David Carnahan & Susan Chao
Enterprise Intelligence Branch

Defense Health Agency

2015 Defense Health Information Technology Symposium

Mr. Magorium's Information Emporium: Population Health, Predictive Analytics, & Metadata

"Medically Ready Force…Ready Medical Force"

DHA Vision

Defense Health Agency

"A joint, integrated, premier system of health, supporting those who serve in the defense of our country."

Learning Objectives

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- Describe how population health supports an accountable care organization (ACO)
- Describe current efforts to provide predictive analytics in the MHS Population Health Portal (MHSPHP)
- Discuss how metadata will transform the responsiveness and flexibility for point of care registries, and clinical decision support tools
- Discuss how big data analytics can support a Learning Health System

Agenda

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- Accountable Care Organizations (ACO) & Population Health Informatics
- Predictive Analytics Using Adjusted Clinical Groups (Johns Hopkins)
- Custom Registries Through User-Derived Metadata Tags
- Point of Care Metadata and Clinical Rules
- Moving from ACO to Learning Health System (LHS) Using Data Discovery

Why is Population Health Important?

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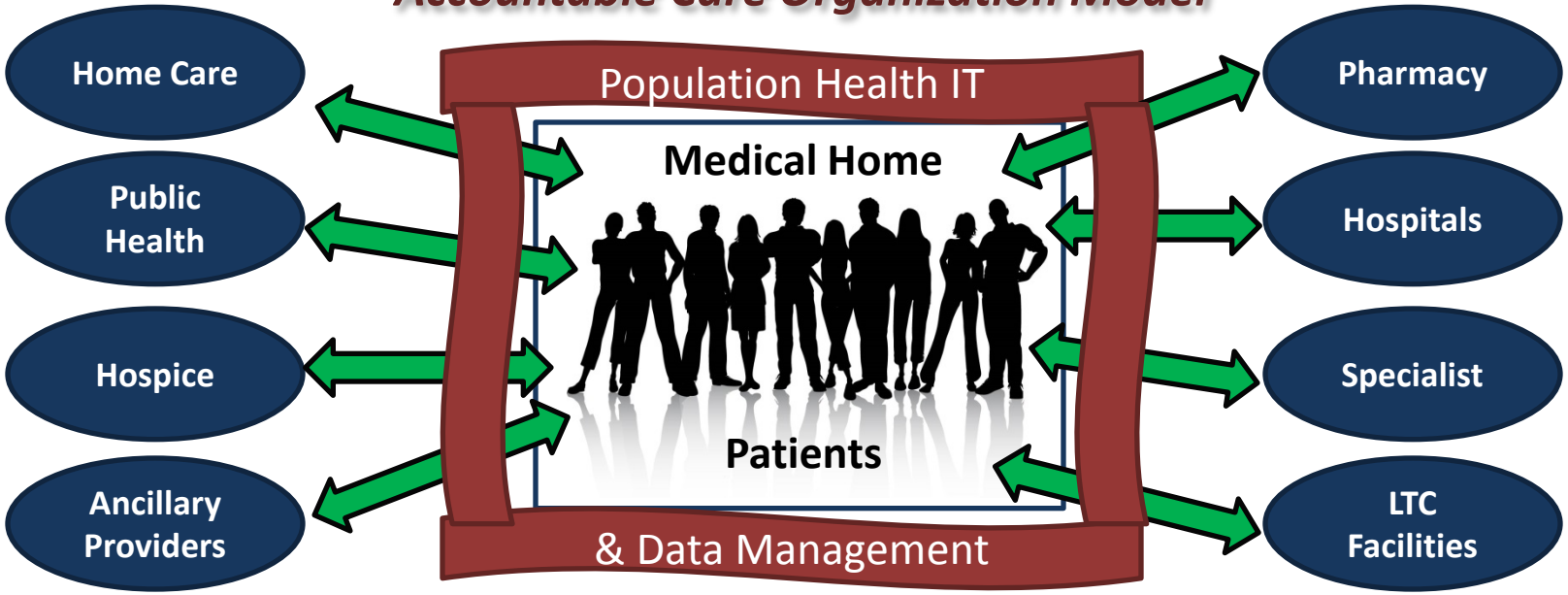
Accountable Care Organization Model



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Why is Population Health IT?

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"Simply put, EHR, HIE, and Meaningful Use only get you so far, much more is needed to aggregate data across the entire continuum of care and make it useful for population health management and engaging customers and patients."

