

SNOMED CT Survey: An Assessment of Implementation in EMR/EHR Applications

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Abstract

A descriptive study of health information technology (HIT) vendors was conducted to identify which EMR/EHR vendors currently work or anticipate working with SNOMED CT, determine the prevalence of SNOMED CT integration in electronic medical record (EMR) and electronic health record (EHR) products, identify the available and potential future applications for SNOMED CT in EMR/EHR systems, and learn what prompts vendors to include SNOMED CT in EMR/EHR systems. The Web-based survey consisting of 25 questions was fielded in November–December 2006. Seventy-two responses were received. The results from this survey on SNOMED CT show a mixed message from respondents with regard to the prevalence of SNOMED CT integration in EMR/EHR products. Those with plans for implementation cited strategic reasons most often. However, HIT vendors who have not yet obtained a SNOMED CT license are waiting for market forces to drive deployment in their systems. Finally, survey respondents currently working with SNOMED CT indicated an expected increase over the next three years in EMR/EHR applications where SNOMED CT will be implemented.

Key Words: SNOMED CT, clinical terminology, electronic medical record, electronic health record

Introduction

The new millennium ushered in the unprecedented national consensus that the widespread use of technology for the electronic health record (EHR) will lead to reduced medical errors, higher-quality care, and improved efficiency in the healthcare industry.¹ To accomplish this, healthcare delivery organizations and providers will need to move beyond encoding only administrative data that comes from healthcare delivery, enrolling members into health insurance plans, and reimbursing for services.² Administrative code sets such as the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and Current Procedural Terminology (CPT) are currently accepted as the standard encoded data for quality-of-care assessments, severity adjustments for payment systems, and many types of healthcare research. However, these systems fall short of the EHR needs for a granular terminology. SNOMED CT, a clinical reference terminology, has been identified as one that can meet those needs by several organizations including the federal government's Consolidated Health Informatics initiative.

Which EMR/EHR applications will require SNOMED CT has not yet been determined. Clinical information systems (CISs) and the EHR infrastructure use a number of applications, often focused on clinical functions, to enable the collection, storage, and processing of discrete or structured data for various purposes. Terminologies that can supply the discrete or structured data and thereby form the information content in the EHR are being studied and standards established. This study looks at the prevalence of SNOMED CT integration in EMR/EHR products, identifies the available and potential future applications of SNOMED CT in EMR/EHR systems, and determines various incentives for vendors to include SNOMED CT in EMR/EHR systems.

This exploratory research is important because it begins to examine the applied usage of SNOMED CT, which has been promoted as a viable international standard for the electronic health record. However, the actual market penetration of this proposed standard has not been determined even in a preliminary way such as this.

Background

SNOMED CT embedded in EHR systems can work behind the scenes to support the encoding of discrete clinical information in a meaningful way. Designed to support the EHR, SNOMED CT is purported to enable the following:

- Improvements in the quality of data available for health services research and measurement of clinical outcomes
- Improvements in the completeness, accuracy, and consistency of health record documentation
- Development of richer computer-aided clinical decision-support systems, such as clinical alert and reminder systems, with the greater detail available
- Improved critical care monitoring via the standardized capture of clinical details such as vital signs, signs/symptoms, medications, interventions, tests, and problem lists
- Integration of medical device clinical data output into EHR systems for use in clinical decision support and other systems
- Improved communication among clinicians because the SNOMED CT concepts are defined (e.g., mapping of local terms such as “lower lumbar radiculopathy” to “sciatica” allows for the meaningful exchange of information)
- Increased efficiency and consistency in clinical trial data collection
- Improved decision support in computerized physician order entry (CPOE) systems because of the level of detailed data available (e.g., standardized capture of type of diagnostic test being ordered)
- Refinements and improved data collection for disease management programs
- Faster dissemination of clinical guidelines supporting the practice of evidence-based medicine³

All of these factors are critical to supporting the nationwide initiative to improve healthcare quality. When the terminologies to support patient care are tied to the terminologies supporting the retrieval of clinical knowledge, providers have immediate access to resources and decision-support tools at the point of patient care delivery.⁴

