Managing Nutrition Support in the EHR Era – We're All in this Together!

Clinical Nutrition Week 2017

Sponsored by ASPEN Clinical Nutrition Informatics Committee (CNIC)

Tuesday, 2/21/2017

9:45 am to 11:15 am

Managing Nutrition Support in the EHR Era – We're All in this Together!

1. Are EHR's Improving in Safety and Efficiency?

    Vincent Vanek, MD, FACS, FASPEN

2. How can we get EHRs to talk to one another?

    Margaret Dittloff, MS, RDN

3. What are the Key Functionalities Necessary in EHRs to Safely Provide Parenteral Nutrition (PN) to our Patients?

    Phil Ayers, PharmD, BCNSP, FASHP

Are EHR's Improving in Safety and Efficiency?

Vincent Vanek, MD, FACS, FASPEN

- Regional Medical Informatics Officer, Mercy Health of Ohio
- Chair ASPEN Nutrition Clinical Informatics Committee

Disclosures

I have no commercial relationships to disclose

Learning Objectives

1. Discuss the methodology of the A.S.P.E.N./Academy EHR Survey
2. Review the findings of the A.S.P.E.N./Academy EHR Survey
3. List the recommendations from the A.S.P.E.N./Academy EHR Survey

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Agenda

1. Brief History behind EHR Implementations
2. Steps in Implementing an EHR
3. Methodology of Initial and Follow Up ASPEN EHR Surveys
4. Findings of the ASPEN EHR Surveys
5. Example of Nutrition Enhancements in an EHR
6. Recommendations from the ASPEN EHR Surveys

History Behind EHR Implementations

- 1991 – IOM calls for transition to EHR within 10 years
- 1996 – HIPPA (initially introduced to standardize electronic healthcare transactions and nation identifiers for providers)
- 1999 – VA implemented EHR (VistA)
- 2000 – IOM published "*To Err Is Human: Building a Safer Health System*" (44,000-98,000 deaths in U.S./yr due to medical errors)
- 2004 – President Bush established National Coordinator for Healthcare Information Technology (ONCHIT) – charged with developing & implementing an interoperable HIT infrastructure to improve quality and efficiency; set goal to have all Americans treated with EHR by 2014
- 2008 – 11% of non-federal U.S. hospitals had basic EHR and < 2% comprehensive EHR

History Behind EHR Implementations

- 2006 – Housing Market "Bubble Busted"
- 2008 – "late-2000s recession,", "Great Recession," "the Lesser Depression," or "the Long Recession"
- 2/2009 – American Recovery and Reinvestment Act (ARRA) – $787 billion (subsequently increased to $840 billion) in tax cuts and benefits, funding of entitlement programs and unemployment benefits, and funding federal contracts, grants, and loans
- 2/2009 – Health Information Technology for Economic and Clinical Health (HITECH) Act part of ARRA – $19 billion

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History Behind EHR Implementations

- 2/2009 – HITECH Act – "Carrot and Stick" approach to getting providers and hospitals to implement EHRs:
  - ✓ "Carrot" – starting in 2010 federal government to provide incentive payments for implementing or having an EHR
    - ➤ Hospitals up to $11 million over 3 years
    - ➤ Provider Offices up to $44,000/provider over 3 years
  - ✓ "Stick" – starting in 2015 Medicare decreases reimbursements 1% with an additional 1% each year to maximum of 5% if do not have an EHR
  - ✓ EHR Must Meet Meaningful Use (MU) to obtain incentive payments or avoid penalties – implemented in Stages, i.e. Stage 1, Stage 2, and Stage 3

History Behind EHR Implementations

- 2015 – Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) – switches from the Sustainable Growth Rate formula to calculate reimbursement to the Quality Payment Program ("Value Based Care Payment")
  - ✓ Advanced Alternative Payment Models (APMs)
  - **OR**
  - ✓ Merit-based Incentive Payment System (MIPS)
- Data collection starts in 2017 payment adjustments start in 2019
- Meaningful Use will be rolled into the above payment models

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Steps in Implementing an EHR
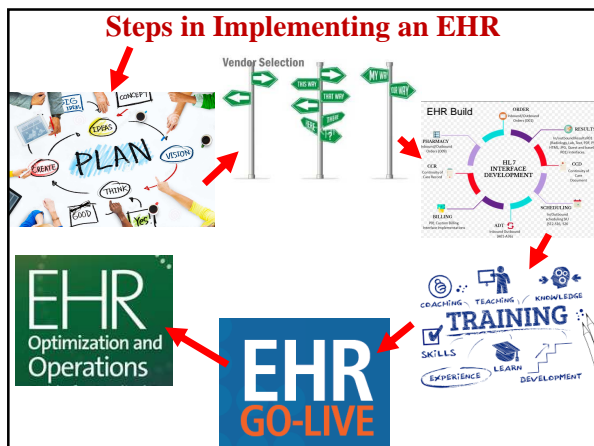
Methodology of Initial and Follow Up ASPEN EHR Surveys

- 2/2012 – Initial EHR Survey – surveyed all ASPEN members from 2/1/2012 to 2/22/2012 [1]
- 7/2014 – ASPEN formed the Clinical Nutrition Informatics Committee (CNIC)
- 9/2014 to 1/2015 – Follow Up EHR Survey – CNIC decided to conduct a follow up EHR survey and expand to members of other nutrition societies as well [2]