Clinical Integration: Population Health and Accountable Care, 3rd Edition, 2015

Mr. Magorium's Information Emporium
"Something for Everyone!"

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Registries & CDS

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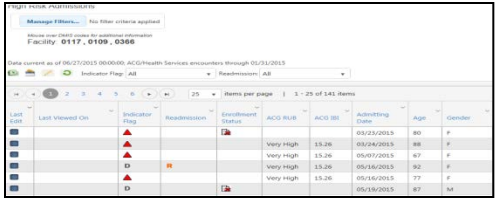
PEC

BH

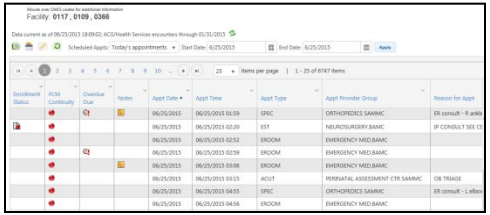
CM/UM

High Risk Admissions Registry



PCMH Nurse

Appointments Registry



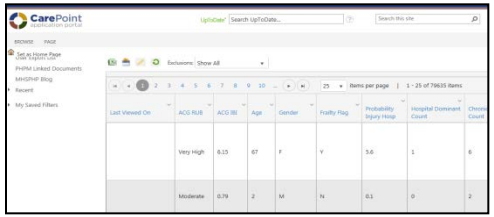
MHSPHP

Military Health System Population Health Portal

CarePoint application portal

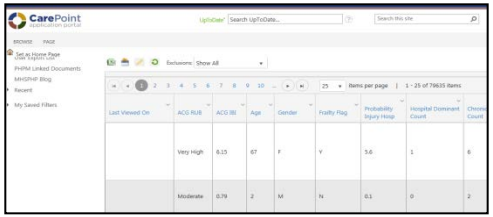
Safety

Global Triggers Registry



Quality

AHRQ Quality Indicator Registry



PNG

MCSC

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High Risk Admission Example

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Exploratory

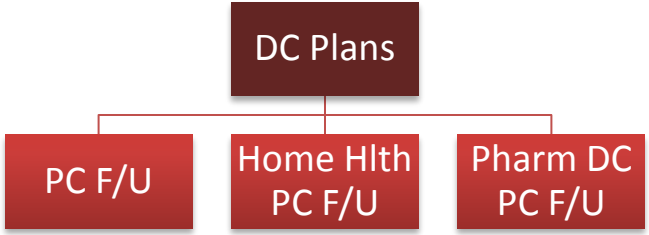
- Age
- Chronic Condition
- LOS
- Gagne Score
- PC F/U*
- RUB
- DRG Group
- ICU Stay

Predictive

- Age
- Chronic Condition
- Gagne Score
- RUB

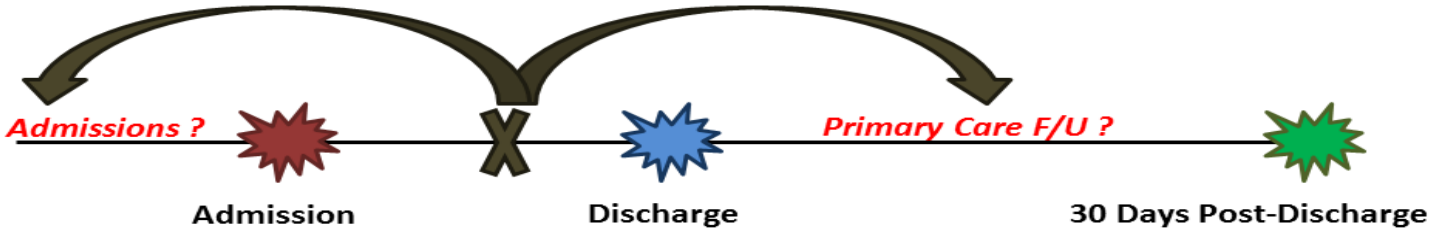
16% of Admissions
40% of Readmissions

Prescriptive



Comparative Effectiveness Studies

High Risk Admissions



Last Edit	Last Viewed On	Indicator Flag	Readmission	Enrollment Status	ACG RUB	ACG IBI	Admitting Date	Age	Gender
		▲					03/23/2015	80	F
		▲			Very High	15.26	03/24/2015	88	F
		▲			Very High	15.26	05/07/2015	67	F
		D	R		Very High	15.26	05/16/2015	92	F
		▲			Very High	15.26	05/16/2015	77	F

