The Clinical Reasoning Platform for Value Based Care at USOncology

March-2017

Hank Head Sr. Director of Clinical Decision Support



Overview

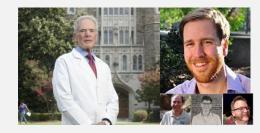
Summary date: 3/08/2017

- Our Background
- Our Team
- Our FHIR based CDS Tools (launched)
- FHIR based tools (on roadmap)
- Lessons and Challenges



Our Background

2007 - 2009 PROVENTYS 🖌



Duke Med spinout

NCI Proof of Concept Predictive Neutropenia

20010 - 2011



VC Funded Startup

Proventys PDx (FN, VTE) Proventys Guideline CDS

2013 - 2017



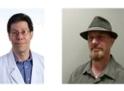
Fully Acquire by Usoncology/McK

RestAPIs since 2012 FHIR since 2015

Our Team – Durham | Boston | SF | Austin



















































Clinical Reasoning Platform / APPs

Clear Value Plus*

- GLIF Guideline model
- EEL based on GELLO
- Highly optimized rules
 engine
- Graph / rules / semantic relationship mix
- FHIR based interop
- Quill Authoring Tool

Value Program APPS

- Value Program Eligibility and Enrollment (incl/excl)
- Program Data/Doc completion
- Workflow Engine
 (clinical data driven)

CDS on FHIR APPS

- IOM Treatment Plan
- Symptom Manager
- CVP Chemo
- CVP Diagnostics
- CVP Radiation
- Dose Calculation

* Current restAPI integrated with Epic, Varian ARIA, iKnowMed, Gen2

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OCM Treatment Plan

Sche

Treat On OF Tan

Diagn Pr Stagir

	Strickler, John T., MD N. CA Medicare, > Blue Shield Medicare	TEXAS ONCOLOGY More breakthroughs. More victories:		byterian Cancer Center Dallas Walnut Hill Ln, Suite 100 Dallas, TX 75231 \$ (214) 739-4175
	Enhanced, Blue Cross of CA		Date:	
uled Visits	View Schedule		22 Feb 2017	#
Next Visit:	25 Feb 2017 (E&M F/U)		Name:	
	28 Jan 2017 (Chemo class)		Gail Wells	
			DOB:	
ent	View Past Treatments		12 Mar 1945 🛗	(72 yo)
Treatment: L medication: oxifen citrate, po solid	Tamoxifen + Goserelin (Q28D) >	My Provider: John T. Strickler, MD		
	6 Aug 2016	My Diagnosis:		
	C8D5	Breast Cancer (Invasive)		
sis harv Diagnosis:	Breast Cancer (Invasive)	Stage at Diagnosis:		
Information		Stage IIB; T2 N1a M0		
	Maintenance	Current Status of Disease:		
	Stage IIB	No Evidence of Disease		
	Pathologic			
	Т2	Biomarkers:		
	N1a	ER status: Positive; PR status: Positive; HER2 status: Fi	ish Negative;	
	мо	The Goal of My Therapy is:		
ent Factors				

Feedback Help 💥

IOM Treatment Plan



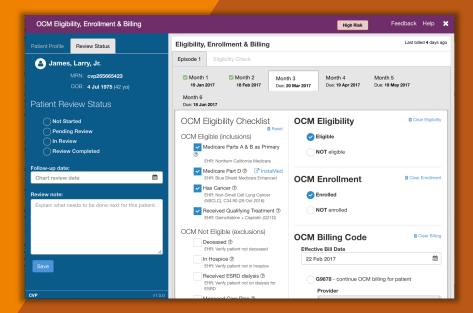
OCM Treatment Plan

Feedback Help 🗙

DOB:	12 Mar 1945 (72 yo)
OCM Status:	Enrolled
Provider:	Strickler, John T., MD
	N. CA Medicare, > Blue Shield Medicare Enhanced, Blue Cross of CA
Scheduled Visits	View Schedule
Next Visit:	25 Feb 2017 (E&M F/U)
Last Visit:	28 Jan 2017 (Chemo class)
Treatment	View Past Treatments
Treatment: On ORAL medication: Tamoxifen citrate, po solid	Tamoxifen + Goserelin (Q28D) 🕻
C1D1:	6 Aug 2016
Last Day Treated:	C8D5
Diagnosis	
Primary Diagnosis:	Breast Cancer (Invasive)
Staging Information	
Treatment Intent:	Maintenance
Stage at Diagnosis:	Stage IIB
Stage Finding Type:	Pathologic
Tumor Classification:	Т2
Pathologic N-value:	N1a
M value:	МО

