

Component 9 - Networking and Health Information Exchange

Unit 7-1 - Supporting Standards for EHR Application

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Unit 7 Objectives

- · Understand:
 - Family of clinical decision support standards, including Arden Syntax, GELLO, and the Infobutton
 - Clinical Guideline standards
 - Single sign-on standards and the HL7 Clinical Context Object Workgroup (CCOW) standard
 - Regulatory standards and standards enhancing patient safety, including reporting requirements
 Bar Code standards

 - Standards for master patient index, patient registries, and record locating standards

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Clinical Decision Support (CDS)

- · Apply information technology to address, in a systematic manner, questions (and other information needs) that arise during patient care and clinical research
- Seek to improve clinical and public health outcomes. CDS can inform and alter healthcare decisions, and standardize decisions and procedures for clinical research

CDS (1/2)

- Provide concise, accurate, and unambiguous factual information (accepted, scientific knowledge or consensus expert opinions) and advice containing evidence and recommendations
 Address information needs at the point and time of decision-making
 Require computer-based representations of general medical knowledge (content or domain knowledge), application-specific decision logic (clinical algorithms), and accurate, standardized representations of current patient data and clinical states

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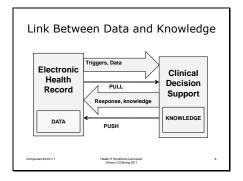
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CDS (2/2)

- Uses knowledge bases derived primarily from the peer-reviewed, scientific literature; carefully derived expert consensus may suffice; and evidence-based knowledge obtained for clinical data with outcomes
- Data mining, including patient signs and symptoms, clinical data, decisions, treatment and outcome is rapidly becoming a major source of knowledge.

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Slide 7	Some Decision Support Tools • Knowledge reference framework and knowledge representation - Arden Syntax - GELLO • Clinical Guidelines - Guideline Interchange Format (GLIF) [HL7] - Guideline Elements Model (GEM) [ASTM] • Disease Management Protocols • Infobutton [HL7] • Evidence-Based Care Plans Compart Market 12 Market Carelle 100		
Slide 8	Arden Syntax Is an HL7/ANSI Standard Current version is 2.7 Arose from the need to make medical knowledge available for decision making at the point-of-care Makes the knowledge and logic explicit Allows sharing within and between institutions Standardizes the way medical knowledge is integrated into health information systems		
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Medical Logic Module (MLM)

- MLM is a stream of text stored in an ASCII file in statements called slots
- Slots consist of
 - Slotname
 - Slotbody
- Slots are grouped into three categories:
 - Maintenance

 - LibraryKnowledge

Maintenance Example

maintenance: title: Contrast CT study in patient with

maintenance:
title: Contrast CT study in pa
renal failure;;
filename: ct_contr.mlm;;
version: 1.00;
institution: Duke Medical Center;;
author: John Doe, MD;;
specialist: Jane Doe, MD;;
date: 2010-09-11;
velidation: lesting: validation: testing;;

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Library Example

library: purpose: To alert the health care provider of new or worsening serum creatinine level.;; explanation: If the creatinine is at or above a threshold (1.35 mg/dl), then an alert...;; keywords: renal insufficiency; renal failure;; citations: Proceedings of the Fifteenth Annual Symposium on Computer Applications in Medical Care; 1991 Nov 17-20; Washington, D.C. New York: IEEE Computer Society Press, 1991.;; links: URL "NLM Web Page", http://www.nlm.nih.gov/;

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Knowledge Example

- Type
 Coded and required
 - Presently only one type slot defined
 Type: data_driven
- "data_driven"
- uata_uriveri

 Implies that these slots follow:
 Data
 Priority
 Evoke
 Logic
 Action
 Urgency

Data Slot

- Terms in the MLM that are matched to terms in the database
- Use of { } implies flexibility in mapping to the institution's local database
- Mapping terms in this way separates the logic in the MLM from institution-specific information

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Data Slot

- Read statement
 - Without an operator
 - Obtains a list of values from the database
 - With an operator
 - Obtains a single value from the database
- · Examples of operators
 - First, last, min, max, count, average, sum