The National Committee on Vital and Health Statistics (NCVHS) study identified SNOMED CT as one of the core set of Patient Medical Record Information terminology standards.⁵ SNOMED CT was also adopted as a Consolidated Health Informatics (CHI) standard for the following domains: lab result contents, nonlaboratory interventions/procedures, anatomy, diagnosis/problem lists, and nursing.⁶ In May 2006, SNOMED CT was identified as one of the preferred terminologies in the American Society for Testing and Materials (ASTM) Continuity of Care Record.⁷

Also in 2006, the Healthcare Information Technology Standards Panel (HITSP) recommended SNOMED CT in their Interoperability Specifications.⁸ Then in January 2007, Secretary Mike Leavitt, Department of Health and Human Services, accepted the standards recommended by HITSP for the Electronic Health Records, Biosurveillance, and Consumer Empowerment use cases.⁹ One of the terminology standards named was SNOMED CT.

Four years ago SNOMED CT became available to all U.S. users at no cost through the National Library of Medicine’s Unified Medical Language System (UMLS). However, the enablers or impediments regarding the integrating of SNOMED CT into EHR systems are relatively unknown. A National Library of Medicine (NLM) representative, upon questioning during the July 2005 NCVHS Subcommittee on Standards and Security, recognized the need to find out what the incentives and barriers are to EHR vendors’ adopting SNOMED CT.¹⁰

With the U.S. government acknowledging the need to gain a better understanding of vendor concerns regarding integration of SNOMED CT into their clinical information systems, identifying the barriers to SNOMED CT adoption is critical. Creating a well-articulated value proposition for interoperable EHR systems plays a role in removing many barriers to adoption.¹¹ Learning what prompts vendors to include SNOMED CT in EHR systems could help develop strategies to accelerate use and encourage implementation.

Research Questions

1. Which health information technology (HIT) vendors are working with SNOMED CT?
2. What is the prevalence of SNOMED CT integration in EMR/EHR products?
3. What prompts vendors to include SNOMED CT in EMR/EHR systems?
4. What are the available and potential future applications for SNOMED CT in EMR/EHR systems?

Methodology

The questions were researched by a descriptive study conducted by the Foundation of Research and Education (FORE) of the American Health Information Management Association (AHIMA). A Web-based survey was used to obtain the data from EMR/EHR HIT vendors. Because of the type of systems implemented in the ambulatory and hospital environments, both EMR and EHR systems were included in the study.

Study Sample and Procedure

An extensive search for EMR/EHR vendors was made in order to obtain as complete a representation of vendors as possible. The list began with members of the Healthcare Information and Management Systems Society (HIMSS) EHR Vendors Association, and any EHRs certified by the Certification Commission for Healthcare Information Technology (CCHIT) were added.^{12, 13} Winners of TEPR awards for the past five years were checked to ensure inclusion.¹⁴ Vendors participating in the AC Group's 2006 EHR/PMS survey, as listed in the summary document, were added if not already included.¹⁵ Vendors found in the EMR/EHR category of the *Healthcare Informatics 2006 Resources Guide* were added where necessary, as were those listed in the EMR category of the *Health Management Technology Online Resource Guide*.^{16, 17} The 2006 13th annual *Healthcare Informatics 100*, a list of the top 100 companies ranked by 2005 healthcare IT revenue, was reviewed, and companies with EHR products were included.¹⁸ Exhibitors at the 2006 HIMSS Exhibition categorizing their products as EMR or EHRs were reviewed, as were vendors listed with an Electronic Health Record Systems/Services specialty in the AHIMA vendor directory.^{19, 20}

In an attempt to gather as comprehensive a list as possible, vendor lists compiled by various commercial sites were checked. These sites included VoiceRecognition.com, EMREdge, EMR Consultant, the EMR Forum, and EMRUpdate.²¹⁻²⁵ In addition, a list found on the Web site of the Computer Science Division of the College of Engineering at UC Berkeley, otherwise of unknown origin, was checked, along with featured vendors on the EHR Selector Web site.^{26, 27}

Once the list was assembled from all these sources, duplications were removed to ensure that each vendor would receive the survey only once.

Study Tool

A set of 25 questions was developed by a small group of experienced SNOMED CT users. They were designed based on the following study objectives:

- to identify the HIT vendors working with SNOMED CT,
- to determine the prevalence of SNOMED CT integration in EMR/EHR products,
- to learn what prompts vendors to include SNOMED CT in EMR/EHR systems, and

- to identify the available and potential future applications for SNOMED CT in EMR/EHR systems.