TEXAS	Texas Oncology: Presbyterian Cancer Cente Dalla 8196 Walnut Hill Ln, Suite 10	
More breakthroughs. More victories:		Dallas, TX 75231 & (214) 739-4175
	Date:	
	22 Feb 2017	#
	Name:	
	Gail Wells	
	DOB:	
	12 Mar 1945	(72 yo)
My Provider:		
John T. Strickler, MD		
My Diagnosis:		
Breast Cancer (Invasive)		
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Stage IIB; T2 N1a M0		
Current Status of Disease:		
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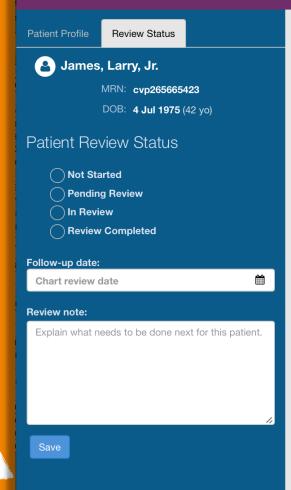
Treatment Factors





OCM Eligibility and Enrollment

OCM Eligibility, Enrollment & Billing

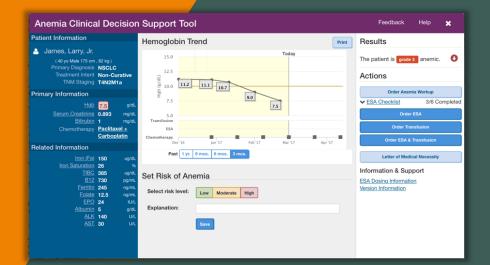


CVP

Eligibility, Enrollment & Bill	ling		Last billed 4 days ago
Episode 1 Eligibility Check			
Month 1 Month 2 19 Jan 2017 18 Feb 201	Month 3 7 Due: 20 Mar 2017	Month 4 Due: 19 Apr 2017	Month 5 Due: 19 May 2017
Month 6 Due: 18 Jun 2017			
OCM Eligibility Check	klist OCN	l Eligibility	â Clear Eligibility
OCM Eligible (inclusions)		Eligible	
Medicare Parts A & B as ② EHR: Northern California Me		NOT eligible	
Medicare Part D ⑦ C EHR: Blue Shield Medicare E		I Enrollment	Clear Enrollment
Has Cancer ⑦ EHR: Non-Small Cell Lung C (NSCLC), C34.90 (29 Oct 20)		Enrolled	
Received Qualifying Trea EHR: Gemcitabine + Cisplati		NOT enrolled	
OCM Not Eligible (exclusion	ns) OCN	I Billing Code	🛍 Clear Billing
EHR: Verify patient not decea	ased Effe	ctive Bill Date	
In Hospice ⑦ EHR: Verify patient not in hos		Feb 2017	ش
Received ESRD dialysis EHR: Verify patient not on dia	?	G9678 - continue OCM	billing for patient
ESRD		Provider	

High Risk

Feedback Help 🗙





Clear Symptom Mgt | Anemia

Anemia Clinical Decision Support Tool

Patient Information

А.

James, Larry, Jr. (40 yo Male 175 cm, 82 kg) Primary Diagnosis NSCLC Treatment Intent Non-Curative TNM Staging T4N2M1a

Primary Information

<u>Hgb</u>	7.5	g/dL
Serum Creatinine	0.893	mg/dL
<u>Bilirubin</u>	1	mg/dL
Chemotherapy	Paclitax	<u>el +</u>
	<u>Carbopl</u>	<u>atin</u>

Related Information

<u>Iron (Fe)</u>	150	ug/dL
Iron Saturation	26	%
TIBC	385	ug/dL
<u>B12</u>	730	pg/mL
<u>Ferritin</u>	245	ng/mL
Folate	12.5	ng/mL
<u>EPO</u>	24	IU/L
<u>Albumin</u>	5	g/dL
ALK	140	U/L
<u>AST</u>	30	U/L





Feedback

Decision Tools Last Day Treated: C3D1

Diagnosis
Primary Diagnosis
Staging Information
Treatment Intent
Stage at Diagnosis
Treatment Factors
Histology
ECOG performance
status
ALK testing (conside
testing for sequemour
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ECOFIt testing (conside
testing for sequemour
history)
Line of Thereavy (LOT)