Global Triggers (Safety) Example

items per page | 1 - 25 of 150 items

IHI Indicator	Test/Drug Name	Test Result	Test/Drug/Previous Admission Date
Positive Blood Culture	BLOOD CULTURE		05/26/2015 08:30
PTT>100 seconds	PARTIAL THROMBOPLASTIN TIME	102.3	06/04/2015 16:53
Readmission Within 30 Days			06/18/2015 20:20
Readmission Within 30 Days			05/09/2015 12:58
PTT>100 seconds	PARTIAL THROMBOPLASTIN TIME	102.3	04/01/2015 02:47
PTT>100 seconds	PARTIAL THROMBOPLASTIN TIME	105.8	03/31/2015 06:31
PTT>100 seconds	PARTIAL THROMBOPLASTIN TIME	127.4	04/01/2015 05:00
Readmission Within 30 Days			06/15/2015 15:56

Predictive Analytics using ACG

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Demographics

Encounters

Medications

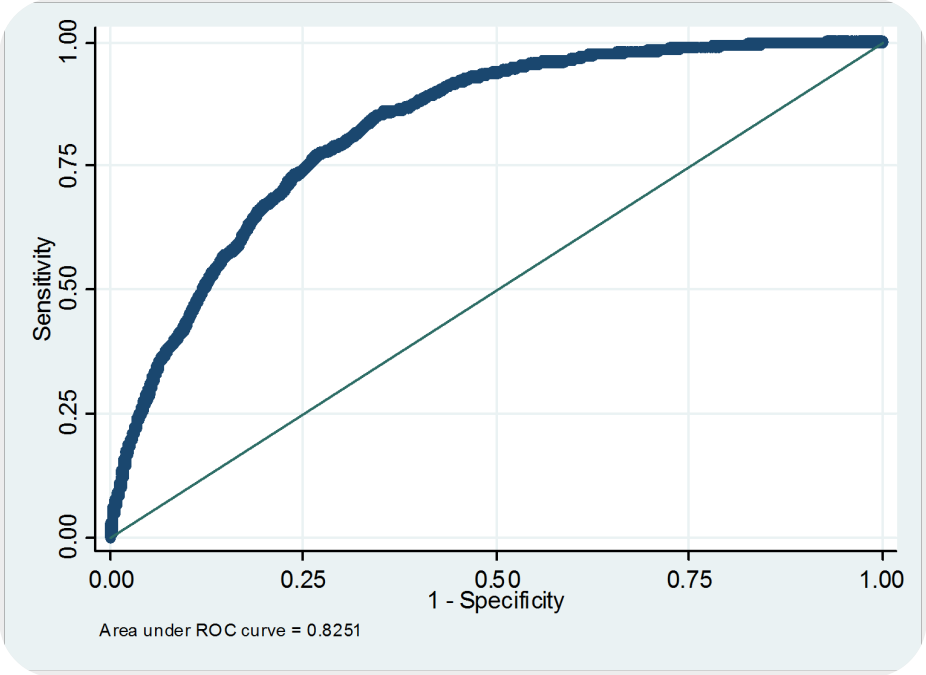
Johns Hopkins
Validated Logic Models

- Pharmacy Adherence
- Care Coordination
- Chronic Conditions
- Total Cost
- Pharmacy Cost
- Frailty Flag
- Specialist Count
- Prob Hospitalization
- Prob Readmission
- Prob High Total Cost
- Prob High Pharm Cost