1. Vanek VW. NCP, 2012, 27(6):718-737
2. Vanek VW et al. NCP, 2016, 31(3):401-415

Methodology of Initial and Follow Up ASPEN EHR Surveys

- Survey Monkey link emailed to potential participants
- Survey consisted of 20 questions
  - ✓ 6 Questions – Discipline, Country, Setting, How long in nutrition support?, What EHR do you use and how long have you used it?
  - ✓ **5 Questions – Rate the safety and effectiveness of: 1) Nutrition documentation, 2) Ordering oral diets, 3) Ordering oral nutrition supplements (ONS), 4) Ordering tube feedings (EN), 5) Ordering parenteral nutrition (PN)**
  - ✓ 2 Questions – What do you like best and least about the nutrition content of your EHR (free text fields)
  - ✓ 7 Questions – different between surveys
    - ➢ Initial Survey - who enters nutrition orders
    - ➢ Follow up Survey – specific questions about PN ordering and one question on time to complete work before and after EHR

Responses to the safety and effectiveness questions of the 5 different Nutrition Content Areas in the ASPEN EHR Survey

1. Highly safe and effective
2. Moderately safe and effective
3. Usually safe and effective, but opportunities for improvement
4. Needs improvement before I would consider it completely safe and effective
5. Serious safety and effectiveness concerns and needs urgent changes

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Responses to the safety and effectiveness questions of the 5 different Nutrition Content Areas in the ASPEN EHR Survey

FAVORABLE RESPONSES

1. Highly safe and effective
2. Moderately safe and effective

UNFAVORABLE RESPONSES

3. Usually safe and effective, but opportunities for improvement
4. Needs improvement before I would consider it completely safe and effective
5. Serious safety and effectiveness concerns and needs urgent changes

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Response Rates for the ASPEN EHR Surveys

Nutrition Societies	Response Rates
2012 Initial EHR Survey	
• ASPEN members only	864/5,810 (14.9%)
2014 Follow EHR Survey	
• ASPEN Members	393/6,179 (6.4%)
• Non-ASPEN Members in Database	236/33,165 (0.7%)
• American Society for Nutrition [1]	28/2,189 (1.3%)
• Academy of Nutrition and Dietetics [2]	468/8,559 (5.5%)
TOTAL	1,989/55,902 (3.6%)

NOTE: Individuals in 2014 Survey of other nutrition organizations were instructed to not respond if they had already received the survey as a member of another nutrition society
[1] Medical Nutrition Council members only – includes ASN members who practice clinically
[2] Clinical Nutrition Managers, Dietitians in Nutrition Support, Medical Nutrition Practice Group, and Pediatric Nutrition Dietetic Practice Group

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Background Information from the ASPEN EHR Survey

	2012-ASPEN	2014 - ASPEN	2014-Non-ASPEN
Discipline			
• Dietitian	676 (78%)	315 (80%)	660 (90%)
• Physician	98 (11.5%)	51 (13%)	28(4%)
• Pharmacist	51 (6%)	11 (3%)	30 (4%)
• Nurse/NP	35 (4%)	14 (3.5%)	9 (1%)
• Not specified	4 (0.5%)	2 (0.5%)	5 (1%)
Located in U.S.	790 (91%)	371 (94%)	671 (92%)
Practice Setting			
• Hospital only	605 (70%)	291 (74%)	411 (56%)
• Outpt only	19 (2%)	8 (2%)	92 (13%)
• Both	189 (22%)	87 22%)	212 (29%)
• Home Care	51 (6%)	7 (2%)	17 (2%)
Time in Nutrition Support			
• 1-2 years	82 (9%)	43 (11%)	86 (12%)
• 3-5 years	118 (14%)	44 (11%)	77 (11%)
• 5-10 years	183 (21%)	67 (17%)	137 (18%)
• > 10 years	481 (56%)	239 (61%)	432(59%)
Currently Using EHR	742 (86%)	347 (94%) *	577 (90%)

* p< 0.05

Favorable Responses to 5 Nutrition Content Areas

- Favorable responses for each content area ranged from 44% to 62%
- None of the 2014 favorable responses were significantly better than the 2012 responses and Ordering ONS and Ordering PN were significantly lower
- 2014 Non-ASPEN favorable responses significantly higher compared to 2014 ASPEN favorable responses for Ordering PN
- TOTAL Responses –
  - o Ordering ONS significantly higher than other 4 areas
  - o Ordering Oral Diets significantly higher than Nutrition Documentation

	No. (%) Favorable Responses			
	2012-ASPEN	2014-ASPEN	2014-Non-ASPEN	TOTAL
No. Respondents	608	291	411	1,310
Nutrition Documentation	306 (50%)	137 (47%)	222 (54%)	665 (51%)
Ordering Oral Diets	345 (57%)	146 (50%)	232 (56%)	723 (55%) [1]
Ordering ONS	379 (62%)	158 (54%) [2]	240 (58%)	777 (59%) [3]
Ordering EN	339 (56%)	143 (49%)	225 (55%)	707 (54%)
Ordering PN	335 (55%)	128 (44%) [2]	220 (54%) [4]	683 (52%)

p<0.05 ordering oral diets responses significantly better compared with nutrition documentation but not significantly different from any other nutrition content areas
p<0.05 comparing 2014 ASPEN member survey vs 2012 ASPEN member survey
p<0.05 ordering oral nutrition supplements responses significantly better compared with each of the other 4 nutrition content areas
p<0.05 comparing 2014 A.S.P.E.N. member survey vs 2014 non-A.S.P.E.N. member survey

