA applications have been placed in the public domain and as an open-source system has been used by other US health care organizations (e.g. Department of Defense Military Health System, Indian Health Service and other non-government hospitals), as well as internationally in at least 15 countries. In 2018 the VHA contracted Cerner to replace VistA as part of a 10-year, \$16 billion implementation project with rollout expected to start in 2021 (COVID delayed).

2. Peckham C, Kane L, Rosensteel S (August 25, 2016). "Medscape EHR Report 2016: Physicians Rate Top EHRs". Medscape. Retrieved August 27, 2017. See <https://www.medscape.com/features/slideshow/public/ehr2016>

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United States – U.S. Department of Veterans Affairs, Veterans Health Administration, Washington DC

VistA Cost-Benefit Analysis

- Byrne et al³ compared health information technology in the VHA to norms in the US private health care sector, plus estimated the costs and benefits of selected VistA applications for the period 2004 to 2007.
- Health IT Spending: On average, the VHA has higher ratios of health IT total spending and IT operations and maintenance costs than the private health care sector. For capital expenses, the VHA is at or below the industry averages.
- Adoption of Health IT: The VA achieved **close to 100 percent adoption** of selected VistA components (e.g. CPRS or the Computerized Patient Record System) since 2004. In contrast, the private health care sector had not reached significant adoption of any of these applications. In 2007, adoption in the private health care sector of inpatient electronic health records stood at 61 percent; use of inpatient bar-code medication administration was 22 percent; computerized physician order entry adoption was 16 percent; and outpatient electronic medical record adoption 12 percent.
- IT-Related Quality Measure Performance: For preventive care process measures such as cancer screenings, the VHA had higher performance during 2004–2007 relative to the private health care sector. VHA **patients with diabetes had better glucose testing compliance (15% higher)**, **more controlled cholesterol (17% higher)**, and **more timely retinal exams** when compared to the Medicare health maintenance organization (HMO) private-sector benchmark (see the details on the chart overleaf).

3. Bryne et al., “The Value From Investments In Health Information Technology At The U.S. Department Of Veterans Affairs”, Health Affairs 29, No. 4., 2010. See <https://www.healthaffairs.org/doi/pdf/10.1377/hlthaff.2010.0119>

