

Applying Pharmacy Data to Design Innovative Care Management Interventions in Medicaid Populations

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Improving Your Hand in Care Management

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Goals for this Presentation

- To describe the conceptual basis of an Rx-based predictive model
- To present details of the construction and technical features of the this model
- To apply this tool for care management of diabetics in an adult SSI population, showing how to apply the Rx model and related tools to better understand risk in population subgroups
- To demonstrate the utility of a pharmacy-based tool where diagnostic data may be unavailable
- To consider the implications the findings for forming new care management intervention around a population subgroup



Johns Hopkins ACG Philosophy

- Comprehensive measure of a population's risk and disease burden. They do not just categorize organ system-based diseases.
- They can be applied to a wide range of population oriented case-mix / risk adjustment applications. They do more than identify outliers.
- ACGs are designed by clinicians with clinical “sense” paramount. Excellent statistical performance is a happy by-product.
- Unlike any other widely used case-mix tools, ACG's academic home provides for an emphasis on **research & development and openness.**

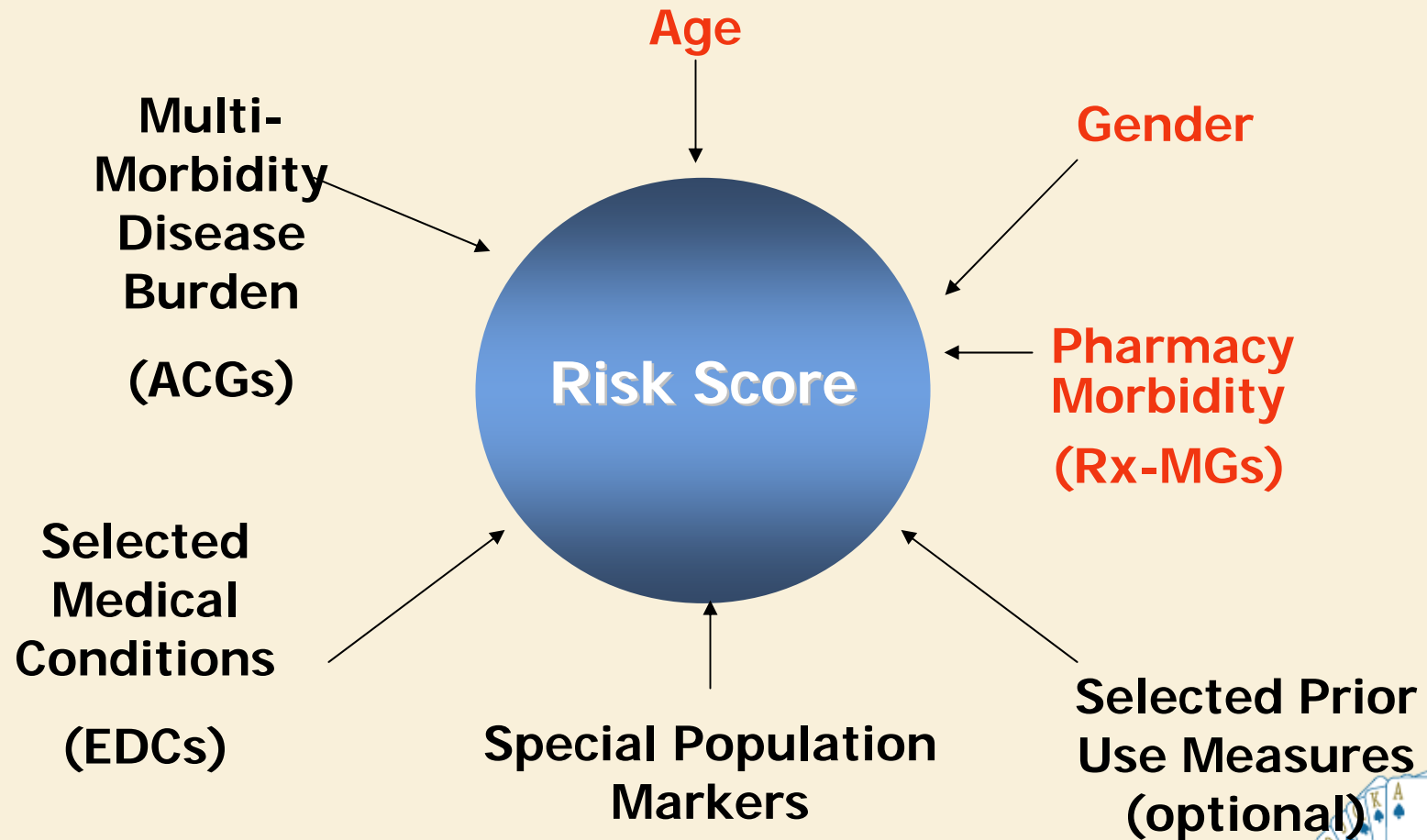


Defining Predictive Modeling (PM) in Healthcare:

- The process by which clinical data are used to estimate the risk of **future** medical service utilization.
- **Primary Purposes of PM**
 - Case identification
 - Disease management tiering
 - Actuarial forecasting
- **PM is a risk adjustment application**



