AI-BASED HEALTH SIGNALS DISCOVERY ENGINE
LEARNING OBJECTIVES

• Integrated lexicon-based data extraction

• Actionable insight from dark matter

• Improve population health analytics

Machine Learning  Clinical Insights  Discovery Engine
CLINICAL SEMANTIC NETWORK

- Actionable Clinical Data
- Computable Record
- Discovery Engine
- Genomic Aware
- National Health Outcomes

Clinical Semantic Network

SNOMED CT
LOINC
ICD-10
RX NORM

Precision Medicine
- Genomic Results
- LOINC / RXNORM
- SNOMED CT

Clinical Content
- Health Population Management
**THE VIRTUAL CSN (vCSN)**

Virtualize the CSN Lexicon - integrated with industry terminologies (i.e. SNOMED CT)

“Mark up” or “tag” unstructured healthcare records

Convert the extracted terms to clinical insights
The Virtual CSN (cont.)

Integrate with existing structured data sets

Group patients / members / consumers into cohorts
VIRTUALIZATION OF CSN

CSN Database ➞ Binding ➞ Transitional Modeling ➞ Machine Learned

Virtualized CSN

Submodel 1 ➞ Submodel 2 ➞ Submodel n
DETAILS

Patient Data → Natural Language Processing → Machine Learning → Submodel X

CSN-number → CSN-number → CSN-number

Goldblatt Systems
MODELS AND SUB-MODELS

Diseases
Pathways
Database

Millions of Pathways

Thousands of Pathways

Submodel X

CSN-number

CSN-number

CSN-number
## SAMPLE RESULTS

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*Note: The nodes represent the results of the sample data.*
Disorders

Supplementary Classification of External Causes of Injury and Poisoning

Surgical and Medical Procedures as the Cause Of Abnormal Reaction of Patient or Later Complication, without Mention of Misadventure at the Time of Procedure

Other procedures, without mention of misadventure at the time of procedure, as the cause of abnormal reaction of patient, or of later complication

Shock therapy as the cause of abnormal reaction of patient, or of later complication, without mention of misadventure at the time of procedure
INTERACTIVE OVERVIEW

Click Here
Patient 194,779 > Encounter 125,654 > Note 1,953,483

HISTORY AND PHYSICAL
LOCATION OF PATIENT:
Room:
DATE OF ADMISSION:
02/11/2015
CRT:
KQH 2/12/15
PRIMARY CARE PHYSICIAN:

ASSESSMENT:
1. Increased shortness of breath from baseline, particularly with reported paroxysmal nocturnal dyspnea in a patient with elevated NT-proBNP.
   She also has underlying chronic obstructive pulmonary disease with no evidence of pneumonia.
2. End-stage renal disease, on Monday, Wednesday, and Friday regimen.
3. Anemia of chronic disease.
5. Medical conditions listed.
RECOMMENDATIONS:
The patient will be admitted for at least overnight monitoring, Dr. has been consulted.
The patient is not a candidate for dialysis to see urgently, but may require supplemental dialysis tomorrow at the discretion of the consultant.
There may be multifactorial component to her presentation, she does have an underlying COPD.
and she has had a history of acute on chronic diastolic heart failure in the past with the last echocardiogram being in August with the EF was 65% at that time.
We will go ahead and repeat the 2D echocardiogram, while we have her.
We will repeat the cardiac enzymes in the morning as well, those are atypical for an MI presentation.
Keep her on supplemental O2.
Give DuoNeb treatments via respiratory.
Encourage incentive spirometry.
Her blood gases reasonable tonight.
In the past, she has been much higher CO2 retainer as high as 69.
We will keep the head of the bed elevated.
She may benefit from BIPAP for nocturnal dyspnea, at the moment she seems stable.
The plan of care has been reviewed in detail with Dr. who was also examined the patient.
The patient is lucid enough to confirm that she wishes to be regarded as a FULL CODE.
CHIEF COMPLAINT:
Shortness of breath, particularly at nighttime.
HISTORY AND PHYSICAL

LOCATION OF PATIENT:
Room:
DATE OF ADMISSION:
02/11/2015
CRT:
KOH 2/12/15

PRIMARY CARE PHYSICIAN:

ASSESSMENT:
1. Increased shortness of breath from baseline, particularly with reported paroxysmal nocturnal dyspnea in a patient with elevated NT-proBNP.
2. She has also underlying chronic obstructive pulmonary disease (COPD) with no evidence of pneumonia.
3. End-stage renal disease on Monday, Wednesday, and Friday regimen.
4. Anemia of chronic disease.
5. Chronic obstructive pulmonary disease on home O2.
6. Medical conditions listed.

