The Clinical Reasoning Platform for Value Based Care at USOncology

March-2017

Hank Head
Sr. Director of Clinical Decision Support
Overview

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

2007 - 2009

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
IOM Treatment Plan

DOB: 12 Mar 1945 (72 yo)
OCM Status: Enrolled
Provider: Strickler, John T., MD
Insurance: N. CA Medicare, Blue Shield Medicare Enhanced, Blue Cross of CA

Scheduled Visits
Next Visit: 25 Feb 2017 (E&M F/U)
Last Visit: 28 Jan 2017 (Chemo class)

Treatment
Treatment: Tamoxifen + Goserelin (Q28D)
On ORAL medication:
Tamoxifen citrate, po solid
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: T2
Pathologic N-value: N1a
M value: M0

Diagnosis

My Provider:
John T. Strickler, MD

My Diagnosis:
Breast Cancer (Invasive)

Stage at Diagnosis:
Stage IIB; T2 N1a M0

Current Status of Disease:
No Evidence of Disease

Biomarkers:
ER status: Positive; PR status: Positive; HER2 status: Fish Negative;

The Goal of My Therapy is:
OCM Eligibility and Enrollment
The patient is grade 3 anemic.

**Actions**
- Order Anemia Workup
- Order ESA
- Order Transfusion
- Order ESA & Transfusion
- Letter of Medical Necessity

**Information & Support**
- ESA Dosing Information
- Version Information
### Toxocities & Interventions / Symptom Management

#### Overall risk to patient is **High**

- **NEEDS ATTENTION: Anemia is HIGH risk**
- **NEEDS ATTENTION: Anxiety is HIGH risk**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Risk</th>
<th>Addressed</th>
<th>Tracked With</th>
<th>Caused By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemia</td>
<td>☑</td>
<td>Needs attention: High risk of developing Anemia.</td>
<td>Hgb (7.5 - 8 Feb 2017)</td>
<td>Gemcitabine + Cisplatin (Q21D)</td>
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<tr>
<td>Neutropenia</td>
<td></td>
<td>Augmentin</td>
<td>ANC (0.9) - 8 Feb 2017</td>
<td>Gemcitabine + Cisplatin (Q21D)</td>
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<tr>
<td>Nausea</td>
<td></td>
<td>Dolasetron</td>
<td></td>
<td>Gemcitabine + Cisplatin (Q21D)</td>
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<tr>
<td>VTE</td>
<td>☑</td>
<td>discussed with patient when to call the office vs go to ED</td>
<td></td>
<td>Gemcitabine + Cisplatin (Q21D)</td>
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<tr>
<td>Nutrition</td>
<td>☐</td>
<td></td>
<td>Nutrition Risk Assessment</td>
<td>oral ulcers</td>
</tr>
<tr>
<td>Anxiety</td>
<td>☑</td>
<td>Needs attention: High risk of developing Anxiety issues.</td>
<td>Anxiety / Distress Assessment</td>
<td>financial issues</td>
</tr>
</tbody>
</table>

### Hospitalization & Hospice

Patient is not in hospital or hospice.

### Quality of Life: Patient Goals & Concerns
James, Larry, Jr.
MRN: cvp265665423
DOB: 4 Jul 1975 (42 yo)
OCM Status: Enrolled
Provider: Shah, Kevin Naresh, MD
Insurance: Northern California Medicare, Blue Cross of CA, Blue Shield Medicare Enhanced

Scheduled Visits
Next Visit: 1 Mar 2017 (IV chemo)
Last Visit: 8 Feb 2017 (IV chemo)

Treatment
View Past Treatments
Treatment: Gemcitabine + Cisplatin (Q21D)
C1D1: 20 Dec 2016
Last Day Treated: C3D1

Diagnosis
Primary Diagnosis: Non-Small Cell Lung Cancer (NSCLC)

Staging Information
Treatment Intent: Non-Curative (Metastatic)
Stage at Diagnosis: Stage IV

Histology: Squamous
ECOG performance: ECOG 1

Documentation Completion
Completed 7 of 13 steps

<table>
<thead>
<tr>
<th>Status</th>
<th>Date</th>
<th>Step</th>
<th>Actions</th>
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</thead>
<tbody>
<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>1. Patient Information</td>
<td>View Treatment Plan</td>
</tr>
<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>2. Diagnosis</td>
<td>View Treatment Plan</td>
</tr>
<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>3. Prognosis</td>
<td>View Treatment Plan</td>
</tr>
<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>4. Treatment goals</td>
<td>View Treatment Plan</td>
</tr>
<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>5. Initial plan for treatment</td>
<td>View Treatment Plan</td>
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<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>6. Expected response to treatment</td>
<td>View Treatment Plan</td>
</tr>
<tr>
<td>Incomplete</td>
<td></td>
<td>7. Treatment benefits &amp; harms</td>
<td>Create Benefits &amp; Harms</td>
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<tr>
<td>Incomplete</td>
<td></td>
<td>8. Information on quality of life</td>
<td>Create Patient Goals &amp; Concerns</td>
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<tr>
<td>Completed</td>
<td>15 Feb 2017</td>
<td>9. Responsibility for patient care</td>
<td>View Care Team</td>
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<td>Incomplete</td>
<td></td>
<td>10. Advance care plans</td>
<td>Create Advance Care Plan</td>
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<tr>
<td>Incomplete</td>
<td></td>
<td>11. Estimated patient costs</td>
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<tr>
<td>Incomplete</td>
<td></td>
<td>12. Psychosocial plan</td>
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<tr>
<td>Incomplete</td>
<td></td>
<td>13. Survivorship plan</td>
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</table>
CVP Prior Auth

CVP Guideline Authorized
CVP Reporting

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

VBC Reporting for Practices, Payers and Manufacturers
CDS on FHIR APP Roadmap

- CVP Chemo 22 GL
- Clinical trials
- Value Eligibility
- Care Team
- PHR Weight
- Predict Anemia
- Predict Nausia
- CVP Diagnostic
- OCM Summary
- Value Docu
- PHR Pain
- PRH Tx Plans
- Predict Neutro
- Predict Periph Neuro
- CVP Radiation
- Dose Adjust
- Value Goals
- PHR Anxiety
- PHR Appointmt
- Predict VTE
- Predict Hospitaliz

The US Oncology Network
FHIR Resources (partial list)

- FHIR Care Plan
- FHIR Observations
- FHIR Concept Maps
- FHIR Medications
- FHIR CDS Hooks
- FHIR DiagResults
- FHIR Plan Def
- FHIR Appointments
- FHIR Questionnaire
- FHIR Conditions
- FHIR Eligibility
- Big Lists Pub/Sub...

The US Oncology Network

Content Authoring
- Quill GL Auth
- Quill Rules Auth
- FHIR Value Sets

On roadmap
- Update for FHIR
- In Design/Dev
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](http://hapifhir.io)

CDS using [https://github.com/fhir-crucible/fhir_models/](https://github.com/fhir-crucible/fhir_models/)

CDS Hooks [http://cds-hooks.org](http://cds-hooks.org)

Most apps SMART on FHIR [http://smarthealthit.org](http://smarthealthit.org)

IG Support - [https://fhir.furore.com/simplifier-net/](https://fhir.furore.com/simplifier-net/)

Our team loves FHIR Connectahtons. 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