Risk Factors in the Johns Hopkins ACG Predictive Model

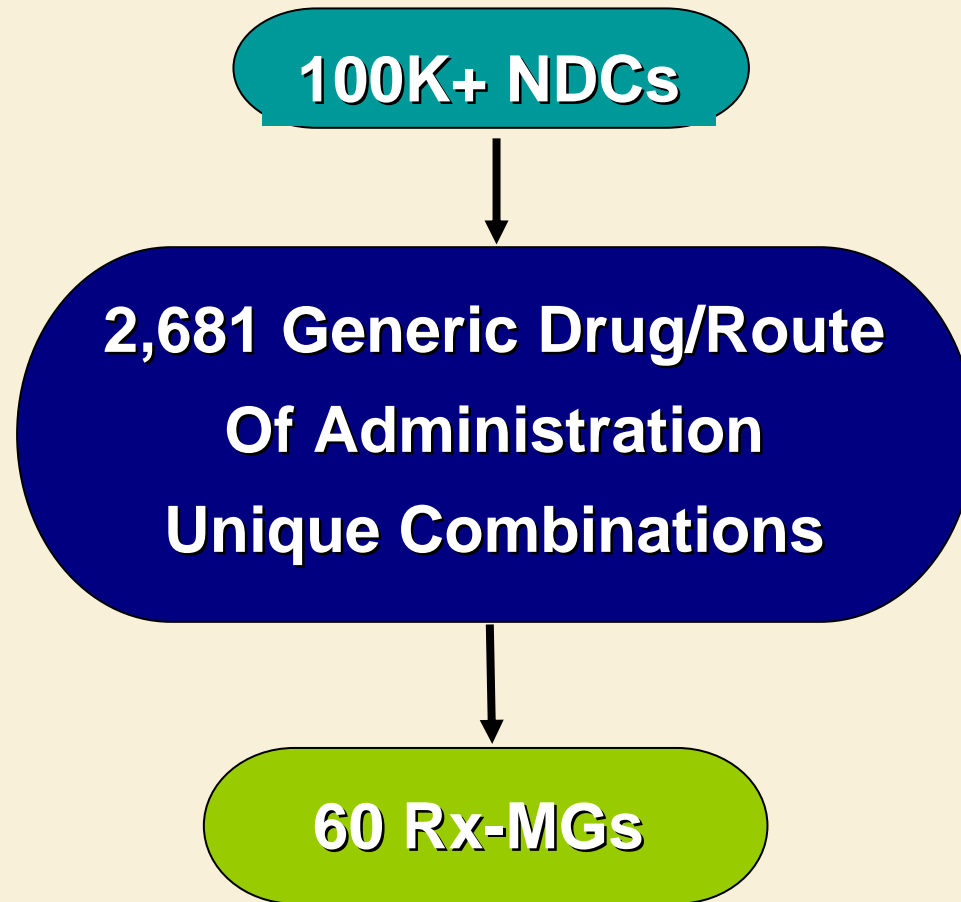


Attributes of Rx-PM

- **Clinically meaningful and actionable**
- **Avoid issues of assigning specific diagnoses**
- **Exhaustive, covers all drugs and spans clinical practice**
- **Global, employs both US and international drug coding systems**
- **Parsimonious, limited to 60 groups**
- **Excellent statistical performance**
- **Continuously updated**



From NDCs to Rx-Morbidity Groups



The Major Rx-MG Categories

- Allergy/Immunology
- Cardiovascular
- Ears, Nose, Throat
- Endocrine
- Eye
- Female Reproductive
- Gastrointestinal/Hepatic
- General Signs & Symptoms
- Genito-urinary
- Hematologic
- Infections
- Malignancies
- Musculoskeletal
- Neurologic
- Psychosocial
- Respiratory
- Skin
- Toxic Effects/ Adverse Reactions
- Others / non-specific medications



The GI/Hepatic Rx-MG Categories

Gastrointestinal / Hepatic	
Rx-MG	Exemplary Therapeutic Classes
Acute minor-palliative	Antidiarrheals, laxatives, antacids
Chronic liver disease	Interferons, penicillamine
Chronic stable	Gallstone solubilizing agents
Inflammatory bowel disease	5-aminosalicylates, infliximab
Pancreatic disorders	Digestive enzymes
Peptic disease	Proton pump inhibitors, H2 antagonists, GI stimulants



An Application in Medicaid: JHHC Care Management
Priority Partners

End Stage Renal Disease

Physical Rehabilitation

Behavioral Health

Guided Care

End of Life Care

*Cardiovascular/Diabetes
TeleWatch*

Complex Medical

Partners with Mom

Children with Special Needs



Maryland Medicaid

- Medicaid
 - Provides health insurance to low-income families (TANF), children, elderly, and people with disabilities (SSI)