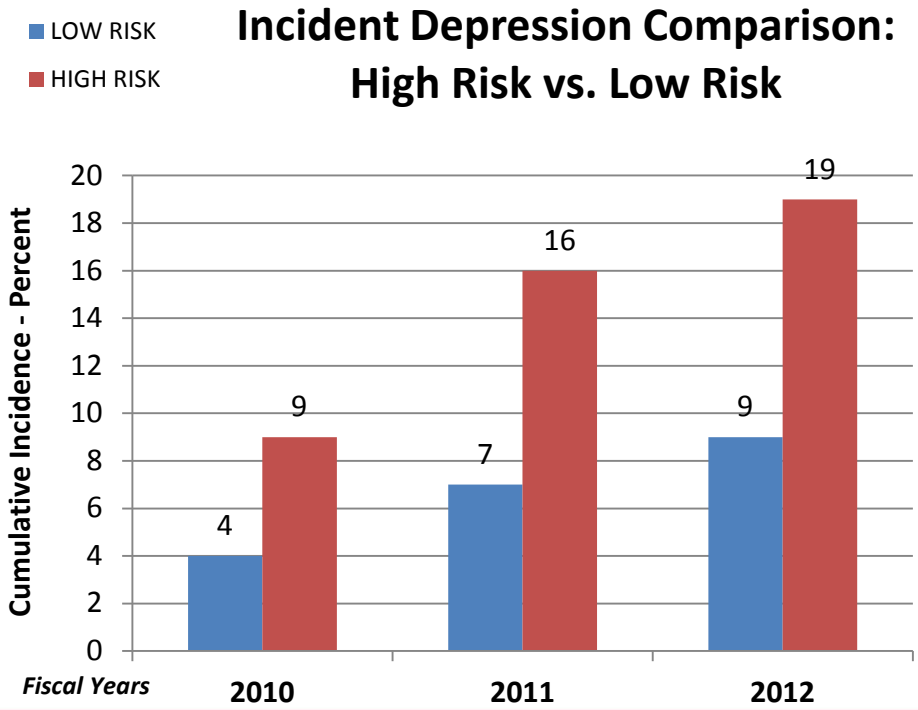
Predictive Analytics Using ACG

Hypothesis:
Can ACG Variables Predict Incidence of Depression in Patients with Chronic Disease?

- **Age**
- **Resource Utilization Band (1-5)**
- **Chronic Condition Count (Quintile)**
- **Pharmacy Cost (Quintile)**
- **Frailty Flag (Y/N)**



Operationalizing Study Results



N = 2466

Selected Field	Operator	Value
ACG RUB	Greater Than Or Equal To	3
Frailty Flag	Equal	Y
Chronic Condition Count	Greater Than Or Equal To	3
Pharmacy Cost	Greater Than	1000

N = 1869

EDC Codes	Not Equal	PSY09-1
EDC Codes	Not Equal	PSY09-2

Health Services Registry (HSR)

MEDC Codes	EDC Codes
ADM END FRE GAS GSI GSU MUS NUR NUT PSY SKN TOX	ADM02-2 ADM05-2 ADM06-2 END02-2 FRE02-2 FRE08-2 FRE12-2 GAS01-2 GAS03-2 GAS07-2 GAS14-2 GSI01-2 GSU01-2 GSU10-2 MUS01-2 MUS09-2 MUS13-2 MUS14-2 MUS17-2 NUR03-2 NUR22-2 NUT02-2 PSY01-2 PSY02-2 PSY03-2 PSY05-2 PSY09-2 PSY20-2 SKN20-2 TOX03-2

END 02 – Osteoporosis
GAS 03 – Constipation
MUS 13 – Cervical d/o
MUS 14 – LBP
NUR 03 – Neuropathy
NUR 22 – Migraine d/o
NUT 02 – Nutritional Def
PSY 02 – Substance Abuse
PSY 03 – Tobacco Use
PSY 09 – Depression
TOX 03 – AE from Procedure

MEDC Codes are like a systems perspective

-1 New
-2 Established

A Registry of Registries (HSR)

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N = 4,997

Query Builder

Filters | My Filters

AND/OR	(	Selected Field	Operator	Value
		EDC Codes	Contains	PSY09

N = 621

AND/OR	(	Selected Field	Operator	Value
		EDC Codes	Contains	TOX03

Tagging – Customized Cohorts

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Enrollment data current as of 06/16/2015; Monthly metrics/registry patients current through 03/31/201

Exclusions: Show All

1 - 25 of 5879 items

Gender	BenCat	Tags
M	RTA	Diagnosis ✕ Glycemic ✕ Virus ✕
F	RTN	
M	ADN	
M	ADA	
M	ADA	Allergy ✕ X-Ray ✕
M	RTN	
F	RTFMLY	Epidermis ✕ Cat Scan ✕ Asthma ✕

Group Tagging

High	2.45	05/27/2015	20
High			
High			
High			
High			
Very High	6.61	05/27/2015	20

- Open Patient View
- Add / View Exclusions
- Add Test / Screening
- Add / View Notes
- Add Tags
- View Locally Entered Patient Data Summary

Individual Patient Tagging

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Tagging

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Public Tags

GLYCEMIC ✕ VIRUS ✕

Depression

Diagnosis

Epidermis

Pulmonary

51
34
49
26
51
57
13
57
58

Public Tags

DIAGNOSIS ✕ GLYCEMIC ✕ VIRUS ✕

Private Tags

Select ...