Comparison Favorable Responses by Discipline

- Combining all 3 survey groups from 2012 and 2014
- Only significant differences in discipline compared to all other disciplines combined was with Nutrition Documentation
  - ✓ Dietitians had a higher Favorable response rate
  - ✓ Pharmacists had a significantly lower Favorable response rate

	% Favorable Responses				
	Nutrition Documentation	Ordering Oral Diets	Ordering Oral Supplements	Ordering Tube Feedings	Ordering PN
Discipline					
Dietitian	571/1097 (52%) [1]	602/1097 (55%)	653/1097 (60%)	593/1097 (54%)	576/1097 (53%)
Physician	19/45 (42%)	27/45 (60%)	30/45 (67%)	28/45 (62%)	26/45 (58%)
Pharmacist	50/120 (42%) [2]	67/120 (56%)	67/120 (56%)	62/120 (52%)	55/120 (46%)
Nurse/NP	23/42 (55%)	25/42 (60%)	25/42 (60%)	22/42 (52%)	22/42 (52%)

[1] $p < .05$—discipline's score significantly better than the other disciplines listed combined.
[2] $p < .05$—discipline's score significantly worse than the other disciplines listed combined.

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Comparison Favorable Responses by Length of Time EHR in Use

- Combining all 3 survey groups from 2012 and 2014
- Only consistent differences across all 5 Nutrition Content Areas were:
  - ✓ Respondents using the EHR 1-3 years significantly more favorable responses than Respondents using EHR < 1 year
  - ✓ Respondents using the EHR > 10 years significantly more favorable responses than Respondents using EHR < 1 year

	% Favorable Responses				
	Nutrition Documentation	Ordering Oral Diets	Ordering Oral Supplements	Ordering Tube Feedings	Ordering PN
Length of Time EHR in Use					
< 1 year	56/166 (34%)	66/166 (40%)	69/166 (42%)	58/166 (35%)	59/166 (36%)
1-3 years	152/327 (46%) [1]	176/327 (54%) [1]	192/327 (59%) [1]	169/327 (52%) [1]	164/327 (50%) [1]
3-5 years	164/302 (54%)	162/302 (54%)	187/302 (62%)	168/302 (57%)	154/302 (51%)
5-10 years	178/319 (56%)	198/319 (62%) [1]	202/319 (63%)	207/319 (65%) [1]	191/319 (60%) [1]
> 10 years	115/196 (59%) [2]	121/196 (62%) [2]	127/196 (65%) [2]	122/196 (62%) [2]	112/196 (57%) [2]

[1] $p < .05$—group's responses significantly better than previous group.
[2] $p < .05$—>10-year group responses significantly better than the <1-year group.

Comparison Favorable Responses by Vendor

- Combining all 3 survey groups from 2012 and 2014
- KLAS is non profit organization that ranks EHR vendors each year – some re-arranging of vendor ranks from 2011 to 2014
- Most of the respondents used one of the two top ranked vendors
- Average Favorable responses for all 5 Nutrition Content Areas significantly correlated with the Vendor's KLAS Rank in 2014

KLAS Rank		EHR Vendor	No. Using Vendor	% Favorable Responses	
2011	2014			Average [1]	Range
1	1	A	387	60.0%	56%-63%
2	2	B	285	55.6%	49%-65%
4	3	D	92	52.8%	51%-54%
5	4	E	206	43.8%	41%-51%
3	5	C	54	55.6%	48%-61%
---	6	L [2]	39	40.2%	26%-54%
T6	---	F [2]	54	40.2%	30%-48%
T6	NR	G	5	60.0%	60%
NR	NR	H	27	33.4%	30%-37%
NR	NR	I	2	12.5%	0%-50%
NR	NR	J	4	30.0%	25%-50%
NR	NR	K	7	54.2%	43%-57%
NR	NR	M	23	50.6%	43%-57%

[1] Excluding the non-ranked vendors, the 2014 KLAS ranking significantly ($p < .01$) correlated to the EHR vendor's average favorable responses
[2] Same vendor but had a different EHR application in the 2012 survey (F) than in the 2014 survey (L)

Example of Enhancements in EHR

- Unpublished data - Mercy Health of Ohio – 19 hospitals
- All adult pts admitted 4th Quarter 2014
- Comparison pts with Admission Nutrition Screen (NS) positive vs. negative NS
- NS Pos. pts had higher hospital mortality, LOS, readmission rate, and hospital charges
- NS Pos. pts had higher frequency of Malnutrition Discharge Dx but still 86% had none
- Dietitian's Malnutrition Assessment was not recorded discretely so could not factor into analysis

