# Component 14: Vendor-Specific Systems

## Instructor Manual

### Version 3.0/Spring 2012

**Notes to Instructors**

This Instructor Manual is a resource for instructors using this component. Each component is broken down into units, which include the following elements:

- Learning objectives
- Suggested student readings, texts, reference links to supplement the narrated PowerPoint slides
- Lectures (voiceover PowerPoint in Flash format); PowerPoint slides (Microsoft PowerPoint format), lecture transcripts (Microsoft Word format); and audio files (MP3 format) for each lecture

**Self-assessment questions reflecting Unit Objectives with answer keys and/or expected outcomes**
- Application Activities (e.g., discussion questions, assignments, projects) with instructor guidelines, answer keys and/or expected outcomes

# Contents

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*Likewise, the above also applies to the Curriculum Development Centers (including Columbia University, Duke University, Johns Hopkins University, Oregon Health & Science University, University of Alabama at Birmingham, and their affiliated entities).*

**Component Overview**

This component will provide an in-depth discussion in Vendor-Specific Systems, focusing specifically in areas such as system and database architectures used in commercial Electronic Health Records (EHRs), vendor strategies for terminology, knowledge management, ways to assess decision support capabilities in EHRs, and finally vendor-specific training (go-live strategies).

**Component Objectives**

At the completion of this component, students will be able to:

- Assess and compare common commercial EHR systems using KLAS ratings in training and organizational decision-making contexts.
- Apply CCHIT, meaningful use, Joint Commission and National Patient Safety Goals to decisions about commercial EHR vendor selection, when given typical workplace scenarios.
- Evaluate key factors (costs of an EHR, including capital, licensing, maintenance and staffing, and stakeholder needs) into workplace decisions for selecting vendor-specific systems
- Analyze the functionality of a vendor EHR system, given a set of user needs
- Compare database architectures employed by different vendor applications to evaluate how these impact performance and extensibility
- Evaluate EHR systems based on vendor strategies for terminology management, knowledge management and data exchange
- Compare decision support capabilities and customizability, given different vendor EHRs
- Evaluate training and go-live strategies of different EHR vendors in terms of impact on cost, workflow, and patient safety.

## Component Authors

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## Component 14/Unit 1

**Unit Title**
**Common Commercial Electronic Health Record (EHR) Systems Used in Ambulatory and Inpatient Care Settings**

**Unit Description**
This unit will provide an introduction to common commercial electronic health record systems used in ambulatory and in patient care, and provide ratings to facilitate organizational decision making.

**Unit Objectives**
By the end of this unit, the student will be able to:
1. Describe the most common commercial electronic health record (EHR) systems used in ambulatory and inpatient care settings
2. List Health Information and Management Systems Society (HIMSS) resources available on EHR systems
3. Describe functions and applications of HIMSS resources available on EHR systems
4. Describe functions and applications of KLAS ratings available on EHR systems
5. Apply KLAS rating system to evaluate software selections for ambulatory and acute care EHRs.
6. Provide a summary of inpatient and ambulatory vendors

**Unit Topics / Lecture Titles**
1. Common commercial electronic health record (EHR) systems used in ambulatory and inpatient care settings.
2. Health Information and Management Systems Society (HIMSS)
3. KLAS ratings
4. Summary of inpatient and ambulatory vendors

**Unit References**
(All links accessible as of 1/1/2014)

**Websites**
1. Retrieved June 20, 2010, from http://www.epic.com
2. Retrieved June 20, 2010 from http://www.cerner.com
3. Retrieved June 20, 2010 from http://www.meditech.com

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4. Retrieved June 20, 2010 from http://www.eclipsys.com
5. Retrieved June 20, 2010 from http://www.himss.org
6. Retrieved June 20, 2010 from http://www.klasresearch.com

**Suggested Readings**
None

**Student Application Activities**
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## Component 14/Unit 2

**Unit Title**
**Certification of Commercial EHRs**

**Unit Description**
This unit will focus on quality of certification of commercial EHRs, and how to apply Certification Commission for Health Information Technology (CCIHT), Joint Commission and National Patient Safety goals to decisions about commercial EHR vendor selections.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Describe the Certification Commission for Health Information Technology (CCHIT) and its role in the certification of commercial EHRs
2. Describe or give examples illustrating how CCHIT criteria are used for certification of HER systems
3. Identify the benefits of 'meaningful use' of EHRs and identify examples of 'meaningful use' of EHRs in given scenarios
4. Identify the three stages of implementation requirements for 'meaningful use' of EHRs
5. Identify the role of governing bodies certifying commercial EHRs, including FDA oversight, the Joint Commission, and National Patient Safety Goals