ADD

Rules Engines & EBM

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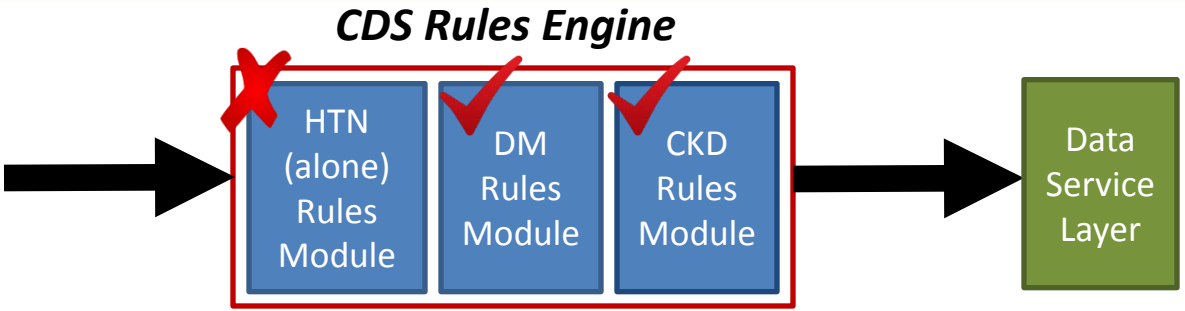
PMH

1. *Diabetes*
2. *HTN*
3. *HLP*
4. *Chronic Kidney Disease*
5. *Osteoarthritis*



Data Layer

A1C < 8	Metformin eGFR < 60 eGFR > 55	Needs Statin	Check PTH	Bone Density Exam	BP at Goal

Dynamic dashboard give CDS recommendations based on Patient's data and DM and CKD Evidence Based Medicine Guidelines

MHSPHP
Military Health System Population Health Portal
MHSPHP

Presentation Layer

The Team Behind the Emporium

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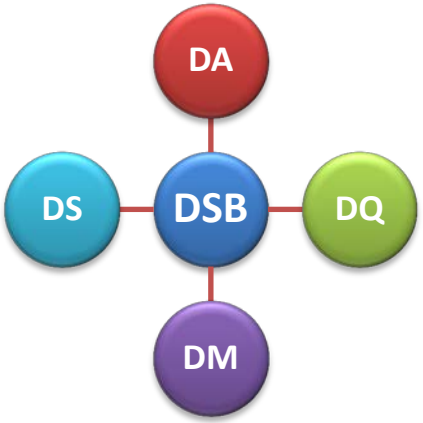
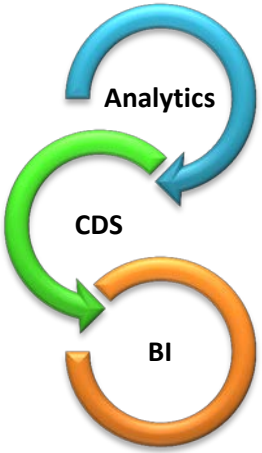
Data Service Branch



E-Intelligence Branch



Web Strategies Branch
Registries Branch

MHSPHP
Military Health System Population Health Portal
MHSPHP

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Learning Healthcare Systems

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… as defined by the Institute of Medicine (IOM), are characterized by a number of core attributes. Particularly important is a consistent emphasis on a collaborative approach that shares data and insights across boundaries to drive better, more efficient medical practice and patient care. Key to this vision is the creation of system linked by a common EHR and shared databases. This interconnected system in turn can be supported by new methods of clinical research and data analysis and would rely on modern information technology and informatics to manage and communicate data that would help guide the decisions made by health systems, care providers, and patients and their families.