	NS Negative	NS Positive	p Value
Number of Patients	27,621 (75%)	9,557 (25%)	---
Hospital Mortality	295 (1.1%)	287 (3.0%)	<0.0001
Discharge Diagnosis Malnutrition			
• None	26,875 (97.3%)	8,229 (86.1%)	<0.0001
• Other Malnutrition diagnosis	444 (1.6%)	672 (7.0%)	<0.0001
• Moderate or Severe Malnutrition	302 (1.1%)	656 (6.9%)	<0.0001
Financial/Clinical Outcomes			
• Hospital LOS (days), mean $\pm$ SD	4.11 ± 3.96	5.36 ± 4.60	<0.0001
• 30-Day Readmission Rate	1,724 (6.2%)	886 (9.3%)	<0.0001
• Total Hospital Charges, mean $\pm$ SD	$33,107 \pm $43,389	$35,891 \pm $42,299	<0.0001

Mercy Health of Ohio EHR Enhancements from Malnutrition Study

- Need to implement Mercy Health wide standardized Malnutrition Policy and Procedure
- Need to switch to a standardized, validated malnutrition screen on admission
- Need to standardize dietitian documentation and record discretely
- Improve accuracy of physician documentation regarding malnutrition such that can accurately code for and receive appropriate reimbursement for malnutrition

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SUMMARY

- All healthcare systems either have or soon will have an EHR
- The ASPEN EHR Survey should be a wake up call for EHR Vendors, EHR Programmers, EHR Implementation Teams, and Nutrition Clinicians that the Nutrition content of the current EHRs need improved!!
- EHR Implementation is a "Clinical" Project NOT and "IT" Project" – NUTRITION CLINICIANS NEED TO BE INVOLVED!!
  - ✓ Work for EHR Venders
  - ✓ Be a part of the healthcare system EHR Build/Support Teams
  - ✓ Formation of Clinical Nutrition Informatics Committees within your organization

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How Can We Get EHRs to Talk to One Another?

Margaret Dittloff, MS, RDN
Academy of Nutrition and
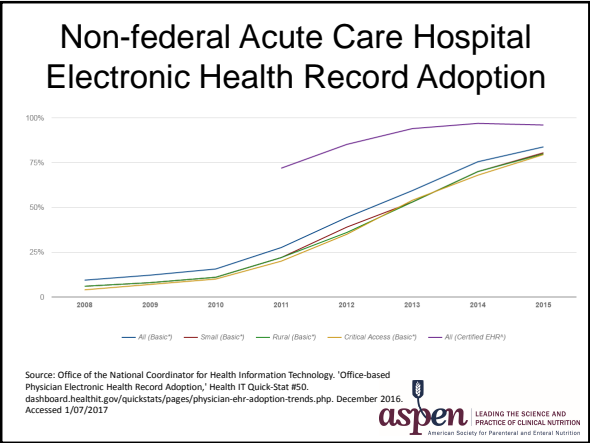Dietetics, Chicago, IL

Disclosures

- Academy of Nutrition and Dietetics, Research Project Manager

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Learning Objectives

Upon completion of this session, the learner will be able to:

1. Define interoperability, the role of interoperability in nutrition care, and why it matters
2. Discuss Health Information Exchanges and why sharing information is so difficult
3. Create a plan to allow seamless information sharing for patients across the continuum of care

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Non-federal Acute Care Hospital Electronic Health Record Adoption

Source: Office of the National Coordinator for Health Information Technology. 'Office-based Physician Electronic Health Record Adoption,' Health IT Quick-Stat #50. dashboard.healthit.gov/quickstats/pages/physician-ehr-adoption-trends.php. December 2016. Accessed 1/07/2017

Interoperability

*The ability of a system to **exchange** electronic health information with and **use** electronic health information from other systems without special effort on the part of the user.*

Waste in Healthcare Spending
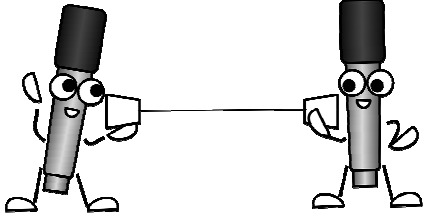
Inaccessible patient information → 40%

Incomplete clinical records

Potential adverse effect in 44% patient-physician encounters

Delayed care or additional services nearly 60% of the time

Source: https://www.healthit.gov/sites/default/files/pdf/ehr-vendor-beacon-topic.pdf
Inforgraphic icon by Icons8

Why is it so hard?
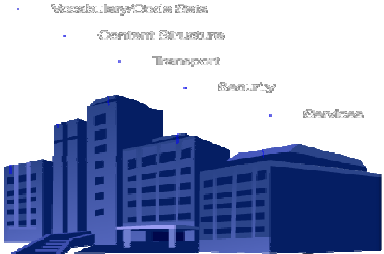

Why is it so hard?