**Unit Objectives**
1. Certification of commercial Electronic Health Records (EHR)
2. CCHIT
3. Meaningful use
4. Safety/FDA oversight/Joint Commission/National Patient Safety Goals

**Unit References**
(All links accessible as of 1/1/2014)

**Websites**
1. Retrieved June 15, 2010 from http://healthit.hhs.gov/portal/server.pt *
2. Retrieved June 15, 2010 from http://www.cchit.org
3. Retrieved June 15, 2010 from http://www.jointcommission.org

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4. Office of the National Coordinator for Health Information Technology, Department of
5. Health and Human Services. (2010). Establishment of the temporary certification program for health information technology: Department of Health and Human Services. Retrieved June 15, 2010 from http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__home/1204*
6. Egerman P, Probst M. (2010). Adoption-Certification Letter HIT Safety: HIT Policy
7. Committee to the National Coordinator for Health IT. Retrieved June 15, 2010 from healthit.hhs.gov/...0.../2011-07-06_policy_transcript_final.pdf

## Suggested Readings

### Websites
1. Certification Commission for Health Information Technology http://www.cchit.org/
2. US Department of Health & Human Services (ONC): Meaningful Use and Standards
3. and Certification Resources http://healthit.hhs.gov/portal/server.pt*

## Student Application Activities
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## Component 14/Unit 3

**Unit Title**
**How Do Organizations Select an EHR? Lessons From the Front Lines**

**Unit Description**
This unit will evaluate key factors (costs of an EHR, including capital, licensing, and maintenance and staffing, and stakeholder needs) into workplace decisions for selecting vendor-specific systems.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Demonstrate concept knowledge of the RFP process
2. Identify the key stakeholders involved in EHR selection and the roles they each play
3. Identify and give examples of the categories of project costs when selecting vendor-specific EHR systems
4. Analyze the financial components that strengthen an EHR vendor
5. Identify the key steps in the selection process for choosing a vendor HER

**Unit Topics / Lecture Titles**
1. How do organizations select an Electronic Health Record? Lessons from the Front Lines
2. RFP process
3. Stakeholders involved
4. Cost (capital, licensing, maintenance, staffing)
5. Financial strength of vendor

**Unit References**
(All links accessible as of 1/1/2014)

**Website:**
1. Wheaton, G. (2008). Request for proposal. Retrieved June 22, 2010 from http://epiqtech.com/request-for-proposal-rfp.htm
2. Request for proposal. (n.p). In Wikipedia.  Retrieved June 22, 2010, from http://en.wikipedia.org/wiki/Request_for_proposal
3. Request for proposal. (n.p). In Wikipedia.  Retrieved June 22, 2010, from http://en.wikipedia.org/wiki/Stakeholder_(corporate)

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4. Request for proposal. (n.p). In Wikipedia.  Retrieved June 22, 2010, from http://en.wikipedia.org/wiki/Stakeholder_theory
5. Aspuro, M. (1998). Supplier financial analysis: by the numbers. Retrieved June 22, 2010 http://www.ism.ws/pubs/proceedings/ confproceedingsdetail.cfm?ItemNumber=10797

**Unit Suggested Readings**
None

**Student Application Activities**
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## Component 14/Unit 4

**Unit Title**
**Electronic Health Record Functionality**

**Unit Description**
This unit will analyze the functionality of a vendor EHR system, given a set of user needs.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Describe EHR functionality of Results Review
2. Describe the EHR functionality of Computerized Provider Order Entry (CPOE)
3. Describe the EHR functionality of Documentation
4. Describe the EHR functionality of Messaging among different vendor systems
5. Describe the procedures for billing supported by EHR vendor systems.