Face validation was performed by AHIMA and FORE staff as well as experienced survey researchers to ensure that the items addressed the important aspects of determining SNOMED CT implementation in EMR/EHR systems. A group of nursing informaticians also conducted face validation. This was felt to be adequate given the exploratory nature of the survey.

The questions were loaded into Key Survey, a Web-based survey instrument. An initial and two follow-up e-mails reminded recipients to complete the survey. Where possible, the vendor's person responsible for terminology activities was targeted to receive the e-mail. The total time period, 45 days, from the initial contact to the closing of the survey provided ample opportunity for respondents to answer. Data from the survey were loaded into SPSS software for comparative analysis.

Results

The survey was e-mailed to 408 HIT vendors. Out of 408 HIT vendors who received the survey, 72 surveys were returned for a response rate of 18 percent. One-third of the top 10 ambulatory EMR vendors replied to the survey.²⁸ Vendor characteristics were not collected in the initial survey. The authors recognize the need to perform follow-up work to identify details on who responded. What can be stated at this juncture is that responses came from large, small, commercial, and open-source vendors.

To determine the HIT vendors working with SNOMED, the question "Do you currently have a SNOMED CT license or have you obtained SNOMED CT through the National Library of Medicine license agreement program or from a middleware vendor?" was asked. Respondents were given the choice of yes or no with three options for no ("No, but plan to obtain one in 2007," "No, but plan to obtain one after 2007," or "No current plans to obtain SNOMED CT").

Of the 72 respondents, 21 replied yes and 51 replied with one of the three no options. Thirty, or 41.7 percent, stated that they have no current plans to obtain a SNOMED CT license. The most common reason given for not making plans to obtain a license was no market demand. Other reasons given included "have not figured out how to best use it yet," "SNOMED CT is a nomenclature originally designed for forensic pathology and it has not evolved to meet the needs of specialty driven systems," and "use MEDCIN." See Figure 1 for additional breakdown.

In order to determine the planned or existing source of the vendor's SNOMED CT license, HIT vendors were asked to choose one of the following:

- a. Middleware vendor, such as Apelon, Health Language, Inc.
- b. National Library of Medicine's UMLS Metathesaurus
- c. SNOMED International
- d. Other—please explain

Of the 42 respondents with a planned or existing source, 40, or 95.2 percent, had obtained SNOMED CT through one of the sources stated above. SNOMED International and the UMLS were chosen most frequently, with 13 (30.9 percent) and 12 (28.6 percent) responses respectively.

Identifying the prevalence of SNOMED CT integration in EHR products was accomplished by asking about respondents' plans for implementation of SNOMED CT in their product. Implementation was defined in the question to mean that SNOMED CT is a part of or is used in the EMR/EHR application. As shown in Figure 2, 14 out of 42 respondents, or 33 percent, had SNOMED CT currently operational. Twenty, or 48 percent, of the respondents indicated that incorporation of SNOMED CT into applications was currently being developed, was planned for 2007, or was planned for 2008 or beyond. All told, 34, or 81 percent, of the respondents holding or planning to acquire a SNOMED CT license have incorporated or plan to incorporate SNOMED CT.

Determining the available and potential future applications for SNOMED CT in EHR systems revealed similar results for what currently exists as well as what is planned. Figure 3 illustrates this comparison. Vendors could choose from clinical decision support; encoding of healthcare data at the sources, for example, problem lists or clinical care documentation templates; health information exchanges; patient care assessment; and other and were not limited to only one choice.

To gain a better understanding of exactly how SNOMED CT was being used, vendors were also asked to select the purpose(s) of SNOMED CT in their applications from the following list:

- As a clinical reference terminology to capture data for problem lists
- As a clinical reference terminology to capture data for quality reporting
- As a clinical reference terminology to capture data for alerts, warnings, or reminders generated by decision support
- As a clinical reference terminology for data retrieval
- As a clinical reference terminology supporting data collection at the point of care
- As a clinical reference terminology for patient care assessments
- Other

As Figure 4 demonstrates, 18 to 22 responses were received for each of the specific choices listed above. No one purpose was found to have substantially higher use than another.