- Different EHRs or even same vendor/different build or version
- "custom" data integrations (redundant?)
- Information blocking
- Query has workflow challenges

Source: https://www.healthit.gov/playbook/pdf/information-blocking-flyer.pdf

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Interoperability
Depends on Standards

- Vocabulary/Code Sets
- Content Structure
- Transport
- Security
- Services

Using a Common Language "Semantics"

Vocabulary / Code Sets / Terminology Standards provide standardized (coded) terms to describe clinical information
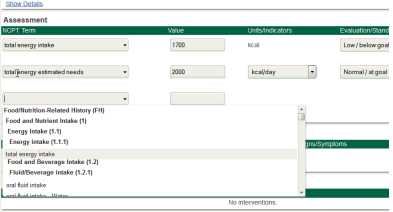
Examples:
- Patient Medications (RxNORM & National Drug Code (NDC))
- Problems (ICD-10 & SNOMED CT)
- Labs (LOINC)
- Nutrition eNCPT (Nutrition Problem/Diagnosis) mapped to SNOMED

Nutrition Diagnosis
(Academy Nutrition and Dietetics Health Informatics Infrastructure App)

Nutrition Status Observation (LOINC)
– Asks the structured identifiable question of 'What is the Nutrition Diagnosis'?
– Answers: From SNOMED-CT terms (synonymous with NCPT terms)

Example: PES format
Problem: Inadequate oral intake (SNOMED-CT US 440321000124101)
Etiology: Narrative (free text)
Signs/
Symptoms: Coded from assessment terms or narrative   (free text)
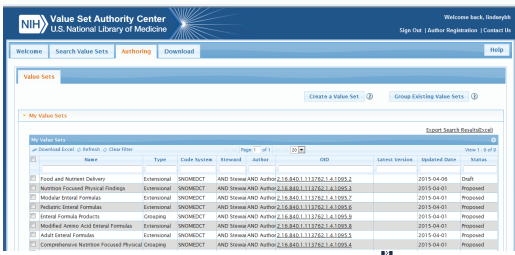
Value Set Authority Center (VSAC)
National Library of Medicine
Supplies sets of data for quality measures and
HL7 C-CDA Standard
Available with complimentary UMLS license

Slide 1: Value Sets for Oral Nutrition & Enteral Formulas

Slide 2: Content/Structure "syntax"

Content and Structure Standards (implementation guides) define who information and the format used to convey it (e.g., "form letter template")

Examples:
- HL7 ADT messages

- HL7 Consolidated-CDA R2 "Care Summary Record"

Slide 3: HL7 Consolidated Clinical Document Architecture (C-CDA)

Document Types	C-CDA (R 1.1)	C-CDA (R2.1)
Continuity of Care Document (CCD)		Nutrition Section Plan of Treatment (Recommendation)
Discharge Summary	Discharge Diet	Nutrition Section Plan of Treatment (Recommendation)
Progress Note		Nutrition Section, Plan of Treatment
Consult Note		Nutrition Section, Plan of Treatment
Care Plan (NEW)		Health Concern, Intervention
Referral Note (NEW)		Nutrition Section, Plan of Treatment
Transfer Summary (NEW)		Plan of Treatment (Recommendation)

Slide 4: CDA Example

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Slide 5: Transport, Security & Services

Transport standards define the method or "how" to move secure messages/information between different electronic systems.

Implementation Specifications for Services (i.e., the infrastructure components deployed and used to address specific interoperability needs)

Examples:
- Direct protocol (secure email messaging)
- X.509 (for digital certificates)
- DNS+LDAP (locating and authenticating recipient's certificates)

Slide 6: MU: Transitions with Summary of Care Record - 2014

Community & State HIE Efforts

2014 survey found:
- 106 HIE efforts were operational
  - ⬇ 11% from 2012
- 21 were planning to become operational
  - ⬇ 60% from 2012

*Not including HIE networks led by single vendors or consortium of vendors such as EPIC's Care Everywhere Network or CommonWell Health Alliance.

Source: Julia Adler-Milstein, Sunny C. Lin, and Ashish K. Jha
Health Aff July 2016 35:71278-285; doi:10.1377/hlthaff.2015.1439

Stakeholders Engaged in Operational HIE Activities
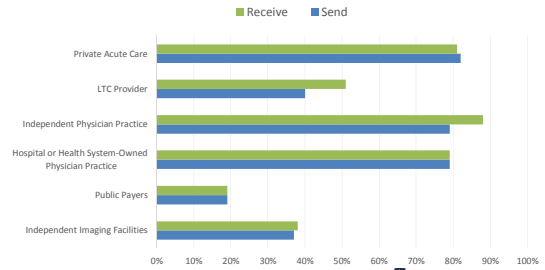
■ Receive ■ Send

Source: Julia Adler-Milstein, Sunny C. Lin, and Ashish K. Jha
Health Aff July 2016 35:71278-285; doi:10.1377/hlthaff.2015.1439

Top Five Commonly Exchanged Data
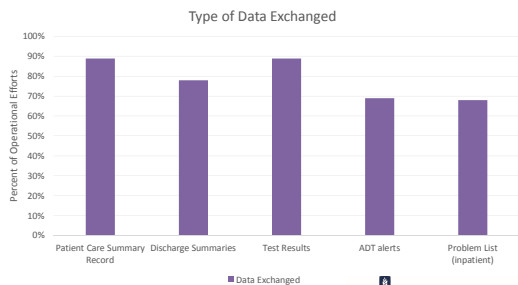
Source: Julia Adler-Milstein, Sunny C. Lin, and Ashish K. Jha
Health Aff July 2016 35:71278-285; doi:10.1377/hlthaff.2015.1439

Significant Barriers to Health Information Exchange

- Developing a sustainable business model
- Integration into care planning workflows
- Lack of funding $
- Limitations of current interface standards
- Competition with EHR vendors

HIE Success Milestones

" San Antonio – first major Texas city to fully engage all hospitals to exchange medical information through local IHE!