CVP Powered by: McKesson Specialty H

Feedback Help 🗙

0001	Toxicities & Interventions / Symptom Management						
Non-Small Cell Lung Cancer (NSCLC)	Overall risk to patient is High © Change Risk NEEDS ATTENTION: Anemia is HIGH risk Open						
Non-Curative (Metastatic)	NEEDS AT	TENTION: Anxie	ety is HIGH risk		Open		
Stage IV	Issue	Risk	Addressed	Tracked With	Caused By		
Squamous ECOG 1	<u>Anemia</u>		A NEEDS ATTENTION: High risk of developing Anemia.	Hgb (7.5) - 8 Feb 2017	Gemcitabine + Cisplatin (Q21D)		
ALK - Negative	Neutropenia		© Augmentin	ANC (0.9) - 8 Feb 2017	Gemcitabine + Cisplatin (Q21D)		
EGFR sensitizing mutation - Positive	Nausea		C Dolasetron	-	Gemcitabine + Cisplatin (Q21D)		
LOT 2	VTE		discussed with patient when to call the office vs go to ED	-	Gemcitabine + Cisplatin (Q21D)		
v1.0.0 EULA fealth Release Notes	Nutrition		-	Nutrition Risk Assessment	oral ulcers		
	Anxiety		A NEEDS ATTENTION: High risk of developing Anxiety issues.	Anxiety / Distress Assessment	financial issues		
	Hospitalization & Hospice Details > Patient is not in hospital or hospice.						
	Quality of Life: Pati	ont Cools & Conv	20120				

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Clear Symptom Manager

Decision Tools					Feedbac	k Help	×
Last Day Treated:	C3D1	Toxicities & Interve	ations / Cumatan	Management			
Diagnosis							
Primary Diagnosis:	Primary Diagnosis: Non-Small Cell Lung Cancer (NSCLC) NEEDS ATTENTION: Anemia is HIGH risk Open					1	
Staging Information		A				Open	
Treatment Intent:	eatment Intent: Non-Curative (Metastatic) NEEDS ATTENTION: Anxiety is HIGH risk Open						
Stage at Diagnosis:	Stage IV	Issue Risk Addressed Tracked With Caused By					
Treatment Factors		10000					11.
Histology:	Squamous	Anemia		A of developing Anemia.	Hgb (7.5) - 8 Feb 2017	Gemcitabine + Cisplatin	
ECOG performance status:	ECOG 1			Open		(Q21D)	
ALK testing (consider testing for squamous history):	ALK - Negative	Neutropenia		Augmentin	ANC (0.9) - 8 Feb 2017	Gemcitabine + Cisplatin (Q21D)	_
EGFR testing (consider testing for squamous history):	EGFR sensitizing mutation - Positive	Nausea		C Dolasetron	-	Gemcitabine + Cisplatin (Q21D)	
Line of Therapy (LOT):	LOT 2	VTE		discussed with patient when to call the office vs go to ED	-	Gemcitabine + Cisplatin (Q21D)	
CVP Powered by: McKesson Specialty H	v1.0.0 EULA ealth Release Notes	Nutrition		-	Nutrition Risk Assessment	oral ulcers	
		Anxiety		A NEEDS ATTENTION: High risk of developing Anxiety issues.	Anxiety / Distress Assessment	financial issues	
		Hospitalization & H Patient is not in i	ospice hospital or hospic	e.		Details)	