Data Discovery with Big Data

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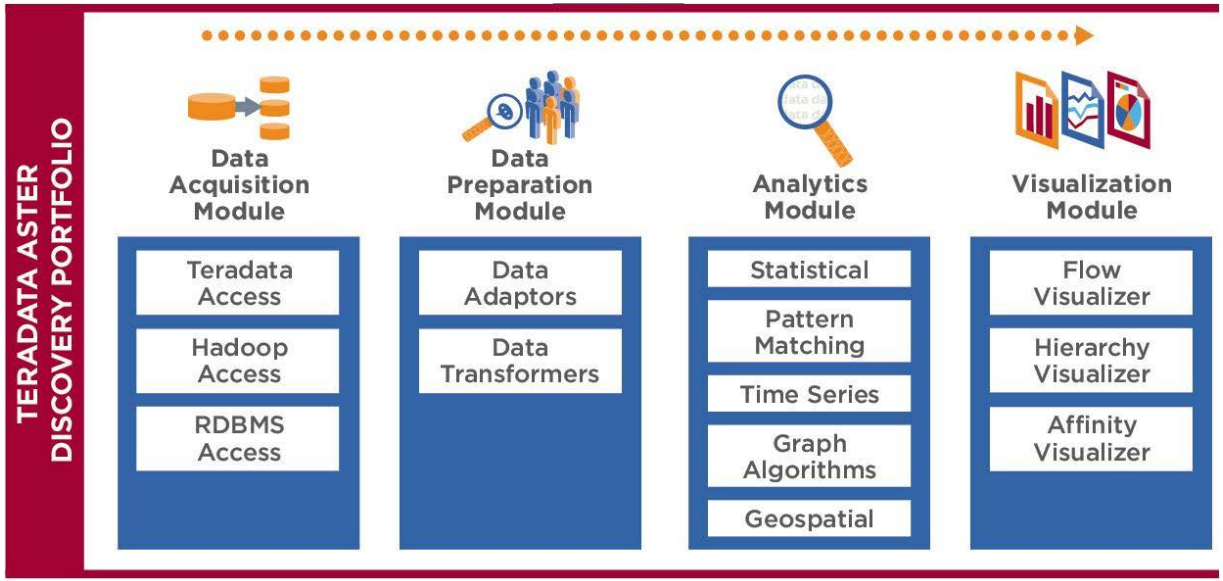
"There are things we do not know that we don't know"*-- Donald Rumsfeld*



Data Discovery with Big Data

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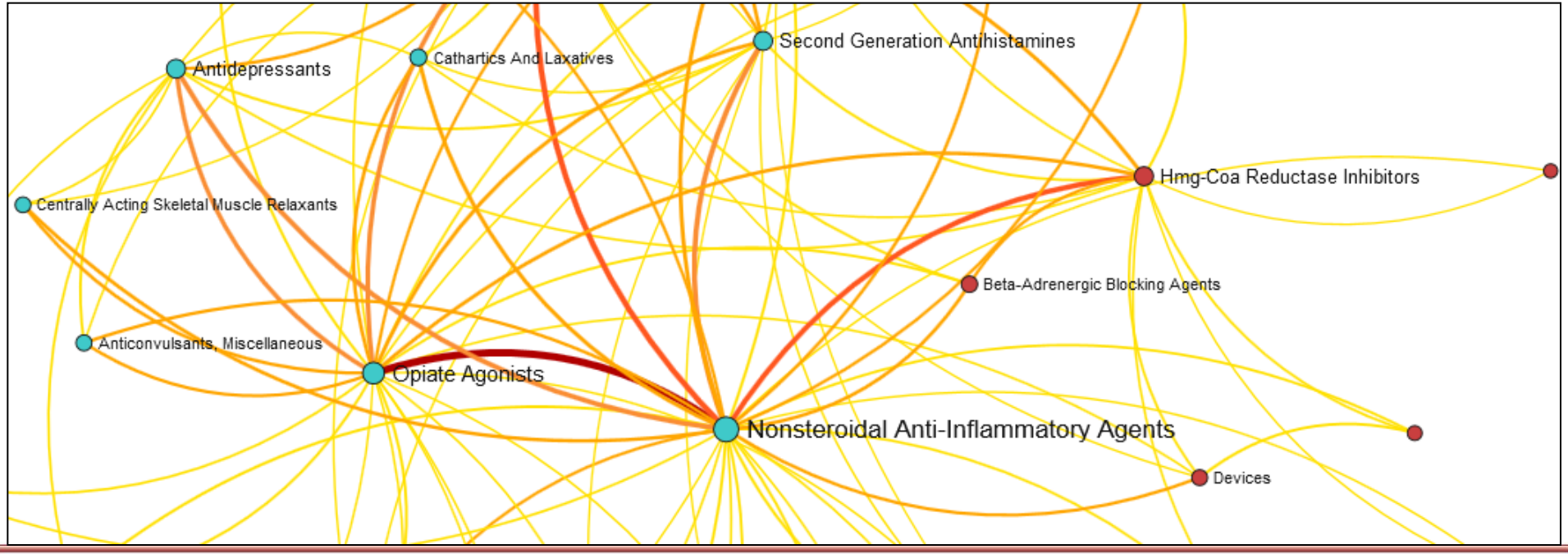
For patients in the top quintile of pharmacy cost, what are the most common medications?