- HealthChoice
 - Mandatory managed care program providing healthcare to Medicaid recipients
 - 7 participating managed care companies
- Priority Partners
 - Johns Hopkins HealthCare and 5 federally qualified health centers



Source: Maryland Department of Health & Mental Hygiene

Maryland Supplemental Security Income

- SSI
 - Federal cash assistance program providing monthly payments to low-income aged, blind, and disabled persons based on nationally uniform eligibility standards
- During 2004: 53,781 SSI beneficiaries between ages of 18-64 were eligible for Medicaid
- Maryland SSI beneficiaries represent approximately 1.5 % of the US total

Source: US Social Security Administration and Maryland Department of Health & Mental Hygiene



Study Population

- All Adult SSI Enrollees Covered by JHHC
- Most Recent Data Year
- Includes Run-out Period
- Excludes Mental Health Carve-out Claims



Risk Modeling Methods Applied to Five Distinct SSI Populations

- Overall Adult SSI (aged 18 and older) (n=15,521)
- Adult SSI with a Least One Chronic Condition (n=12,531)
- Adult SSI with Diabetes (n=2,837)
- Adult SSI “Pathway” Patients (n=1,598)
- Adult SSI Patients Who Are Diabetics but Not “Pathway” (n=1,137)



SSI Population Is Relatively Young With a Peak at Age 45 to 54 Years

Age Category	SSI		Chronic	
	n	Percent	n	Percent
Age between 18 and 24	2,311	14.89	913	8.74
Age between 25 and 34	2,150	13.85	1,126	10.77
Age between 35 and 44	3,081	19.85	2,173	20.79
Age between 45 and 54	4,577	29.49	3,509	33.57
Age between 55 and 59	1,818	11.71	1,458	13.95
Age between 65 and 69	231	1.49	169	1.62