Demo

IOM Care Plan Completion

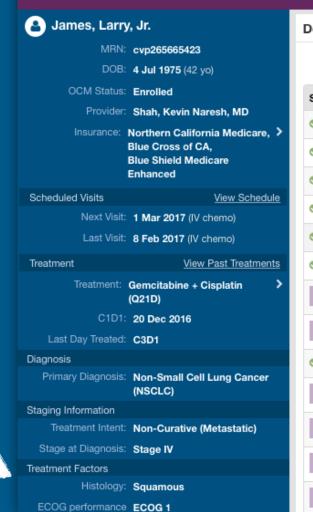
	Help	

B James, Larr	y, Jr.	Documentati	on Completi	on	Completed 7 of 13 step
	cvp265665423				Filter by: Show All
	4 Jul 1975 (42 yo)				
	Enrolled	Status	Date	Step	Actions
	Shah, Kevin Naresh, MD	Completed	15 Feb 2017	③ 1. Patient Information	
	Northern California Medicare, > Blue Cross of CA,				
	Blue Shield Medicare	Completed	15 Feb 2017	⑦ 2. Diagnosis	View Treatment Plan >
	Enhanced	Completed	15 Feb 2017	③ 3. Prognosis	View Treatment Plan
Scheduled Visits	View Schedule 1 Mar 2017 (IV chemo)	Completed	15 Feb 2017	③ 4. Treatment goals	View Treatment Plan >
	8 Feb 2017 (IV chemo)	Completed	15 Feb 2017	③ 5. Initial plan for treatment	View Treatment Plan
Treatment	View Past Treatments	Completed	15 Feb 2017	⑦ 6. Expected response to treatment	View Treatment Plan >
	Gemcitabine + Cisplatin > (Q21D)	▲ Incomplete		⑦ 7. Treatment benefits & harms	Create Benefits & Harms
	20 Dec 2016			8. Information on quality of life 1	Create Patient Goals & Concerns >
	C3D1	▲ Incomplete		© 0. Information on quarty of the	oreare r anone dours à concerns y
Diagnosis		Completed	15 Feb 2017	③ 9. Responsibility for patient care	View Care Team >
	Non-Small Cell Lung Cancer (NSCLC)	A Incomplete		③ 10. Advance care plans	Create Advance Care Plan
Staging Information					
	Non-Curative (Metastatic)	▲ Incomplete		③ 11. Estimated patient costs	
	Stage IV			② 12. Psychosocial plan	Create Notes & Actions >
Treatment Factors		▲ Incomplete		U 12. Esychosocial plan	Create Notes & Actions
	Squamous	∧ Incomplete		③ 13. Survivorship plan	Create Survivorship >
	ECOG 1	a acompiere			

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OCM Data/Doc Checklist

IOM Care Plan Completion



Documentation Completion		Completed 7 of 13 steps	
			Filter by: Show All
Status	Date	Step	Actions
Completed	15 Feb 2017	③ 1. Patient Information	
Completed	15 Feb 2017	⑦ 2. Diagnosis	View Treatment Plan >
Completed	15 Feb 2017	③ 3. Prognosis	View Treatment Plan
Completed	15 Feb 2017	③ 4. Treatment goals	View Treatment Plan >
Completed	15 Feb 2017	③ 5. Initial plan for treatment	View Treatment Plan >
Completed	15 Feb 2017	③ 6. Expected response to treatment	View Treatment Plan >
▲ Incomplete		⑦ 7. Treatment benefits & harms	Create Benefits & Harms
▲ Incomplete		③ 8. Information on quality of life	Create Patient Goals & Concerns.>
Completed	15 Feb 2017	③ 9. Responsibility for patient care	View Care Team >
▲ Incomplete		⑦ 10. Advance care plans	Create Advance Care Plan.>
▲ Incomplete		③ 11. Estimated patient costs	
A Incomplete		③ 12. Psychosocial plan	Create Notes & Actions >
▲ Incomplete		③ 13. Survivorship plan	Create Survivorship.>

Epic Varian Aria iKnowMed Gen1 iKnowMed Gen2

Decisions from the last 7 days 3,165	Total Decision Count 150,305 Last updated at 1506	ecisions This Week 1,478 Last updated at 1506	Decisions Last Week 2,828 Last updated at 15:06
Active Providers 1,002 Last updated at 15:06	Total Providers 2,490 Last updated at 15:06	Active Users 352 Last updated at 15:06	Total Practices 184

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€ Back		Treatr	nent: Metastati	c therapy - No	n-squamous h	nistolog	ies NCC	CN Recommendations		Powered by NCCN
Clear Value Plus [™]		Medic	al Info Financial	Estimate						Clear
Barney Rubble MRN: 891234 DOB: 1965-10-10	-	Hide	Clinical Trials							Hide
Moore, Daniel, MD at Demo Site 1		Treatm	ent Options						Trial ID	Action
	-1	Unspe	cified clinical trial							Select
BCBS Diagnosis	~	Treatm	ent Options		Valu Pathw		NCCN Category of Evidence	Febrile Neutropenic Risk €	Emetic Risk	Action
 Primary Diagnosis Non-Small Cell Lun Cancer (NSCLC) 	ng	Alectin	ib		~	~	24	low	low	Show Options V
Staging Information		Album	in-bound Paclitaxel			~	2A	low	low	Show Options ¥
Stage at diagnosis Stage IV Treatment intent Metastatic	1	Carbo	olatin + Albumin-bou	und Paclitaxel		*	2A	low	moderate	Show Options ¥
NSCL Factors		Carbo	platin + Docetaxel			*	24	low	moderate	Show Options V
Histology Non-squamous	7	Carbo	platin + Etoposide			~	2A	low	moderate	Show Options V
 ECOG performance status ECOG 2 	/	Carbo	platin + Gemcitabine	э		~	2A	intermediate	moderate	Show Options V
 ALK testing ALK - Positive EGFR testing (consider testing for 	1	Carbo	platin + Paclitaxel			*	2A	intermediate	moderate	Show Options ¥
squamous histology) EGFR mutation - Negative	1	Carbo	platin + Pernetrexed			~	2A	low	moderate	Show Options V
PD-L1 Expression PD-L1 Negative	1	Ceritin	ib			~	24	unknown	binb	Feedback