RECOMMENDATIONS:
The patient will be admitted for at least overnight monitoring.
Dr. has been consulted.
The patient is not a candidate for dialysis to see urgently, but may require supplemental dialysis tomorrow at the discretion of the consultant.
There may be multifactorial component to her presentation, she does have an underlying COPD, and she has had a history of acute on chronic diastolic heart failure in the past with the last echocardiogram, being in August with the EF was 65% at that time.
We will go ahead and repeat the 2D echocardiogram while we have her.
We will repeat the cardiac enzymes in the morning as well, those are atypical for an MI presentation.
Keep her on supplemental O2.
Give DuoNeb treatments via respiratory.
Encourage incentive spirometry.
Her blood gases reasonable tonight.
In the past, she has been much higher CO2 retainer as high as 69.
We will keep the head of the bed elevated.
She may benefit from BIPAP for nocturnal dyspnea at the moment she seems stable.
The plan of care has been reviewed in detail with Dr. , who was also examined the patient.
The patient is lucid enough to confirm that she wishes to be regarded as a FULL CODE.

CHIEF COMPLAINT:
Shortness of breath, particularly at nighttime.
HISTORY AND PHYSICAL
LOCATION OF PATIENT:
Room:
DATE OF ADMISSION:
02/11/2015
CRT:
KQH 2/12/15
PRIMARY CARE PHYSICIAN:

ASSESSMENT:
1. Increased shortness of breath from baseline, particularly with reported paroxysmal nocturnal dyspnea in a patient with elevated NT-proBNP.
2. End-stage renal disease, on Monday, Wednesday, and Friday regimen.
3. Anemia of chronic disease.
4. **Chronic obstructive pulmonary disease** on home O2.
5. Medical conditions listed.

RECOMMENDATIONS:
The patient will be admitted for at least overnight monitoring.
Dr. has been consulted.
The patient is not a candidate for dialysis to see urgently, but may require supplemental dialysis tomorrow at the discretion of the consultant.
There may be multifactorial component to her presentation, she does have an underlying COPD,
and she has had a history of acute on chronic diastolic heart failure in the past with the last echocardiogram being in August with the EF was 65% at that time.
We will go ahead and repeat the 2D echocardiogram, while we have her.
We will repeat the cardiac enzymes in the morning as well, those are atypical for an MI presentation.
Keep her on supplemental O2.
Give DuoNeb treatments via respiratory.
Encourage incentive spirometry.
Her blood gases reasonable tonight.
In the past, she has been much higher CO2 retainer as high as 69.
We will keep the head of the bed elevated.
She may benefit from BIPAP for nocturnal dyspnea, at the moment she seems stable.
The plan of care has been reviewed in detail with Dr. who was also examined the patient.
The patient is lucid enough to confirm that she wishes to be regarded as a FULL CODE.

CHIEF COMPLAINT:
Shortness of breath, particularly at nighttime.
HISTORY AND PHYSICAL
LOCATION OF PATIENT:
Room:
DATE OF ADMISSION:
02/11/2015
CRT:
KQH 2/12/15
PRIMARY CARE PHYSICIAN:

ASSESSMENT:
1. Increased shortness of breath from baseline, particularly with reported praeoxysmal nocturnal dyspnea in a patient with elevated NT-proBNP.
2. She also has underlying chronic obstructive pulmonary disease with no evidence of pneumonia.
3. End-stage renal disease, on Monday, Wednesday, and Friday regimen.
4. Anemia of chronic disease.
5. Chronic obstructive pulmonary disease on home O2.

RECOMMENDATIONS:
The patient will be admitted for at least overnight monitoring.
Dr. has been consulted.
The patient is a candidate for dialysis to see urgently, but may require supplemental dialysis tomorrow at the discretion of the consultant.
There may be multifactorial component to her presentation, she does have an underlying COPD,
and she has had a history of acute on chronic diastolic heart failure in the past with the last echocardiogram being in August with the EF was 65% at that time.
We will go ahead and repeat the 2D echocardiogram, while we have her.
We will repeat the cardiac enzymes in the morning as well, those are atypical for an MI presentation.
Keep her on supplemental O2.
Give Duoneb treatments via respiratory.
Encourage incentive spirometry.
Her blood gases reasonable tonight.
In the past, she has been much higher CO2 retainers as high as 69.
We will keep the head of the bed elevated.
She may benefit from BiPAP for nocturnal dyspnea at the moment she seems stable.
The plan of care has been reviewed in detail with Dr. who was also examined the patient.
The patient is lucid enough to confirm that she wishes to be regarded as a FULL CODE.
CHIEF COMPLAINT:
Shortness of breath particularly at nighttime.
Patient 194,779 > Encounter 125,654 > Note 1,953,483