Cardiovascular and Musculoskeletal Problems Are Prominent

SSI			Chronic		
EDC	Number	Percent	EDC	Number	Percent
Hypertension w/o Major Complications (CAR14)	5,389	3.64	Hypertension w/o Major Complications (CAR14)	7,355	13.00
Preventive care (ADM06)	5,266	3.56	Type 2 diabetes, w/o complication (END06)	5,294	9.36
Administrative concerns and non-specific laboratory abnormalities (ADM05)	5,027	3.40	Disorders of lipid metabolism (CAR11)	4,221	7.46
Musculoskeletal signs and symptoms (MUS01)	4,037	2.73	HIV, AIDS (INF04)	2,499	4.42
Disorders of lipid metabolism (CAR11)	3,237	2.19	Asthma, w/o status asthmaticus (ALL04)	2,489	4.40



The Majority of SSI Patients Have 3 or More Co-Morbidities

Chronic Count	SSI		Diabetes					
			All		Pathway		Other	
	n	Percent	n	Percent	n	Percent	n	Percent
0	2,079	16.59	32	1.16				
1-2	3,339	26.65	238	8.64				
3-4	2,518	20.09	467	16.95	214	13.39	253	28.52
5-7	2,201	17.56	726	26.35	438	27.41	288	32.47
8 Plus	2,394	19.10	1,292	46.90	946	59.20	346	39.01



The SSI Population Bears a High Disease Burden

Resource Utilization Band	SSI		Chronic	
	n	Percent	n	Percent
RUB 0 (Low)	2,254	14.52		
RUB 1	2,058	13.26	288	2.76
RUB 2	5,011	32.29	4,113	39.35
RUB 3	3,089	19.90	2,967	28.39
RUB 4 (High)	3,109	20.03	3,084	29.51



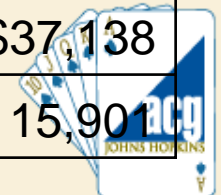
SSI Represents a Fairly Costly Service Population

Cost Category	SSI	Chronic	Diabetes		
			All	Pathway	Other
<i>Total</i>	\$9,912	\$14,310	\$18,086	\$18,607	\$21,967
<i>Pharmacy</i>	\$2,240	\$3,195	\$3,953	\$4,527	\$3,762



There is Considerable Skewing of Costs to Highest Total Cost Decile

Cost Category	SSI	Chronic	Diabetes		
			All	Pathway	Other
<i>Lowest</i>	\$0	\$290	\$672	\$988	\$868
1	\$54	\$923	\$1,829	\$2,278	\$2,142
2	\$286	\$1,755	\$3,105	\$3,445	\$3,438
3	\$805	\$2,852	\$4,708	\$4,882	\$5,205
4	\$1,686	\$4,294	\$6,633	\$6,602	\$7,351
5	\$3,056	\$6,370	\$9,039	\$8,710	\$10,583
6	\$5,238	\$9,426	\$12,598	\$12,021	\$14,651
7	\$9,019	\$14,666	\$19,138	\$18,024	\$23,048
8	\$17,242	\$24,899	\$31,003	\$28,950	\$37,138
<i>Highest</i>	\$61,762	\$77,636	\$94,119	\$79,154	\$115,901



Most Chronically Ill Are in Two Highest RUB Categories

Resource Utilization Band	SSI		Chronic	
	n	%	n	%
RUB 0 (Low)	2,254	14.52		
RUB 1	2,058	13.26	288	2.76
RUB 2	5,011	32.29	4,113	39.35
RUB 3	3,089	19.90	2,967	28.39
RUB 4 (High)	3,109	20.03	3,084	29.51



The Chronically Ill Are a Much More Costly Population to Treat

Cost Category	SSI	Chronic	All	Diabetes	
				Pathway	Other
<i>Total</i>	\$9,912	\$14,310	\$18,086	\$18,607	\$21,967
<i>Pharmacy</i>	\$2,240	\$3,195	\$3,953	\$4,527	\$3,762