**Unit Topics / Lecture Titles**
1. Results Review
2. Computerized Provider Order Entry (CPOE)
3. Documentation
4. Messaging
5. Electronic Health Record Functionality

**Unit References**
(All links accessible as of 1/1/2014)

**Websites**
Retrieved June 15, 2010 from http://healthit.hhs.gov/portal/server.pt

**Book**
1. Armstrong, C. W. (2000). American Hospital Association guide to computerized physician order-entry systems. Chicago, IL: American Hospital Association

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**Unit Suggested Readings**

**Book**
1. Armstrong, C. W. (2000). American Hospital Association guide to computerized physician order-entry systems. Chicago, IL: American Hospital Association

**Student Application Activities**
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# Component 14/Unit 5

**Unit Title**
**System and Database Architectures Used in Commercial EHRs**

**Unit Description**
This unit will compare database architectures employed by different vendor applications, for fulfilling different user purposes.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Demonstrate concept knowledge of system and database architectures used in commercial EHRs
2. Describe the health information systems landscape, including CPOE, Pharmacy, Lab, etc.
3. Identify the different EHR hardware platforms
4. Compare different EHR operating systems and databases
5. Explain the importance of security, privacy, auditing and performance monitoring in EHRs

**Unit Topics / Lecture Titles**
A. EHR modules and the health information systems landscape (CPOE, Pharmacy, Lab, etc.)
B. Thick/thin client (Citrix, Web)
C. Operating systems, databases (SQL Server, Oracle, Cachet)
D. Security, auditing, performance monitoring

**Unit References**
(All links accessible as of 1/1/2014)

**Websites**
1. Corman, R. (2011). Prototype dashboard for real-time monitoring of EHR system use and performance. Corman Technologies, INC. Santa Rosa, CA. http://www.cormtech.com/examples.html (Slide32)
2. Electronic health records for the primary care providers. (2007). The New York City Department of Mental Hygiene: City Health Information, vol.26(1), p.1-6. Retrieved on August 25th, 2011 from http://www.nyc.gov/html/doh/downloads/pdf/chi/chi26-1.pdf
3. Pricing structure (2011). Retrieved from eClinicalWorks on August 25th, 2011 from http://www.eclinicalworks.com/products-pricing.htm

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4. Summary of HIPAA Security Rules. Retrieved from U.S Department of Health and Human Services: Health Information Privacy on August 25th, 2011.
5. Notice of Proposed Rulemaking to Implement HITECH Act Modifications. Retrieved from U.S Department of Health and Human Services: Health Information Privacy on August 25th, 2011. http://www.hhs.gov/ocr/privacy/hipaa/understanding/coveredentities/hitechnprm.html

**Journals/Book**

1. Hripcsak et al. Use of electronic clinical documentation: time spent and team interactions. J Am Med Inform Assoc. 2011 Mar-Apr;18(2):112-7. (Slide 30)
2. AHIMA e-HIM Work Group on Security of Personal Health Information. "Ensuring Security of High-Risk Information in EHRs" Journal of AHIMA 79, no.9 (September 2008): 67-71.

**Images**

Slide 4 - Vawdrey, D. (2011). Sample EHR architecture. Department of Biomedical Informatics, Columbia University Medical Center.
Slide 7 - Vawdrey, D. (2011). Example of EHR hardware configuration. Department of Biomedical Informatics, Columbia University Medical Center.
Slide 11 - Vawdrey, D. (2011). Hypothetical Relational Database Model. Department of Biomedical Informatics, Columbia University Medical Center.
Slide 13 - Vawdrey, D. (2011). Hypothetical Relational Database Model. Department of Biomedical Informatics, Columbia University Medical Center.
Slide 15 - HiMSS online buyer's guide (2011). Retrieved from Health Information and Management Systems Society on August 23, 2011 http://onlinebuyersguide.himss.org/
Slide 16 - Retrieved from KLAS on August 23, 2011. http://www.klasresearch.com
Slide 19 - EpicCare impatient EMR-KLAS Performance Ratings. (2011). Retrieved from KLAS on August 23, 2011, http://www.klasresearch.com/Vendors/OnlinePerformanceRatings.aspx
Slide 21 - Eclipsys Sunrise Clinical Manager: KLAS performance ratings. (2011). Retrieved from KLAS on August 23, 2011, http://www.klasresearch.com/Vendors/OnlinePerformanceRatings.aspx

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Slide 22 - QuadraMed CPR: KLAS Performance Ratings. (2011). Retrieved from KLAS on August 23, 2011, http://www.klasresearch.com/Vendors/OnlinePerformanceRatings.aspx
Slide 23 - NextGen EMR: KLAS Performance Ratings. (2011). Retrieved from KLAS on August 23, 2011, http://www.klasresearch.com/Vendors/OnlinePerformanceRatings.aspx