Vendors were asked what their most important reason was for implementing SNOMED CT in their product. Two specific answer choices, customer request and strategic decision, were provided along with the choice “other” and a request for explanation. Of the 41 who responded, 41.7 percent stated that a strategic decision was the main factor for including SNOMED CT. Only 6.9 percent indicated customer request.

Supplemental questions included on the survey gathered general information on other aspects of SNOMED CT use. These included the year the vendor had obtained a SNOMED CT license, the version currently in use, the location where SNOMED CT is stored, and challenges encountered when implementing SNOMED CT. Other questions supplied data about whether the vendor’s system allows the end user to post-coordinate expressions or create subsets or local terms that map to SNOMED CT. Data were collected on which SNOMED CT applications included maps to other terminologies. Two adjunct questions furnished information on whether or not vendors are seeing SNOMED CT included in requests for information or requests for proposals for EHR systems and applications.

Discussion

The results from this survey on SNOMED CT show a mixed message from respondents with regard to the prevalence of SNOMED CT integration in EMR/EHR products. While almost 60 percent of the vendors have or plan to obtain a SNOMED CT license, less than 20 percent of the total respondents indicated that SNOMED CT was currently operational in their applications. This finding is unexpected since SNOMED CT has been identified as a federal standard and available under a national license since 2003.

For the 30 respondents who have no plans to obtain a SNOMED CT license, market demand was the most common reason given for not making plans to do so. With no incentives or drivers in the industry for vendors to implement SNOMED CT, respondents indicated they are looking to their clients to ask for SNOMED CT before they will consider incorporating it into EMR/EHR applications.

For those HIT vendors in various stages of implementation, a strategic decision was the overriding factor in going forward with their plans for inclusion of SNOMED CT in their EMR/EHR applications. Customer request was a distant second for reasons unknown. This may indicate a lack of awareness, alternative priorities, hesitation to adopt, or other barriers.

Finally, the survey respondents who are currently working with SNOMED CT indicated that in the next three years there will be an increase in EMR/EHR applications in which SNOMED CT will be implemented. Applications include clinical decision support; encoding of healthcare data at the sources,

for example, problem lists or clinical care documentation templates; health information exchange; and patient assessment.

To better understand if the SNOMED CT implementation status shown in this survey has changed from previous years, the results of a 2005 survey of EHR trends and usage were reviewed. While not specific to SNOMED CT, the survey did indicate that planned implementations appeared to show an increase in the use of clinical codes, for example, LOINC, MEDCIN, or SNOMED, the first time this occurred in the seven years the survey has been conducted.²⁹

Limitations of the Study

Obtaining a complete representation of HIT vendors is made difficult by the enormous volatility and diversity in the field. Vendors come and go in the healthcare market due to various reasons such as lack of funding, mergers, and acquisitions. An additional complicating factor is finding the knowledgeable person within the company who knows about the product in which SNOMED CT would be utilized. In some cases, the e-mails were not sent to a specific individual but instead to the general information mailbox due to an inability to determine whom to contact in the company. Both of these factors may have accounted for not receiving a response to the survey.

Another factor to consider regarding the results of this study is that the top two ambulatory EMR vendors, representing 38 percent of installations, did not respond to the survey.³⁰ The prevalence of SNOMED CT integration in their EMR/EHR products is not known.

In addition to the above limitations, numerous attempts to have the selected vendors respond were made. Seventy-two surveys were completed. There may be vendors who did not respond who are working in some capacity with SNOMED CT in their applications. Thus, while the study provides insight into the status of SNOMED CT implementation in EHR/EMR applications and the prevalence of SNOMED CT integration in EMR/EHR products, the entire population of HIT vendors working with SNOMED CT is not represented.

Conclusion

The message is mixed from respondents with regard to the prevalence of SNOMED CT integration in EMR/EHR products. In order for SNOMED CT to be implemented in EMR/EHR applications, vendors need a business case for why SNOMED CT should be deployed in their systems. This case may come about because of strategic reasons or by market demand.

Respondents who are currently working with SNOMED CT indicated that in the next three years they will increase SNOMED CT implementation in EMR/EHR applications. These include clinical decision support; encoding of healthcare data at the sources, for example, problem lists or clinical care documentation templates; health information exchange; and patient assessment.