Hypertension, Diabetes, and Hyperlipidemia are Prominent in

Chronically Ill Population

SSI			Chronic		
EDC	No.	%	EDC	No.	%
Hypertension w/o Major Complications (CAR14)	5,389	3.64	Hypertension w/o Major Complications (CAR14)	7,355	13.00
Preventive care (ADM06)	5,266	3.56	Type 2 diabetes, w/o complication (END06)	5,294	9.36
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Musculoskeletal signs and symptoms (MUS01)	4,037	2.73	HIV, AIDS (INF04)	2,499	4.42



Diabetics Show An Age Profile Similar to Overall SSI Population

Age Category	Diabetes					
	All		Pathway		Other	
	n	Percent	n	Percent	n	Percent
Age between 18 and 24	444	15.65	257	16.08	184	20.74
Age between 25 and 34	413	14.56	219	13.70	128	14.43
Age between 35 and 44	557	19.63	327	20.46	143	16.12
Age between 45 and 54	833	29.36	459	28.72	157	17.70
Age between 55 and 59	324	11.42	172	10.76	118	13.30
Age between 60 and 64	220	7.75	141	8.82	134	15.11
Age between 65 and 69	46	1.62	23	1.44	23	2.59

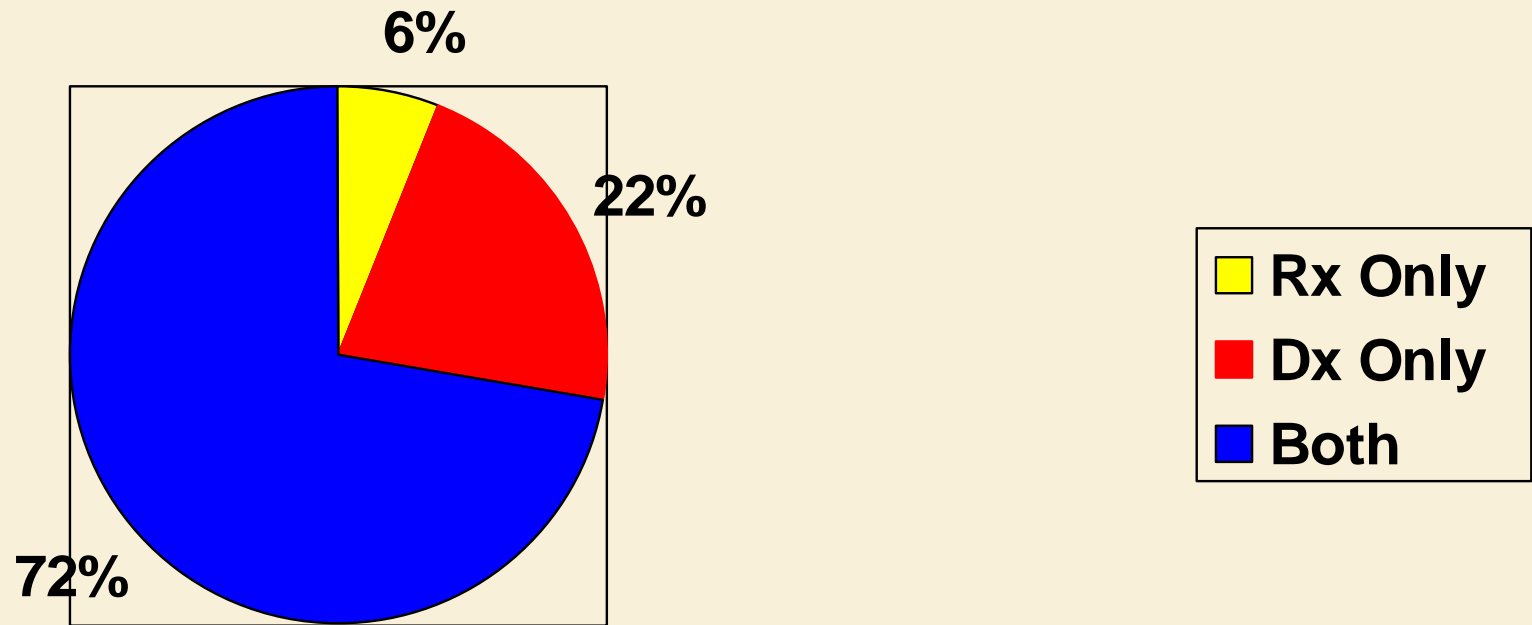


Diabetics Are Substantially More Co-Morbid Than the SSI Population

Chronic Count	SSI		Diabetes					
			All		Pathway		Other	
	n	%	n	%	n	%	n	%
0	2,079	16.59	32	1.16				
1-2	3,339	26.65	238	8.64				
3-4	2,518	20.09	467	16.95	214	13.39	253	28.52
5-7	2,201	17.56	726	26.35	438	27.41	288	32.47
8 Plus	2,394	19.10	1,292	46.90	946	59.20	346	39.01



The Rx-PM Approach Captures Most Diabetic Patients



Diabetics Are Dedicated Users of Services

- Only 3% of Diabetic Patients Failed to Use Any Health Care Services
- Non-Users a Logical Focus of Care Management Intervention, Missing Basic Mandated Care