Everything is possible.

Source:
http://hietexas.org/summer-2016/milestone-all-major-san-antonio-hospitals-sharing-securely

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Nutrition Across Care Settings

- Enteral Use Case
- Transferred to Rehab Hospital or LTPAC with EN or PN
- Discharged to home (Home Health – Infusion Services)

Slide 1: Interoperability Standards Advisory - 2017

Slide 2: Nutrition Documentation
(HL7 CDA Format)

Document Template (Transfer Summary) Header (Provider/Patient Info)
Section Template
Entry Template
Entry Template
Nutrition Section
Nutrition Status Observation
Nutrition Assessment
Plan of Treatment Section
Entry Template
Nutrition Recommendation

NEW

Slide 3: Nutrition and the CDA

Goal – map the nutrition care process to the CDA structure

Nutrition Section

- Increased number of document types allowed for addition of nutrition content
- Nutrition Section
  - Nutrition Status Observation
  - Nutritional Assessment
- Nutrition Recommendation

Nutrition Status Observation

Nutritional Assessment

The Nutrition Section represents diet and nutrition information and overall nutritional status of the patient based on the nutrition assessment findings.

Describes the overall nutritional status of the patient including findings related to nutritional status.

Represents the pt's nutrition abilities and habits including intake, diet requirements or diet followed.

HIMSS 2014: Nutrition Data in Care Coordination – Making and Impact
Larry Garber, MD and Elaine Ayres, MS, RD

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Slide 4

Exchanging Diet and Nutrition Orders Across the Continuum of Care

Type	Standard Implementation/Specification	Standards Process Maturity	Implementation Maturity	Adoption Level	Federally Required	Cost	Test Tool Availability
Implementation Specification	HL7 Version 3 Standard: Diet and Nutrition, STU Release 1	Balloted Draft	Pilot	●○○○○	No	Free	Yes
Emerging Implementation Specification	HL7 FHIR – Nutrition Order (Request) Resource (STU 3 Sept 2016 Ballot)	Balloted Draft	Pilot	●○○○○	No	Free	Yes

Limitations, Dependencies, and Preconditions for Consideration	Applicable Security Patterns for Consideration
• See FHIR projects in the Interoperability Proving Ground.	• **System Authentication** - The information and process necessary to authenticate the systems involved • **User Details** - identifies the end user who is accessing the data • **User Role** - identifies the role asserted by the individual initiating the transaction. • **Purpose of Use** - Identifies the purpose for the transaction.

Slide 5

To improve the interoperability of nutrition and diet order information across the continuum of care, it is critical that health care providers and sending and receiving system vendors have a clear understanding of the components involved in ordering, preparing, and providing meal trays, formula feedings, and nutritional supplements to patients and residents.

Slide 6: HL7 Domain Analysis Model: Diet and Nutrition Orders

3 Types of Orders:

- Oral Diets
- Oral Nutritional Supplements
- Tube Feeding or (Infant) Formula Feedings

http://www.hl7.org/implement/standards/product_brief.cfm?product_id=289

Slide 1

FHIR DSTU2

Home Documentation Implementation Resources Clinical Administrative Infrastructure Financial

Home

This is the Current officially released version of FHIR, which is DSTU 2.
For a full list of available versions, see the Directory of published versions.

http://hl7.org/fhir/DSTU2/index.html

⬡ Welcome to FHIR®

First time here? See the executive summary, the developer's introduction, or the clinical introduction, and then the FHIR overview / roadmap. See also the open license (and don't miss the full Table of Contents or you can search this specification).

DSTU updates:
• Oct-24 2015: Corrections to invariants, generated conformance resources, extension cardinalities, examples
• May-15 2016: New security note about risks associated with XML Entities, and release an updated validator

Major Sections:

General Documentation Implementation & Exchange Clinical Resources Administrative Resources Infrastructural Resources

Quick links:

Documentation
• Resource List
• JSON, XML & RDF
• REST API & Search
• Data Types
• Using Terminologies
• Extensions
• Full table of contents

Implementation
• Downloads
• Adapting FHIR for local use
• Implementation Guides
• FHIR Schemas & Schematrons
• Examples: XML, JSON
• Code: Java, C#, Pascal, iOS, JS, XML
• Common Use Cases & Profiles
• Security

External Links
• Support Links (StackOverflow, Forum, etc.)
• Public Test Servers & Software
• How FHIR is developed
• FHIR Wiki
• Implementation guide registry
• Blogs that cover FHIR
• Translations: Russian, Japanese