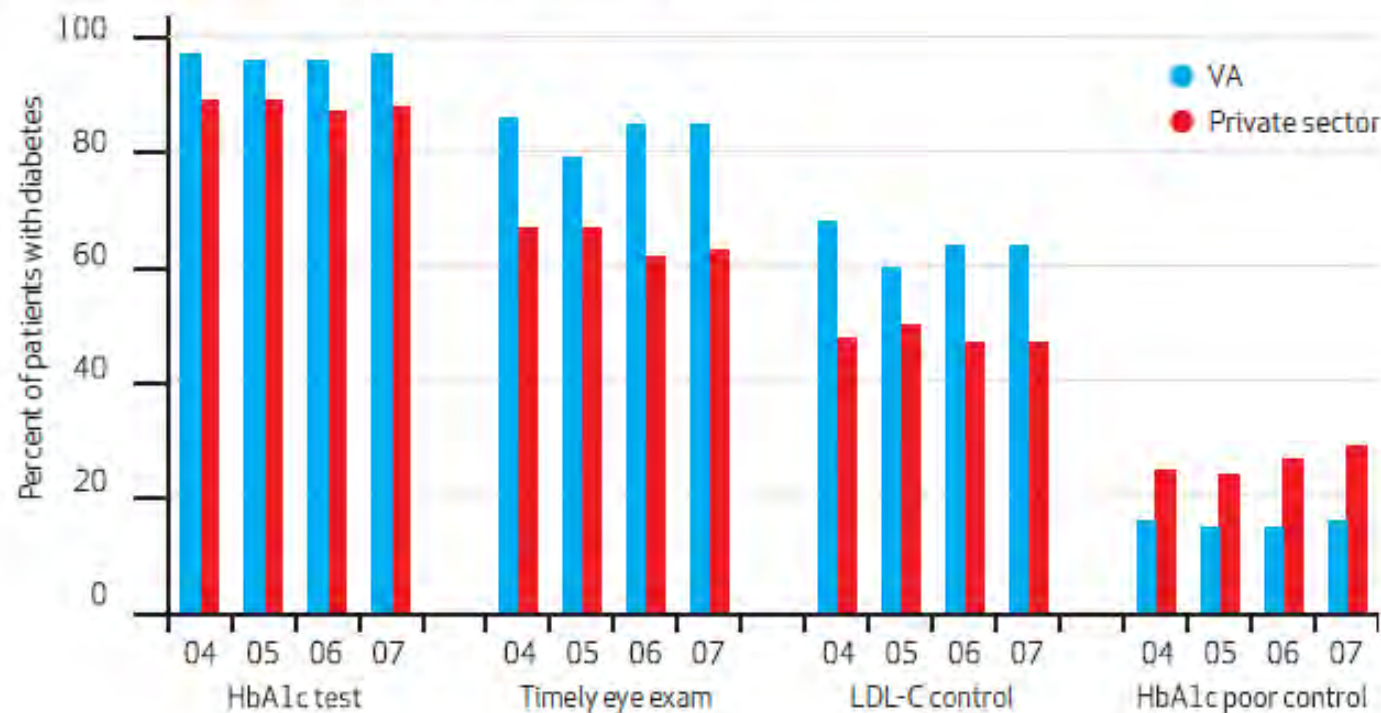


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Selected Outpatient Health Information Technology (IT)-Related Quality Measures For Patients With Diabetes, Department Of Veterans Affairs (VA) And Private Sector, 2004-2007





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VistA Cost-Benefit Analysis con't

- **Net Value:** The total net value of the VHA's investments in the VistA components modeled exceeds \$3.09 billion. By 2003, the benefit projections equaled the costs, with the VHA potentially accruing a net positive value from 2004 through 2007. In 2007, the annual net value was estimated to exceed \$687 million, with annual benefits projected to be threefold greater than annual costs.
- **Benefits:** The gross value of the VHA's investments in VistA applications was projected to be \$7.16 billion. Cumulative reductions in unnecessary care attributable to prevention of adverse drug event–related hospitalizations and outpatient visits as a result of VistA was the largest source of benefit in the projections, with an estimated value of \$4.64 billion, or 65 percent of total estimated value. The cumulative value of eliminated redundancies (e.g. duplicate laboratory tests) accounted for \$1.92 billion, or 27 percent of projected value. (see more detail in the chart overleaf)
- **Costs:** The total cost to develop, implement, and maintain the VistA applications, including the Computerized Patient Record System, was estimated at \$4.07 billion. The Computerized Patient Record System entailed the largest investment of the VistA applications analyzed, with projected costs of \$3.60 billion (which includes \$1.56 billion for the earlier Decentralized Hospital Computer Program). The bar-code medication administration, picture archiving and communication systems, and Laboratory Electronic Data Interoperability application were comparatively smaller investments, collectively equaling \$470 million.

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Cost Benefit Analysis - VistA Applications and Sources of Value

VistA Component	System Feature	Source of Value	Benefit Category
Computerized Patient Record System (CPRS; 1997–2007; inpatient, outpatient)	<ul style="list-style-type: none"> Electronic capture and reporting of allergies/adverse reactions, problem lists, inpatient and outpatient medications, test results, discharge summaries, provider notes, notifications/patient record flags Orders for medications, laboratory tests, radiology tests, event delay, diets, consult/request tracking Clinical decision support through clinical reminders, order checking. 	<ul style="list-style-type: none"> Reduced inpatient costs for preventable adverse drug events caused by inpatient medications Reduced inpatient costs for avoided influenza and pneumonia Reduced inpatient costs for preventable adverse drug events caused by outpatient medications Reduced outpatient visit costs for preventable adverse drug events caused by outpatient medications Reduced laboratory and radiology costs for redundant and unnecessary tests Reduced time spent on chart pulls by file clerks in the inpatient setting Reduced time spent on chart pulls by file clerks in the outpatient setting 	<ul style="list-style-type: none"> Avoided utilization Avoided utilization Avoided utilization Avoided utilization Eliminated redundancy Reduced workload Reduced workload
Picture archiving and communication system (2002–2007; inpatient)	<ul style="list-style-type: none"> Exam lists, exam locks, specialized display tools, results-routing capabilities, color imaging, 3D imaging 	<ul style="list-style-type: none"> Reduced radiological film supply costs Reduced film processor maintenance costs Reduced time spent on film processing by radiology department clerks Reduced floor-space costs for film library 	<ul style="list-style-type: none"> Decreased expenses Decreased expenses Reduced workload Reduced expenses
Bar-code medication administration (1998–2007; inpatient)	<ul style="list-style-type: none"> Real-time, point-of-care validation for administration of unit dose and IV medications 	<ul style="list-style-type: none"> Reduced inpatient costs for preventable adverse drug events caused by inpatient medication administration errors 	<ul style="list-style-type: none"> Avoided utilization
Laboratory Electronic Data Interoperability (2001–2007; inpatient and outpatient)	<ul style="list-style-type: none"> Laboratory order sending and tracking, results transmission and integration into CPRS, standardized electronic communication with non-VistA laboratories 	<ul style="list-style-type: none"> Reduced time spent on order processing by VA laboratory technicians 	<ul style="list-style-type: none"> Reduced workload



Case Study #1

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Veterans Health Information Exchange