- This is a Stable Population, With Only 10 New Enrollees Out of 2,837 Patients



Diabetics Show Greater Disease Burden Than the Chronically Ill

Resource Utilization Band	Diabetes					
	All		Pathway		Other	
	n	Percent	n	Percent	n	Percent
RUB 0 (Low)						
RUB 1	178	3.63	37	2.32	7	0.79
RUB 2	869	30.63	461	28.85	223	25.14
RUB 3	771	27.18	475	29.72	267	30.10
RUB 4 (High)	1,019	35.92	625	39.11	390	43.97



HIV and Depression Are Not Prominent EDCs for Diabetes

DIABETES

EDC	Number	Percent
Type 2 diabetes, w/o complication (END06)	2,619	16.21
Hypertension, w/o major complications (CAR14)	2,112	13.07
Disorders of lipid metabolism (CAR11)	1,468	9.09
Obesity (NUT03)	619	3.83
Ischemic heart disease (excluding acute myocardial infarction) (CAR03)	578	3.58
Type 1 diabetes, w/o complication (END08)	572	3.54
Asthma, w/o status asthmaticus (ALL04)	549	3.40
Degenerative joint disease (MUS03)	461	2.85
Emphysema, chronic bronchitis, COPD (RES04)	454	2.81
Congestive heart failure (CAR05)	401	2.48
Cardiac arrhythmia (CAR09)	370	2.29
Thyroid disease (END04)	320	1.98



Diabetics Represent a Substantially More Costly Service Population

Cost Category	SSI	Chronic	Diabetes		
			All	Pathway	Other
<i>Total</i>	\$9,912	\$14,310	\$18,086	\$18,607	\$21,967
<i>Pharmacy</i>	\$2,240	\$3,195	\$3,953	\$4,527	\$3,762



Diabetics Are Predicted to Be Higher Users of Services Than Those Who Are “Merely” Chronically III

Predictive Scores	SSI	Chronic	Diabetes		
			All	Pathway	Other
For High Total Use					
<i>Dx Model</i>	1.00	1.41	1.69	1.79	2.02
<i>Rx Model</i>	1.00	1.33	1.84	2.07	1.73
For High Pharmacy Use					
<i>Dx Model</i>	1.00	1.43	1.54	1.56	1.94
<i>Rx Model</i>	1.00	1.39	1.77	1.97	1.73