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Evoked Slot

- Triggers an MLM
- Example
 - The occurrence of an event
 - Timed execution after an event
 - Periodic repetition after an event
 - Direct call from another MLM

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Slide 16	Evoked Slot - Example
	data: creatinine_storage := event {'32506','32752'; /* isolated creatinine */'32506','33801'; /* chem 20 */);
	evoke: creatinine_storage;;
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Slide 17	Evoked Slot – More Examples
	Evoke: 3 days after time of creatinine storage;
	Evoke: every q day for 7 days starting at time of creatinine storage;

Logic Slot

 Evoke: every 1 day starting at time of K_storage until K>=3;

- Set of medical criteria
- Logical algorithm
- Ends with a "conclude statement"

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Logic Slot – Looping Statements

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While <expr> do <block> enddo;

for <expr> do <block> enddo;

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Slide 21 Logic Slot - Call Statements • var1 := call my_mlm with param1, param2; • var1 := call my_event with param1, param2; • var1 := call my_interface_function with param1, param2;

Example - Call Statements

/* Define find_allergies external function*/
find_allergies := INTERFACE
(\RuleServer\Allergy\Rules\try, institution\find_allergies.exe);
/* Lists two medications and their allergens */
med_orders=("PEN-G", "aspirin");
med_allergens:=("penicillin", "aspirin"); med_allergens=('penicillin', 'aspirin');

/* Lists three patient allergies and their reactions 1'
patient_allergies=('milk', 'codeline', 'penicillin');
patient_reactions=('hives', NULL, 'anaphylaxis');

/* Passes 4 arguments and receives 3 lists as values 1'
(meds_allergens, reactions)= call find_allergies with
med_orders, med_allergens, patient_allergies, patient_reactions;

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Conclude Statement

- · conclude true;
 - Terminate the rule
 - Go to the action slot
- · conclude false;
 - Terminate the rule
 - Do not go to the action slot

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Logic Slot - Example

if last_creat is not present then
alert_text := "No recent creatinine available.
Consider ordering creatinine before giving IV
contrast.";
conclude true;
elseif last_creat > 1.5 then
alert_text := "No recent creatinine available.
Consider ordering creatinine before giving IV
contrast.";
conclude true;
else conclude false;

Action Slot

- Carries out action if logic slot concludes
 true
- · Examples of actions
 - Write message to screen
 - Store a message in a file
 - Call another medical logic module

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Action Slot - Example

action:

write "Last creatinine: " || last_creat
" on: " || time of last_creat;

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Action Slot - Example

data:

ed_email := destination 'ed@duke.edu';

action:

write at ed_email "Patient who may qualify for study registered today. Pt #: "|| patient_no;

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Urgency Slot

- Determines importance of action if MLM concludes true
- Coded slot with value from 1 (low urgency) to 99 (high urgency)

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MLM - Time and Duration

- Time data refers to points in time (time stamp)
- Duration is an interval of time
 - Duration expressed as years, months, days, hours, minutes, seconds
- Comparisons using time and duration

ctime» is before <time>;
<time> is after <time>;
<time> is equal <time>;
<time> is equal <time>;
<time> is within <time> to <time>;
<time> is within <todynamoral columne;
<time> is within <todynamoral columne;
<time> is within the past <duration>

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Operators

- Assignment: potassium :
- = 3.3
- Comparison: =(EQ),>(GT),<(LT),>=(GE).<=(LE),<>(NE)
- Logical and, or, not
- Mathematical
 - + * / () abs int sqrt log exp sine cosine tangent arcsin arccos arctan

Summary

In this subunit:

- Introduced the Arden Syntax which has been around for a long period of time.
 The Arden Syntax is easy to use and has the Arden Syntax is easy to use and has the Arden Syntax is easy to use and has the Arden Syntax is easy to use and has the Arden Syntax is easy to use and has the Arden Syntax is easy to use and has the Arden Syntax is easy to use and has the Arden Syntax which has been around for a long period of time.
- considerable power

 One of the complaints of Arden Syntax is that it does not handle complex expressions, particularly those involving timing such as intervals after other events