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Slide 2

FHIR® NutritionOrder Resource

Request for Oral Diets

Request for Tube Feedings

Request for Oral Nutritional Supplements

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Slide 3

FHIR® NutritionOrder Resource

• Standard Terminology developed using SNOMED CT

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Slide 4

Generated Narrative with Details

id: enteralonly
patient: Peter Chalmers
orderer: Dr Adam Careful
identifier: 1/1

enteralFormula
baseFormulaType: Diabetic specialty enteral formula (Details : {http://snomed/sct code '6547210001241l2' = '6547210001241l2', given as 'Diabetic specialty enteral formula'})
baseFormulaProductName: Acme Diabetes Formula
caloricDensity: 1 calories per milliliter (Details: UCUM code cal/mL = 'cal/mL')
routeofAdministration: Instillation, nasogastric tube (Details : {http://hl7.org/fhir/v3/RouteOfAdministration code 'NGT' = 'Instillation, nasogastric tube', given as 'Instillation, nasogastric tube'})

administration
schedule: Starting 17/09/2014 5:00:00 PM, Do Once
rate: 60 ml/hr (Details: UCUM code mL/h = 'mL/h')

administration
schedule: Starting 17/09/2014 9:00:00 PM, Do Once
rate: 80 ml/hr (Details: UCUM code mL/h = 'mL/h')

administration
schedule: Starting 18/09/2014 1:00:00 AM, Do Once
rate: 100 ml/hr (Details: UCUM code mL/h = 'mL/h')

maxVolumeToDeliver: 880 milliliter/day (Details: UCUM code mL/d = 'mL/d')
administrationInstruction: Hold feedings from 7 pm to 7 am. Add MCT oil to increase calories from 1.0 cal/mL to 1.5 cal/mL.

Slide 5

Enteral Feeding Nutrition Order and Observations Feedback

• Create and store NutritionOrder Resources in "FHIR server"

Sample EHR-CPOE Tube Feeding Order Entry

Patient: Chalmers, Peter		PID: XXXXX	
Order Start	Effective NOW Today	Effective - (designate time) Tomorrow	0700
Frequency			
Order Details:			
Enter Formula Type	Acme Diabetes Formula		
Route of Administration	Route Nasogastric		
Method	Method: ○ Bolus ● Continuous		
Initial Rate	60 mL/hour		
Goal Rate	100 mL/hour		
Goal (Total) Volume (24 hr)	880 mL/day		
Duration (hr)	12 hour		
	Hold feeding from 7 PM to 7 AM		
Notes:			
	Hold feedings from 7 PM to 7 AM. Add MCT Oil to increase calories from 1.0 cal/mL to 1.5		

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Slide 6

Concept: Embedded or Mobile TF App
Actual-to-Goal Amounts

• Get Resources and Generate a quick graph of the actual delivered volume/energy vs. what was ordered.

Patient: Robert F. Hill
Provider: Dr Adam Careful

Feeding suspended to transport patient for test procedure

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Learning Assessment Questions

1. Semantic interoperability depends on structured clinical content that use the same
   a) message format
   b) standardized terminology and value sets
   c) emerging open-source APIs
   d) infrastructure services

2. Using clinical terminology and structured nutrition data in our nutrition assessment and progress notes within the electronic health records will enable
   a) speed of data entry
   b) improved dietitian workflow
   c) use of nutrition concepts for quality improvement and outcomes research
   d) provider engagement

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2. Office of the National Coordinator for Health Information Technology, Report to Congress on Health Information Blocking (April 2015), available at https://www.healthit.gov/sites/default/files/reports/info_blocking_040915.pdf.
3. Engagement In Hospital Health Information Exchange Is Associated With Vendor Marketplace Dominance. *Health Aff*. July 2016 35:71286-1293;
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What Are the Key Functionalities Necessary in EHRs to Safely Provide PN to Patients

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Disclosures

Baxter
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Janssen
Mallinckrodt

Learning Objectives

1. Review the ASPEN/ASHP/AND call to action paper for optimizing the EHR in the PN process.

2. Discuss opportunities for optimizing the EHR for PN.

3. Describe the benefits of EHR optimization in the PN process.

Call to Action

- 2015 work group was formed consisting of members of ASPEN, ASHP, AND
  – Experts in PN
  – EHR Functionality
  – Health Information Technology (HIT) standards

- Publish a call to action paper in journals of participating organizations. *A Call to Action for Optimizing the Electronic Health Record in the Parenteral Nutrition Process.*

Goals

- Increase awareness of EHR vendors of consensus recommendations and guidelines for safe PN ordering
- Recommend to EHR vendors opportunities to improve PN process functionality and clinical decision support
- Encourage HIT standards for PN across the continuum of care
- Publish a joint paper on EN and best practices

Key Areas

- Standardized PN order and label
- Clinical Decision Support (CDS) and warnings for:
  - Macronutrient
  - Micronutrient
  - Toxicities
  - Incompatibities
- EHR interfaces with Automatic Compounding Device (ACD)
- Ordering cyclic PN
- Transition from hospital to home

Standardization

- Development and implementation of technical and practice standards into a process so that all health care providers deliver the same level of care
- Opportunities exist for standardization at each step in the PN process
- Supported by:
  - ISMP
  - ASPEN 2004 safe practice
  - ASPEN 2007 statement on PN standardization
  - ASPEN 2014 Consensus Recommendations

ISMP Safe Practice Recommendations

- Match prescribing and pharmacy templates
- Build, test and heed automated warnings
- Heighten suspicions of errors
- Carry out effective redundancies
- Provide clear labeling that matches the sequence of ingredients in the PN order templates in EHR PN order form and the ACD
- Educate and validate competency
- Eliminate transcription of PN orders