- Because the majority of Veterans receive care at both VHA and private health care facilities, the VHA set up a Veterans Health Information Exchange (VHIE)⁴ to support interoperability between the VHA, other federal agencies and the private health care sector to **better manage the coordination of care.**
- Currently the VHA and over 220 participating providers can electronically share a variety of health information including: prescriptions and medications, allergies, illnesses, laboratory and radiology results, immunizations, procedures and clinical notes, and other relevant medical information. The **health information, including SNOMED CT encoded information from VistA, is extracted to a Continuity of Care document and exchanged securely** with the participating providers.
- The participating providers include federal agencies (e.g. Department of Defense, Social Security Administration), health care organizations (e.g. Kaiser Permanente, Johns Hopkins Medicine), state and regional HIEs (e.g. Indiana Health Information Exchange, Maine HealthInfoNet) and the private sector (e.g. Walgreens Pharmacies, CVS MinuteClinic).
- All VHIE participating providers have to be part of the national HIE, eHealth Exchange, which operates in all 50 states. VHIE can exchange information at both at an organizational level (i.e. Continuity of Care documents via eHealth Exchange) and at the personal provider level (i.e. direct messaging via DirectTrust)⁵. The eHealth Exchange network is the largest HIE in the US and is connected to 75 percent of all US hospitals, to 61 regional or state health information exchanges, and more than 30 EHR technologies (e.g. Epic, Cerner).

4. See <https://www.va.gov/VHIE/index.asp>

5. See <https://ehealthexchange.org/> and <https://www.directtrust.org/>



Case Study #1

VHIE: A Health Information Exchange

United States – U.S. Department of Veterans Affairs, Veterans Health Administration, Washington DC

Veterans Health Information Exchange

Benefits Achieved

- **Allergy Documentation Rate** - Review of all inbound VHIE transactions in FY14 showed that VHIE use was associated with a **nearly eight-fold increase in the allergy documentation rate** (7.5% vs. 0.84%)⁶.
- **Access to Immunization Services** - The VHIE Retail Immunization Coordination Project established a partnership between the VHA and Walgreens so Veterans could receive their immunizations at a local Walgreens located closer to their home than their nearest VHA facility. Analysis of Veterans immunized at Walgreens between September 2014 and January 2015 showed that **64% of study Veterans now traveled <5 miles to receive their immunization**, 12% of study Veterans traveled between 5 to 10 miles, and 24% of study Veterans traveled more than 10 miles. In addition, it was noted **that 93% of Veterans traveled less than 54 miles, the average distance rural Veterans traveled to the nearest VHA facility**.
- **Laboratory Test and Imaging Ordering** - Participation in the VHIE reduced the ordering of laboratory and imaging tests at inappropriately short intervals in the ambulatory care setting. **CBC & Renal profile ordering was reduced by 1.98%; Lipid and Liver tests by 3.19%; and imaging orders by 1.3%**. The effect upon potential overuse was realized early, within the first year of implementation of the VHIE.

6. Pan et al., "Assessments of the Veteran Medication Allergy Knowledge Gap and Potential Safety Improvements with the Veteran Health Information Exchange", AMIA Annual Symposium Proceedings 2012. See <https://www.ncbi.nlm.nih.gov/pmc/journals/362/>

7. Botts et al., "Improved Veteran Access to Care through the Veteran Health Information Exchange (VHIE) Retail Immunization Coordination Project", AMIA Annual Symposium Proceedings 2016. See <https://www.ncbi.nlm.nih.gov/pmc/journals/362/>

8. Haggstrom et al., "Impact of VA Health Information Exchange upon the Overuse of Laboratory and Imaging Tests", AMIA Annual Symposium Proceedings 2017. See <https://www.ncbi.nlm.nih.gov/pmc/journals/362/>

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Veterans Health Information Exchange

Benefits Achieved con't

- **Diabetes Care** - Providers of Veteran patients enrolled in the VHIE had **improved access to diabetes data** residing in non-VHA health care systems. About 1 in 5 Veteran patients had data identifying diabetes diagnoses in non-VHA clinical systems. However, the VHIE program had **no measurable effect upon the quality of diabetes care**⁹.
- **Prevalence of Medication Data in Non-VHA health Care Systems** – A study was conducted to describe the prevalence of medication dispensing across VHA and non-VHA health care systems among a cohort of Veteran patient population. The data demonstrated that **17.4% of Veterans had medication use identified from non-VHA sources**, including prescriptions for antibiotics, antineoplastics, and anticoagulants. These data support the need for the VHIE to improve sharing and coordination of information, with the potential to reduce adverse medication interactions and improve medication safety¹⁰.

9. Haggstrom et al., "Impact of VA Health Information Exchange upon the Quality of Diabetes Care", J Gen Intern Med. 2014 Apr; 29 (Suppl 1).

10. Nguyen et al., "Medication Use among Veterans across Health Care Systems", Appl Clin Inform. 2017 Mar 8; 8(1):235-249



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