Experience of the Zato Health Team and the Zato Health Interoperability Platform Processing Electronic Clinical Records to Extract Clinical Quality Measures

Discussion with Connecticut HIT Council
Jan. 15, 2016
Zato Health Team Experience with Computer Assisted Coding and Extraction of Medical Knowledge from Clinical Data

• Dr. Daniel Heinze, Founder and CTO of Zato Health was previously Founder and CTO of A-Life Medical and inventor of LifeCode® software

• A-Life and LifeCode® were acquired by the largest US health insurer, UnitedHealth in 2010.

• LifeCode® is a product of OPTUM – the health services platform of UnitedHealth
LifeCode® - Invented by Dr. Daniel Heinze

- Patented Natural Language Processing (NLP) for computer assisted coding
- Assists medical coders and clinical abstractors by reading clinical documentation
- Deciphers the meaning and context of words within medical records
- Makes sense of doctor/patient interactions
- Correctly codes diagnoses and procedures of patient care for insurance purposes
- Recommends appropriate and compliant ICD-9 and CPT-4 codes
- Reduces the costs of manual claims coding and speeds the reimbursement process
- More accurate efficient coding; enhances productivity
- At the core of OPTUM 360™ clinical documentation improvement
- Has successfully processed hundreds of millions of medical records
Seamlessly integrated software to improve care quality and cost effectiveness

1. Next-Gen extraction of medical concepts and ICD-10 coding from diverse clinical data, leveraging a comprehensive medical ontology

2. Data normalization, indexing, edge processing for de-centralized analysis across different EHR vendor databases and other healthcare data silos

Improved quality of clinical documentation, billing, performance measures

Fully verifiable via links to highlighted evidence in the source clinical data

Standardized performance reports to meet payment performance requirements of State, Federal, and private payers
Leveraging relationships among:

- Clinical anatomy
- Diseases
- Symptoms, Observations
- Medical tests
- Findings, Diagnoses
- Treatments, Procedures
- Morphological abnormalities
Examples of Healthcare Applications Enabled by Zato Health

- Clinical Documentation Improvement
- Risk stratifying patients
- Automated coding & billing to ICD-10 standards
- DRG Dashboard for proactive monitoring of DRGs
- Patient quality measure reporting (GPRO-EZ)
- Reporting Meaningful Use measures
- Cross clinical and genomic variant data analysis simultaneously
- Effective and efficient search for patient clinical care and audits
- Real time monitoring and quality alerts for evidence based intervention
Extraction and Analysis of Clinical Data from a Cerner EHR Data Repository for a Multi-Hospital Provider

- NLP medical knowledge extraction, coding, indexing of 2.2 million clinical records and millions of lab records of 230,000 patients extracted from Cerner EHR
- Clinical data normalized and indexed for demonstration of DRG Dashboard application and Clinical Documentation Improvement
- HIPAA compliant live demonstrations of capabilities may be arranged upon approval by Baystate and execution of confidentiality agreement.
- Implications for cost savings by further automation of chart reviews
- Verifiability of reported data by automatic hyperlinking to evidence
- Low staff requirement and cost for a pilot and evaluation
Extraction of Medical Knowledge from Clinical Data for Correlation with Genomic Data

• Initiative of UCONN Medical School
• De-identification of EHR clinical records, while preserving full fidelity of the medical knowledge in the clinical data. Low site staff time.
• Enabling edge analysis in parallel across outpatient data, inpatient data, diagnoses, medications, imaging studies, test and procedure results, lab and pathology results, demographics, genomic variants
• Objective: to enable discovery of novel genetic variants that are associated with diseases or pharmacogenomics phenotypes
• Extending research data reach to accelerate research discoveries

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Additional Zato Team Experience - Anita Karcz MD MBA

- Emergency medicine physician
- Co-founder of Institute for Health Metrics
- VP Product Development InterQual
- Over 20 years innovating with electronic clinical data
- Experience with different EHR vendor systems
- Worked with data from 100 providers to produce clinical quality measure reports, processing over 20 million clinical records in the past 5 years
Dr. Karcz’ Use of Electronic Clinical Data for Quality Measures

- Quality initiative experience (MU, IQR, PQRI, etc) from both a clinical and informatics perspective
- Managing/evaluating pilots/projects using electronic clinical data
- Institute for Health Metrics site PI for 4 federal grants:
  - AHRQ-physician practice quality reporting from EMR
  - NCI-comparative effectiveness of therapies for breast cancer
  - NHLBI-anticoagulation therapy and VTE post total joint replacement
  - CDC-early diagnosis and clinical outcomes in sepsis
Remaining Slides are not part of the presentation. They are available for reference during Q&A.
1. Analysis of Clinical Data in the DRG Dashboard Application

Progress Status and Implications

- Live demonstration for DRGs of Pneumonia and Congestive Heart Failure at https://www.youtube.com/watch?v=93IbgDbc5G0
- Rank ordered risks calculated for each DRG across patients
- Rank ordered risks calculated for each patient for each DRG
- Easy toggle from dashboard view to source medical record with highlighted evidence
- Easy to use, non-intrusive, highly productive tool for Clinical Decision Support, early intervention, improved outcomes
### Congestive Heart Failure

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**Total: 840**

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2. Virtual Data Lake of Clinical and Genomic Variant Records
Progress Status and Implications

• Live demonstration of next-gen NLP extraction and edge processing across multiple databases of multiple organizations with data centers in New York and Massachusetts at

https://www.youtube.com/watch?v=omJfbNLUt90&feature=youtu.be

• Live demo of fusion of results over multiple private and public networks

• De-identified clinical data and genomic variant data – 8 billion records

• Unified global view from single pane of glass

• Scalability for nation-size virtual data lakes that are interoperable
Extraction of ICD-9-CM Codes from Medical Records

Document: Doc0127_CAC

HEADER
ARUP_NA19240_Exome | ACMH | 46947625 | 075014 | 2/16/1997 12:00:00 AM | UNSTABLE ANGINA | Signed | DIS
Assignment Date: 2/16/1997 | Report Status: Signed Discharge Date: 9/14/1997

PRINCIPAL DIAGNOSIS:
PRINCIPAL DIAGNOSIS: Myocardial Infarction.