CVP Chemotherapy



CVP Prior Auth

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Clark Kent	05/08/1939	(Recurrent/Metastatic)	Eligibi X Rejected	rendered		Pending
Bob Dylan	08/24/1968	EC	✓ Au No provider match		IDs •	112345678
Jerry Seinfeld	07/31/1972	TAC	Cli No patient match Patient ineligible		IDs *	.23456789
George Costanza	02/28/1960	CAF Docetaxel + Trastuzumal	ML Non-authorized Not st		IDs v 🖌	.23456789
Jed Wirtz	09/09/1945	(Recurrent/Metastatic) Docetaxel + Trastuzumal (Recurrent/Metastatic)	2 Not s Claim withdrawn			Send
Alice Cooper	06/18/1962	Docetaxel + Trastuzumat (Recurrent/Metastatic)	Eligibility incomple Eligibility pending	te	IDs *	123456789
Newman	03/29/1956	FAC	Eligib Eligibility approved	; claim pending		Add info
		Doxorubicin (Recurrent/				



CVP Guideline Authorized

CVP Reporting

In VBC we must be able to measure the effect of our CDS interventions



Jan 2016 Feb 2016 Mar 2016 Apr 2016 May 2016 Jun 2016 Algo 2016 May 2016 VBC Reporting for Practices, Payers and Manufacturers

All Sites

All Practices

Intervention Start (Feb 28)

control

CDS Tools > Anemia CDS ESA use with and without CDS use - High Risk Patient:

o Intervention

DS Intervention Used

Organizations

Practices

Sign Or

Last Six Months

Clear Value PlusSM Highmark

All Organizations / CVP / Highmark

NCCN

CDS Tools

All Insurers

100%

25%

Reports

All Provider

CDS on FHIR APP Roadmap

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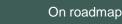
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The US Oncology Network

Value Goals





FHIR Resources (partial list)

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FHIR Conditions

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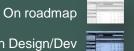
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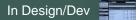
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FHIR Value Sets



Update for FHIR









Challenges with FHIR

- Workflows with large lists
 - Show me all of the patients with high risk of hospitalization for Anemia / intervene / back to list
 - Pub/Sub model or Polling next steps... 1st version impacted transactional performance of EHR
- Chemotherapy Order Templates
 - Multiple repeating cycles / courses / sequential / adjacent / concurrent with diff. cycle length
- Early in use of CDS Hooks
 - Launch context
 - Handoff back to EHR for next steps (move to dose modification screen)
- Complex Data types
 - Transfusions
- Automation of Value Sets and Conept Maps (with highly fungible content)
 - Guideline updates 3-4/year across 22+ guidelines (average 700 nodes)

Standards/Tooling

iKnowMed EHR's using HAPI - http://hapifhir.io

CDS using https://github.com/fhir-crucible/fhir_models/

CDS Hooks http://cds-hooks.org

Most apps SMART on FHIR http://smarthealthit.org

IG Support - https://fhir.furore.com/simplifier-net/

Our team loves FHIR Connectathons. There are a lot of tough issues to work on.



Our Offering

- We are hiring Ruby on Rails Sr. Devs / SOA Architect / Content
- We can help you **commercialize your predictive model**
 - Lean hypothesis testing with real clinical users run by PhD HF leaders
 - Model validation with real data
 - POC / Beta testing with clinical users
- We will partner / leverage our platform in other disease areas
- We have sales, billing and implementation infrastructure
- We can help you turn your early phase work into a revenue generating product



Innovations

Deep User Centered Design / Lean Hypothesis testing BDD/XP-agile with aspects of Medical Device UX/Test Deterministic Hybrid Graph/Rule engine Custom Concept Authoring (Quill) Content is Test Driven Development (TDD) GL Concepts, Rules, PlanDef, Observations + Automated Tests Workflow - webapp for guideline partner review/approve