**Unit Suggested Readings**
*None*

**Student Application Activities**
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## Component 14/Unit 6

**Unit Title**
**Vendor Strategies for Terminology, Knowledge Management, and Data Exchange**

**Unit Description**
This unit will evaluate EHR systems based on vendor strategies for terminology management, knowledge management and data exchange.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Define interoperability
2. Describe vendor strategies for terminology and knowledge management and how these impact interoperability
3. Describe processes and requirements for exchanging data with personal health records

**Unit Topics / Lecture Titles**
A. What is interoperability?
B. Clinical knowledge sources (EBM) - Advanced clinical automation systems
C. Clinical Measurement - from Discern Expert to HealthFacts
D. Exchanging data with personal health records (PHRs)

**Unit References**
(All links accessible as of 1/1/2014)

**Websites**
1. Halamka, D.J. (2011). Interoperability. Retrieved from Health Information Technology Standards Panel (HITSP) on September 4th, 2011. http://www.hitsp.org/Halamka.aspx
2. Health Level Seven (2007). Data definition tables: Final Standard. Retrieved on September 5th, 2011 from http://www.hl7.org/special/committees/vocab/V26_Appendix_A.pdf
3. Wagsness, L. (2009). Electronic health records raise doubt. Retrieved on August 20th, 2011 from The Boston Globe. http://www.boston.com/news/nation/washington/articles/2009/04/13/electronic_health_records_raise_doubt/

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**Journals/Book**

1. Walker et al. Inviting patients to read their doctors' notes: patients and doctors look ahead: patient and physician surveys. Ann Intern Med. 2011 Dec 20;155(12):811-9.

**Images**

Slides 10 and 12 - Retrieved on August 20th, 2011 from
www.icd9data.com/2012/Volume1/390-459/410-414/410/default.htm
Slide 13 - Retrieved on August 20th, 2011 from
http://search.loinc.org/search.zul?query=glucose

**Unit Suggested Readings**
*None*

**Student Application Activities**
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## Component 14/Unit 7

**Unit Title**
**Assessing Decision Support Capabilities of Commercial EHRs**

**Unit Description**
This unit will compare decision support capabilities and customizability, given different vendor EHRs.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Understand the importance of clinical decision support systems
2. Describe decision support capabilities and customizability of different vendor EHRs

**Unit Topics / Lecture Titles**
A. Basic Clinical Decision Support
B. Custom Clinical Decision Support
C. Medical Logic Modules (MLMs)
D. Case Study: Eclipsys Sunrise: Helios Open Architecture for Custom Development

**Unit References**
(All links accessible as of 1/1/2014)

**Journals/Book**
1. McDonald, CJ. (1976). Protocol-based computer reminders, the quality of care and the non-perfectability of man. N Engl J Med; 295(24): 1351-5.
2. Shortliffe, E.H. (1987). Computer programs to support clinical decision making. JAMA, vol.258(1), p61-66.
3. Shortliffe, E.H. (1976). Computer-Based Medical Consultations: MYCIN, Elsevier/North Holland, New York.
4. Miller, A.R., Pople, E.H., Myers, D.J. (1982). Internist-I, and experimental computer-based diagnostic consultant for general internal medicine. New England Journal of Medicine, vol307 (8), p.468-476.

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5.  Wright AB et al. Creating and sharing clinical decision support content with Web 2.0: Issues and examples. J Biomed. Inf. (42:2), 2008, 334-346

6.  Miller RA., and Masarie FE Jr. (1989). Use of the Quick Medical Reference (QMR) program as a tool for medical education. Methods Inf Med.;28:340-345.

7.  Shortliffe, E.H. (1976). Computer-Based Medical Consultations: MYCIN, Elsevier/North Holland, New York

8.  Barnett, O.G., Cimino, J.J., Hupp, J.A., Hoffer, E.P. (1987). Dxplain: an evolving diagnostic decision –support system. JAMA, vol258 (1), p.67-74.

9.  Eddy, D.M. (1990). Anatomy of a decision. JAMA, vol.263(3), p.441-443.

10. Sittig, D.F., Teich, J.M., Osheroff, J.A., Singh, H. (2009). Improving Clinical Quality Indicators Through Electronic Health Records: It Takes More Than Just a Reminder. Pediatrics, 124;375.