It appears that HIT vendors who have not yet obtained a SNOMED CT license are waiting for market forces to drive deployment in their systems. For example, should end users recognize specific use cases for software applications in which SNOMED CT would be particularly valuable, this could drive the market toward expanded implementation in EMR/EHR applications. In addition, incentives such as a requirement of having SNOMED CT in EMR/EHR applications by the Certification Commission for Health Information Technology (CCHIT) could also affect HIT vendors in their product development life cycle.

Some vendors indicated that if organizations such as CCHIT were to require it, then they would proceed with including SNOMED CT in their products. CCHIT is progressing in developing additional levels of certification. As the industry understanding of effective use of the EHR increases and the technology itself matures, CCHIT is expected to revise its criteria for certification. There is every reason to expect that terminologies will be included in CCHIT requirements at some future date.

Finally, until recently the market focus has been on the enterprise and its internal process and workflow and not on national or regional health information exchange for patient care and public health

purposes. The Office of the National Coordinator for Health Information Technology (ONC) is supporting work on a national health information infrastructure as the means for transferring essential clinical and administrative data throughout the healthcare industry. Terminologies are integral to interoperability and, thus, to deployment of a nationwide health information network capable of delivering on the promise of safer and more cost-effective results.³¹ The results of this survey suggest that additional emphasis is needed to promote the incorporation of SNOMED CT as a chosen standard terminology in EHRs.

Future Research

It is difficult to predict what, if any, effect the recent transition of ownership of SNOMED CT to an international SNOMED CT standards development organization known as the International Health Terminology Standards Development Organisation (IHTSDO) will have on the use of SNOMED CT in EMR/EHR applications. Future research in this area will reveal the effect of this change on SNOMED CT itself.

In addition, should CCHIT require SNOMED CT in EMR/EHR applications, further study would be needed to determine what effect this would have on HIT vendors implementing SNOMED CT.

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Notes

1. Bush, G. W. "State of the Union Address." Washington, DC, 2004.
2. Iezzoni, L. "Assessing Quality Using Administrative Data." *Annals of Internal Medicine* 127, no. 8, pt. 2 (1997, October 15): 666–74.
3. Bowman, S. "Coordination of SNOMED-CT and ICD-10: Getting the Most out of Electronic Health Record Systems." *Perspectives in Health Information Management* (2005).
4. Fenton, S. H., R. Scichilone, and K. Giannangelo. "Clinical Terminologies in the Electronic Health Record." *For the Record* 1, no. 18 (2005, August 29): 30.
5. National Committee on Vital and Health Statistics. *Recommendations for PMRI Terminology Standards*. November 2003. Available at www.ncvhs.hhs.gov.
6. Department of Health and Human Services, Office of the Secretary. 2005 (December 23). *Consolidated Health Informatics (CHI) Initiative; Health Care and Vocabulary Standards for Use in Federal Health Information Technology Systems*. *Federal Register* 70, no. 246; pp. 76287–76288.
7. SNOMED Press Release. May 17, 2006. Available at www.snomed.org/news/documents/ccr_standard.pdf.
8. *Standards Activities/Healthcare Informatics Technology Standards Panel/Interoperability Specification/HITSP Interoperability Specifications—Entire V2.0 Suite*. Available at www.ansi.org/standards_activities/standards_boards_panels/hisb/hitsp.aspx?menuid=3.
9. "HHS Secretary Leavitt Accepts Recommendations from Healthcare Information Technology Standards Panel (HITSP) Data Standards to Support Nationwide Health Information Network." Available at www.ansi.org/news_publications/news_story.aspx?menuid=7&articleid=1413.
10. National Committee on Vital and Health Statistics Subcommittee on Standards and Security. *NLM Standards Related Activities*. July 26–27, 2005. Available at www.ncvhs.hhs.gov/050726tr.htm.
11. Markle Foundation Connecting for Health. *The Data Standards Working Group Report and Recommendations*. June 5, 2003. Available at www.connectingforhealth.org/resources/dswg_report_6.5.03.pdf.
12. Available at www.himssehrva.org/ASP/members.asp.
13. Available at www.cchit.org/certified/2006/CCHIT+Certified+Products+by+Company.htm.
14. Available at www.medrecinst.com/conference/tepr/awards.asp.
15. Available at www.acgroup.org/images/2006_PMS-EHR_Study_-_Summary_Results.pdf.
16. Available at <http://directory.healthcare-informatics.com/BuyersGuide.htm?CD=2642>.
17. Available at www.healthmgttech.com/
18. Available at <http://healthcare-informatics.com/>
19. Available at www.himss.org/
20. Available at www.ahimanet.org/VendorDirectory/.
21. Available at www.voicerecognition.com/electronicmedicalrecord/manufacturers/.
22. Available at www.emredge.com/emr_list.php
23. Available at www.emrconsultant.com/theemrlist.php.
24. Available at www.emrforum.com/.
25. www.emrupdate.com/forums/permalink/11193/11179/ShowThread.aspx.
26. Available at www.cs.berkeley.edu/~jfc/healthtech/lects/lec2/EMRsystems.txt.
27. Available at www.ehrselector.com/ehrselector/EMRToolkit/ASP/Default.asp.