HISTORY AND PHYSICAL
LOCATION OF PATIENT:
Room:
DATE OF ADMISSION:
02/11/2015
CRT:
KQH/2/12/15
PRIMARY CARE PHYSICIAN:

ASSESSMENT:
1. Increased shortness of breath from baseline, particularly with reported paroxysmal nocturnal dyspnea in a patient with elevated NT-proBNP.
2. She has underlying chronic obstructive pulmonary disease with no evidence of pneumonia.
3. End-stage renal disease, on Monday, Wednesday, and Friday regimen.
4. Anemia of chronic disease.
5. Medical conditions listed.

RECOMMENDATIONS:
The patient will be admitted for at least overnight monitoring.
Dr. has been consulted.
The patient is not a candidate for dialysis to see urgently, but may require supplemental diuresis tomorrow at the discretion of the consultant.
There may be multifactorial component to her presentation, she does have an underlying COPD,
and she has had a history of acute on chronic diastolic heart failure in the past with the last echocardiogram being in August with the EF was 65% at that time.
We will go ahead and repeat the 2D echocardiogram, while we have her.
We will repeat the cardiac enzymes in the morning as well, those are atypical for an MI presentation.
Keep her on supplemental O2.
Give Duonex treatments via respiratory.
Encourage incentive spirometry.
Her blood gases reasonable tonight.
In the past, she has been much higher CO2 retainer as high as 69.
We will keep the head of the bed elevated.
She may benefit from BiPAP for nocturnal dyspnea at the moment she seems stable.
The plan of care has been reviewed in detail with Dr. who was also examined the patient.
The patient is lucid enough to confirm that she wishes to be regarded as a FULL CODE.

CHIEF COMPLAINT:
Shortness of breath, particularly at nighttime.
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HISTORY AND PHYSICAL
LOCATION OF PATIENT:
Room: SCPH-3C5 - Sentara Careplex Hospital
DATE OF ADMISSION:
02/11/2015
CPT:
KQH 2/12/15
PRIMARY CARE PHYSICIAN:
Nequita Dowling, MD.
ASSESSMENT:
1. Increased shortness of breath from baseline, particularly with reported paroxysmal nocturnal dyspnea in a patient with
   - She also has underlying chronic obstructive pulmonary disease with no evidence of pneumonia
2. End-stage renal disease on Monday, Wednesday, and Friday regimen.
3. Anemia of chronic disease
5. Medical conditions listed.
RECOMMENDATIONS:
The patient will be admitted for at least overnight monitoring.
Dr. Semret has been consulted.
The patient is not a candidate for dialysis to see urgently, but may require supplemental dialysis tomorrow at the discretion of the consultant.
Thrombocytopenia is a multilocal component to her presentation, she does have an underlying COPD and she has had a history of acute on chronic diastolic heart failure in the past with the last echocardiogram being in August with the EF was 65% at that time.
We will go ahead and repeat the 2D echocardiogram, while we have her.
We will repeat the cardiac enzymes in the morning as well; these are typical for an MI presentation.
Keep her on supplemental O2.
Give DuShet treatments via respiratory.
- Echocardiogram is normal.
Her blood gases reasonable tonight.
In the past, she has been much higher CO2 retainer as high as 65.
We will keep the head of the bed elevated.
She may benefit from BiPAP at the moment she seems stable.
The plan of care has been reviewed in detail with Dr. Amo-Mensah, who was also examined the patient.
The patient is lucid enough to confirm that she wishes to be regarded as a FULL CODE.
CHIEF COMPLAINT:
- Shortness of breath, particularly at nighttime.
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## Pathways

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Judy is actively being treated for her Type 2 Diabetes.

Insights from her records using the vCSN indicated emerging risks of major depressive disorder and lactic acidosis …

… prioritizing her for new interventions, multi-modal engagement, medication review, trigger alerts in Provider offices, etc.
Come visit us at Booth #7