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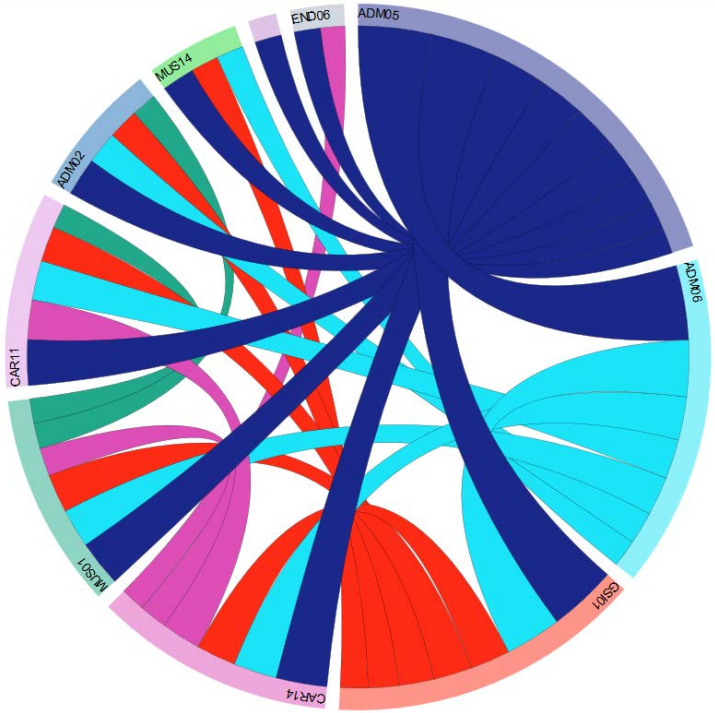
Data Discovery with Big Data



EDC Codes for Top Quintile of Pharmacy Cost

1. ADM 05 – Adm Concern & NS Lab Abnl
2. ADM 06 – Preventive Care
3. GSI 01 – General S/Sxs
4. CAR 14 – HTN
5. MUS 01 – Musculoskeletal S/Sxs
6. CAR 11 – HLP
7. ADM 02 – Surgical Aftercare
8. MUS 14 – LBP
9. END 06 – Type 2 DM

Data Discovery with Big Data

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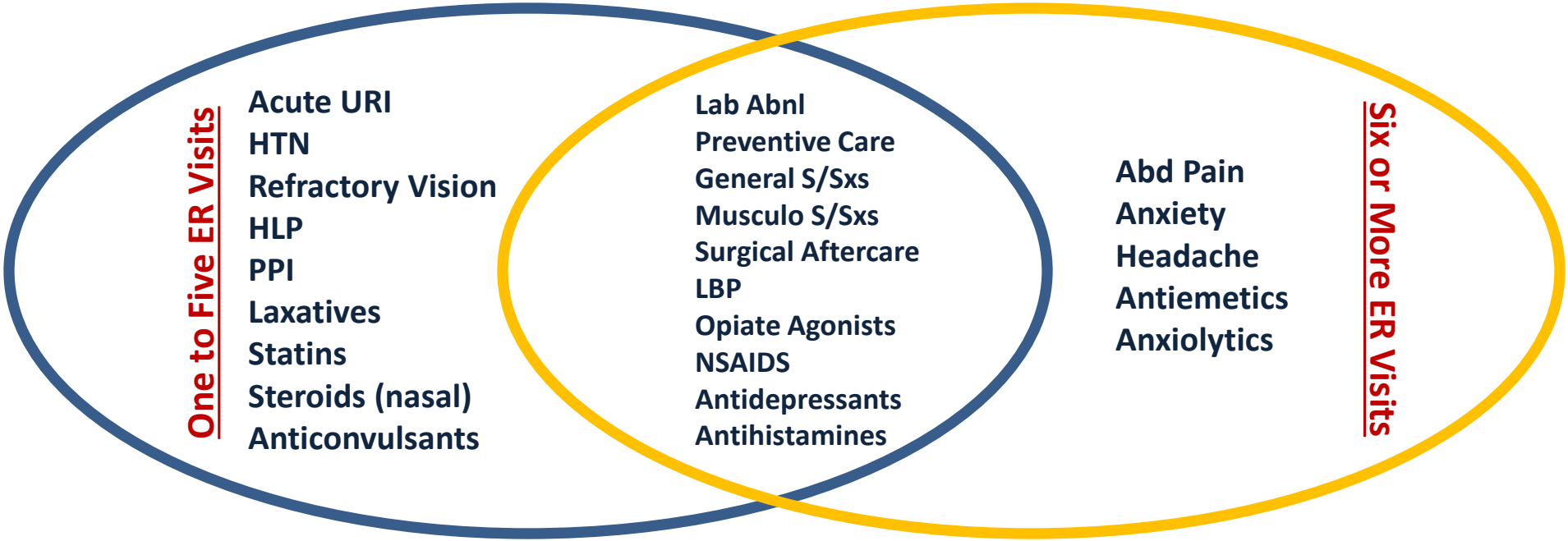
For patients who frequent the ER, what are the most common meds and EDC codes?