OTHER DIAGNOSIS:
1. Sarcoidosis
2. Hypertension

HISTORY OF PRESENT ILLNESS:
The patient is a 65-year-old female with a history of hypertension, hypercholesterolemia, non-insulin-dependent diabetes mellitus, and with no known history of CAD admitted with chest pain. She has had several days of exertional chest pain characterized by substernal burning pain which, at times, radiates to the left shoulder. It is sometimes accompanied by shortness of breath without nausea or occasional diaphoresis. She was seen in the Emergency Department with chest pain on June 1, 1997, with associated tachycardia and elevated cardiac enzymes. An exercise treadmill test on April 1997, for three minutes revealed a maximal heart rate of 127 and maximal blood pressure of 134/80. She experienced chest pain with 1 millimeter of ST depression in V5 and T-wave inversions in V4-V6. This study was interpreted as consistent with, but not diagnostic ischemia. She was started on aspirin and pindolol. On the morning of admission, she was walking to catch a bus and had an episode of substernal chest burning lasting less than 10 minutes with shortness of breath, but no nausea, vomiting, or diaphoresis. She came by cab to Ried Center. In her medical test study was noted to have T wave inversions in II, III, aVF, and V3-V6. On arrival to the Emergency Room, the patient was pain free. She denied lower extremity edema and had mild orthostasis which was unchanged. She denied bright red blood per rectum, and stools were black secondary to iron supplementation. Hematocrit on November, 1997, was noted to be 29.3. The patient had been iron supplements for a long history of colon lymphs.

PAST MEDICAL HISTORY:
1. Significant for a history of sarcoidosis. Her last pulmonary test was in April 1995 which showed an FEV1 of 1.61, 72% of predicted; FEV1 ratio to FVC was 80 or 102% of predicted. FVC was 2.01 or 2.02% in predicted. In the past, she has been treated with prednisone and now uses Ventolin inhalers p.r.n. 2) History of ulcer disease. 3) Status post pacemaker placement in October 1996 for tachycardia bradycardia syndrome. 4) Status post appendectomy. 5) Status post total abdominal hysterectomy for cervical cancer. 6) Adult onset diabetes mellitus, diet controlled. 7) History of left calf deep vein thrombosis in 1992. 8) History of colon polyps with a colonic adenoma diagnosed in 1993.

MEDICATIONS
UNINSOPH 8 mg q.d.; Pravachol 20 mg q.s.; aspirin 325 mg q.d.; atenolol 50 mg b.i.d.; diuretics 200 mg b.i.d.; ferrous gluconate 325 mg t.i.d.

ALLERGIES
Penicillin and penicillin antibiotics, gives rash.
Extraction of Labs, Procedures, and Substances Taken

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Zato Data Security, Tracking, and Accountability for Oversight, Compliance, Auditing, Comparison of Cost Effectiveness

- All Data and indexes remain where the data are created, stored, and protected
- All data access is subject to user role-based discretionary access control
- Optional download encryption and control under Digital Rights Management
- Security enforced and sharing permission controlled at each organization
- Server-to-server security; cross-network data encryption end-to-end
- All user activity is logged at the source for tracking, with global analysis of logs
- Successful financial fraud interdiction in the Intelligence Community processing Suspicious Activity Reports across all US banks under the Bank Secrecy Act
- Successful cross-domain implementation controlling security across multiple security domains and networks in parallel from a single unified interface
Differentiation of Combined Capabilities

- Data transparency normalizes, indexes, filters EHR data, HL-7 data, other data
- Interactive query, analysis from unified interface (‘single pane of glass’)
- Batch analysis: high productivity, flexible output to reports or other applications
- Automatic recognition and extraction of medical concepts ‘on the fly’ in context
- Global navigation across data sources in parallel by context, concepts, facets
- Current awareness from continuous monitoring, real-time filtering, alerting
- Dynamic iterative knowledge discovery and visualization across data sources
- Seamless system integration and interoperability with APIs and Web interfaces
- Integrated medical ontology, automated medical coding, and medical NLP
Differentiation of Performance

- **Massive Scalability** across decentralized application repositories, with capacity for scores of petabytes, trillions of records and documents.
- **Consistent global relevance ranking accuracy** as data volumes increase and number of nodes increases across data centers.
- **Consistent response time performance** as data volumes increase and number of nodes increases across data centers.
- **Efficiency over existing networks** with heavy processing loads at the edge.
- **Cross-Domain access control security** executed at the edge.
- **Unobtrusive** to local production information systems during query and analysis across production data repositories.
Zato Health Summary Slide

- Seamless integration of unique next generation capabilities for integrated NLP extraction, ICD-CM-10 coding, semantic medical ontology, edge-processing
- Team track record for new product innovation resulting in improved accuracy, user productivity, scalability, cost savings in massive production systems
- Unique capability to normalize data from multiple EHRs and other health application data silos and enable de-centralized analysis and quality reporting
- Risk stratification capabilities to impact cost effectiveness of healthcare
- Continuous monitoring and discriminating unobtrusive alerts to improve intervention at the point of care and reduce readmissions
- Revolutionary pricing model affordable to every provider with pilot offering and try-before-buy offer for IBM/Zato Power Linux appliance
Contact Information for Questions or to Request a Technical Presentation

Paul McOwen, CEO

pmcowen@zatohealth.com

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