28. "Top 10 Ambulatory EMR Vendors." *Modern Healthcare's By the Number* 36, no. 51 (2006, December 18): 68.
29. Medical Records Institute. *Seventh Annual Survey of Electronic Health Records Trends and Usage for 2005*. Available at <http://www.ehto.org/2006/US%20Medical%20Records%20Institute%20-%20Results%20of%20the%20EHR%20global%20survey%20in%202005.pdf>.
30. Ibid.
31. American Health Information Management Association and American Medical Informatics Association Terminology and Classification Policy Task Force. *Healthcare Terminologies and Classifications: Essential Keys to Interoperability*. Available at http://library.ahima.org/xpedio/groups/public/documents/ahima/bok1_034273.pdf.

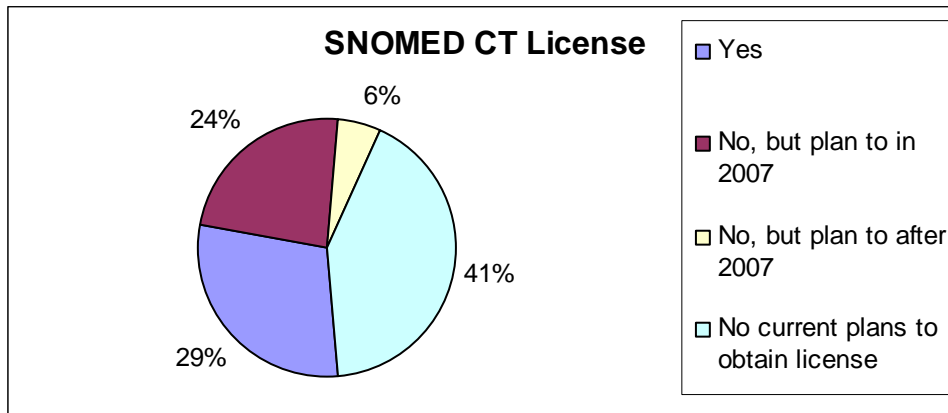
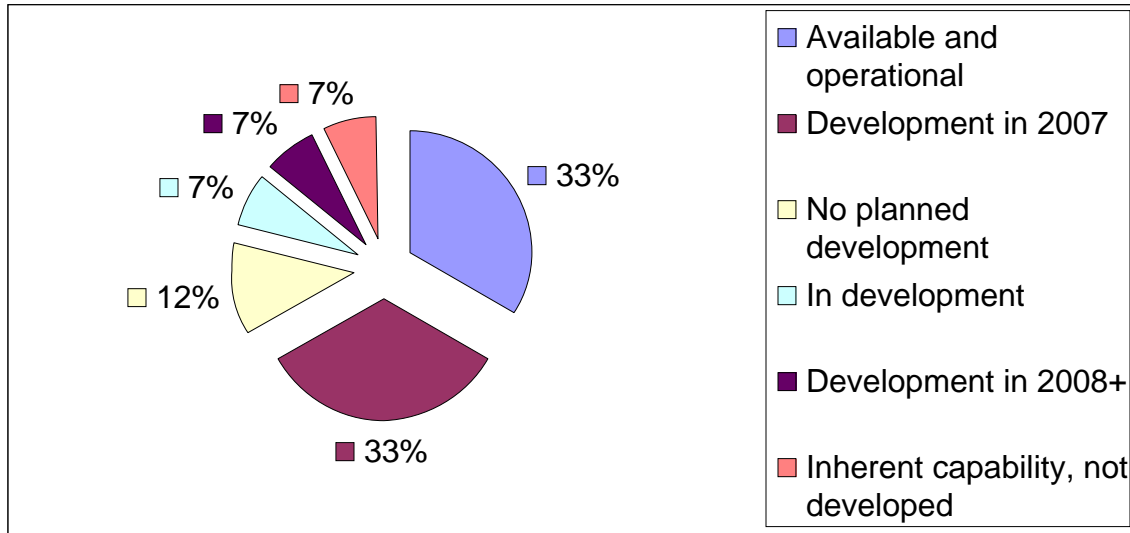
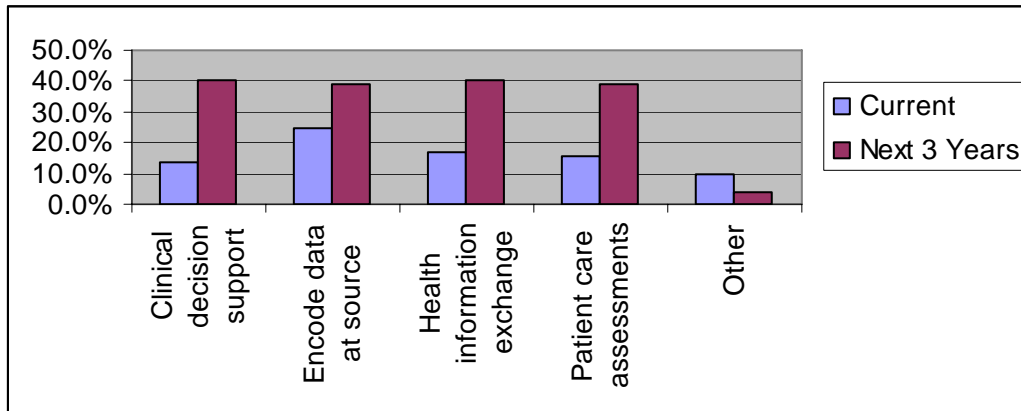
Figure 1**Status of HIT vendors with a SNOMED CT License ($N = 72$)**