How Do You Create a Flexible System Needed to be an ACO?

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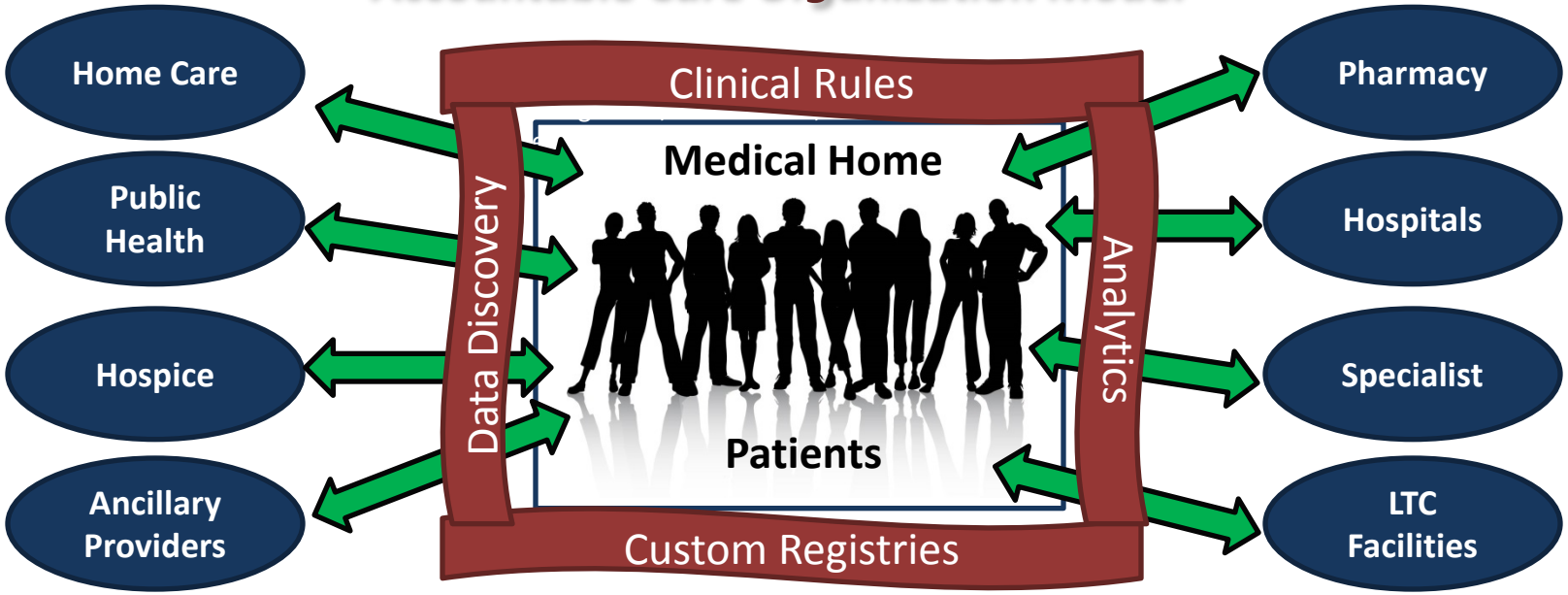

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Evaluations

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Please complete your evaluations

Contact Information

Defense Health Agency

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