Errors in PN Administration
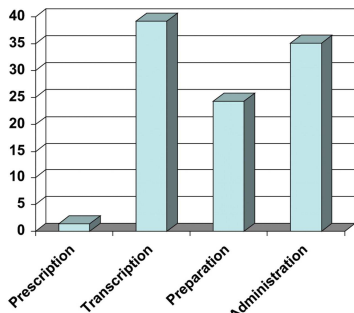
Sacks G S JPEN J Parenter Enteral Nutr 2012;36:20S-22S

A.S.P.E.N. Standardized PN Template for Adult Patients

Order should have same sequence of ingredients and must match label

Figure 1. Parenteral Nutrition Order Template: Adult Patient.
Ayers P, et al. JPEN J Parenter Enteral Nutr. 2013

Slide 1

A.S.P.E.N. Standardized PN Template for Pediatric and Neonatal Patients

Patient Information
Patient name_____Medical record number_____Birthdate/age_____
    Patient location_____Allergies_____

    Height and dosing weight: Ht: _____cm Dosing Wt: _____kg
    Diagnosis(es)/Indication(s) for PN_____
    Vascular access device/location CVC type_____Location_____
    Administration date/time

Base Formula   Amount/kg/day
    Amino acids   g
    Dextrose   g
    IV Fat emulsion   g
Electrolytes
    Sodium phosphate   mmol
    Sodium chloride   mEq
    Sodium acetate   mEq
    Potassium phosphate   mmol
    Potassium chloride   mEq
    Potassium acetate   mEq
    Magnesium sulfate   mEq
    Calcium gluconate   mEq
Vitamins, Trace Elements, Additives
    Multi-component vitamins   mL
    Multi-component trace elements   mL
    Other Additives (eg, cysteine, regular insulin) as clinically appropriate and compatible

PN Instructions
    Total volume_____mL Infusion rate_____mL/hr , start and stop times_____
    Cycle information
    Prescriber and contact information

Figure 2. Parenteral Nutrition Order Template: Pediatric/Neonatal Patient.

Order should have same sequence of ingredients and must match label

Ayers P, et al. *JPEN J Parenter Enteral Nutr.* 2013

Slide 2

Clinical Decision Support (CDS)

- Concentrations
  - Thresholds
- Rates of infusion
  - Dextrose
  - Lipid emulsion
- Stability
  - Divalent ions (cracking)
- Compatibility
  - Calcium-phosphorus
- Point of prescribing
  - Ensure adequate provision of nutrients, avoid deficiencies, toxicities, instabilities
  - Time of order verification/review

Slide 3

Clinical Decision Support

- Dosing alerts (both upper limits/maximums and lower limits/minimums) available in all possible units of measurement (e.g., amounts per day, amounts per dose, amounts per kg per day, amounts per kg per dose, amounts per liter/volume/concentration, % concentration, etc.), taking into account whether the PN is being administered through a central or peripheral line
- Auto-populating fields
- Require mandatory fields to be completed
- Require all fields to be completed before order entry
- Use of check-boxes or drop-down menus instead of free-text when possible
- Precipitation warnings based on the calcium-phosphate curve

Slide 4

EHR and ACD

- Fully integrated with no manual transcription
- Standardized additive sequence
- Alert when formulation issues are identified
- Ability to quickly change products
- Barcode scanning technology

Slide 5

Ordering Cyclic PN

- Ability to taper up and down
- Taper regimens
- Customize as needed

Slide 6

Transition of PN

- Approximately 40,000 individuals in U.S. are dependent on home PN
- Ability to transfer between systems (interoperability)
- Review the last PN order within the hospital
- Standardization

Communication and Timing

PHYSICIAN'S DIRECTIONS
HOME PARENTERAL NUTRITION

PHYSICIAN'S DIRECTIONS
HOME PARENTERAL NUTRITION

PHYSICIAN'S DIRECTIONS
HOME PARENTERAL NUTRITION

PHYSICIAN'S DIRECTIONS
HOME PARENTERAL NUTRITION

Laboratory Monitoring for Home PN Patient

Parameter	Baseline	Week 1,2,3	Week 4	Every 3 months prior to MD office visit
Glucose, BUN, CR, lytes, Ca, Mg, Phos.	x	x	x	x
CBC with diff. and reticulocyte count	x	x	x	x
Total and direct bilirubin, AST, ALT, LDH, Alk Phos, TG	x		x	x
Serum proteins	x		x	x
Vitamin B12, RBC folate, iron indices, trace elements, vitamin D 25-OH	x		x	x

ASPEN Core Curriculum 2012

Summary

- Utilize standardized and validated PN Order and Labeling templates as recommended by ASPEN
- Design PN Orders to facilitate ordering based on ASPEN recommendations and incorporate CDS for Adult, Pediatric, and Neonatal Patients
- Analyze workflow from patient specific PN ordering to minimize manual transcription or double documentation and provide appropriate CDS support in all of these steps.
- Include the functionality to order cyclic PN with and without taper up and/or taper down
- Include the functionality to transition from hospital PN orders to home PN orders and vice versa

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