Figure 2

Prevalence of SNOMED CT Integration (N=42)



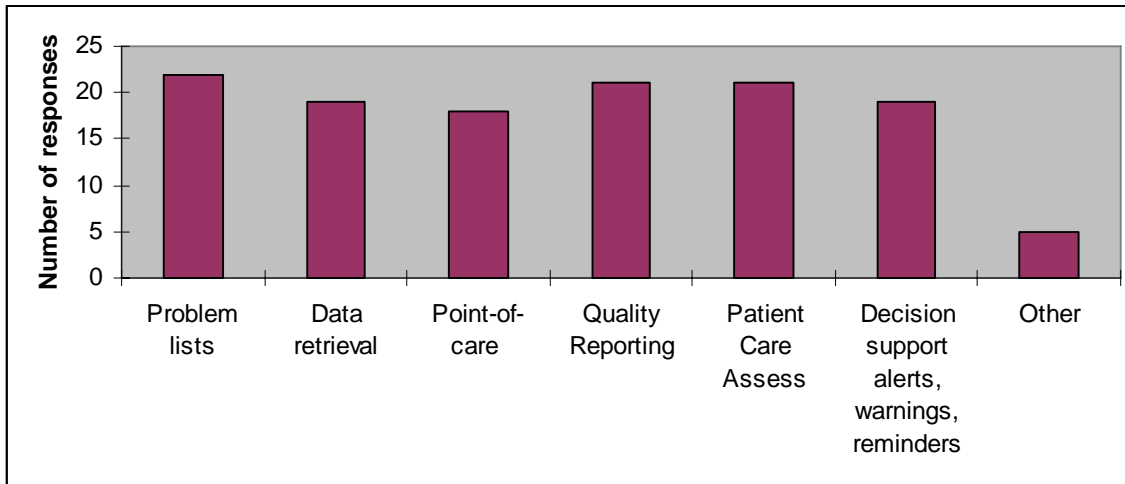
Note: Percentages do not total 100% due to rounding.

Figure 3**Applications for SNOMED CT in EHR Systems ($N = 34$)**

Note: Respondents were not limited to only one choice.

Figure 4

SNOMED CT Uses in EMR/EHR Applications



Note: The total is more than 100% because respondents were able to select more than one purpose.