**Images:**
Slides 14, 19 - Vawdrey, D. (2010). Personal syntax: example of MLM. Department of Biomedical Informatics at Columbia University Medical Center.
Slides 23, 24, 25 - Vawdrey, D. (2010). Clinical workflow alert system. Department of Biomedical Informatics, Columbia University Medical Center.
Slide 26 - Vawdrey, D. (2010). Integrated billing solution: technical architecture. Department of Biomedical Informatics at Columbia University Medical Center

**Unit Suggested Readings**
*None*

**Student Application Activities**
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# Component 14/Unit 8

**Unit Title**
**EHR Go-Live Strategies**

**Unit Description**
This unit will evaluate training and go-live strategies of different EHR vendors in terms of impact on cost, workflow, and patient safety.

**Unit Objectives**
By the end of this unit the student will be able to:
1. Describe characteristics of training and go-live strategies that would facilitate implementation of a new Electronic Health Record (EHR) system
2. Compare the advantages and disadvantages of a big-bang roll-out versus a phased roll-out and vice-versa
3. Identify staffing, command center and on-site consultant considerations
4. Compare strategies for monitoring system usage and change management

**Unit Topics / Lecture Titles**
A. Big-bang vs. phased roll-out
B. Staffing, command center, on-site consultants
C. Monitoring system usage
D. Change management

**Unit References**
(All links accessible as of 1/1/2014)

**Websites**
1. McNamara, C. (n.d.). Organizational Change and Development (Managing Change and Change Management). Free Management Library. Retrieved on August 10th, 2011 from http://www.managementhelp.org/mgmnt/orgchnge.htm
2. Wikipedia. (2011). Change management. Retrieved on August 10th, 2011 from http://en.wikipedia.org/wiki/Change_management
3. Wikipedia. (2011). Change control. Retrieved on August 10th, 2011 from http://en.wikipedia.org/wiki/Change_control

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**Unit Suggested Readings**
*None*

**Student Application Activities**
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**Component Acronym Glossary**

AAP- American Academy of Pediatrics
ACP- American College of Physicians
AHIMA- American Health Information Management Association
AIX-Advanced Interactive Executive
AMI-Acute myocardial infarction
CCD- Continuity of Care Document
CCHIT- Certification Commission for Health Information Technology
CCR- Continuity of Care Record
CDR- Clinical Data Repository
CFO- Chief financial officer
CPOE- Computerized Physician Order Entry
CPT- Current Procedural Terminology
CPT-4- Current Procedural Terminology
DBA- database administrator
DEC PPD-11- Digital Equipment Corporation's Programmed data
Processor 11
FDA- Food and Drug Administration
Ghz- Gigahertz
HIMSS- Healthcare Information and Management Systems Society
HITSP- Health Information Technology Standards Panel
HP-UX- Hewlett Packard Unix
IBM DB2- International Business Machines Database 2
ICA- Independent computing architecture
JAMA- Journal of the American Medical Association
KLAS- Name of a health IT research firm (based on founders' first initials)
LDS Hospital- Latter Day Saints Hospital (Intermountain Healthcare)
LOINC- Logical Observation Identifiers Names and Codes
MAR- Medication administration record
MLMs- Medical Logic Modules
MUMPS- Massachusetts General Hospital Utility Multi-Programming
System
MYCIN- Original name is EMYCIN no abbreviations defined
NAHIT- National Alliance for Health Information Technology
NASDAQ- National Association of Securities Dealers Automated
Quotations
NDC- National Drug Code (directory)
Open VMS platforms- Open virtual memory systems platforms
OTPS-Other than personal costs

PACS- Picture archiving communication system
QMR- Quick Medical Reference
RAM- Random access memory
RFI- Request for information
RFP- Request for proposal
RFQ- Request for qualifications or Request for Quotation
SNOMED-CT- Systematized Nomenclature of Medicine
SQL- Structured Query language
TCP/IP- Transfer Control Protocol/Internet Protocol
TEPR- Toward the Electronic Patient Record (a type of conference)
UAI- Universal Application Integrator
V Lan- Virtual local area network
VIP- Very important person
XML- Extensible Markup Language
Y2K- 'the year 2000'