Pathway Patients May Represent a Distinct Population With Respect to their Needs

- Diabetes
- Hypertension
- Disorders of Lipoid Metabolism



Comparison Group Balanced in Terms of Level of Co-Morbidity

- Persons With Diabetes Who Did Not Have The Two Additional Marker Conditions
- Persons Who Did Have 3 or More Chronic Conditions



“Other” Patients Fail to Show Distinctive Bump in 45 to 54 Age Group

Age Category	Diabetes					
	All		Pathway		Other	
	n	Percent	n	Percent	n	Percent
Age between 18 and 24	444	15.65	257	16.08	184	20.74
Age between 25 and 34	413	14.56	219	13.70	128	14.43
Age between 35 and 44	557	19.63	327	20.46	143	16.12
Age between 45 and 54	833	29.36	459	28.72	157	17.70
Age between 55 and 59	324	11.42	172	10.76	118	13.30
Age between 60 and 64	220	7.75	141	8.82	134	15.11
Age between 65 and 69	46	1.62	23	1.44	23	2.59



“Other” Patients Show Slightly Higher Morbidity Burden

Resource Utilization Band	Diabetes					
	All		Pathway		Other	
	n	Percent	n	Percent	n	Percent
RUB 0 (Low)						
RUB 1	178	3.63	37	2.32	7	0.79
RUB 2	869	30.63	461	28.85	223	25.14
RUB 3	771	27.18	475	29.72	267	30.10
RUB 4 (High)	1,019	35.92	625	39.11	390	43.97



HIV and Depression Are Key Distinguishing EDCs for “Other”

DIABETES

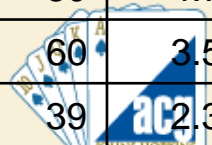
Pathway			Other		
EDC	No.	%	EDC	No.	%
Type 2 diabetes, w/o complication (END06)	1,571	14.32	Type 2 diabetes, w/o complication (END06)	847	17.61
Hypertension, w/o major complications (CAR14)	1,493	13.61	Hypertension, w/o major complications (CAR14)	553	11.49
Disorders of lipid metabolism (CAR11)	1,342	12.23	Asthma, w/o status asthmaticus (ALL04)	208	4.32
Ischemic heart disease (CAR03)	452	4.12	Obesity (NUT03)	202	4.20
Obesity (NUT03)	413	3.76	Type 1 diabetes, w/o complication (END08)	180	3.74
Type 1 diabetes, w/o complication (END08)	380	3.46	Emphysema, chronic bronchitis, COPD (RES04)	148	3.08
Asthma, w/o status asthmaticus (ALL04)	333	3.03	Chronic liver disease (GAS05)	142	2.95
Degenerative joint disease (MUS03)	322	2.93	HIV, AIDS (INF04)	136	2.83
Emphysema, chronic bronchitis, COPD (RES04)	304	2.77	Degenerative joint disease (MUS03)	135	2.81
Congestive heart failure (CAR05)	291	2.65	Cardiac arrhythmia (CAR09)	126	2.62
Hypertension, with major complications (CAR15)	253	2.31	Ischemic heart disease (excluding acute myocardial infarction) (CAR03)	124	2.58
Cardiac arrhythmia (CAR09)	240	2.19	Depression (PSY09)	123	2.56



Prescribing Suggests That “Other” Cohort May Include Intravenous Drug Users

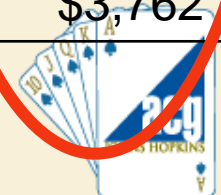
DIABETES

Pathway			Other		
Rx-MG	No.	%	Rx-MG	No.	%
Diabetes Without Insulin (ENDx040)	1,112	19.88	Diabetes Without Insulin (ENDx040)	309	18.27
Hyperlipidemia (CARx040)	816	14.59	Airway Hyperactivity (RESx040)	282	16.68
Hepatic / Peptic Disease (GASx060)	696	12.44	Hepatic / Peptic Disease (GASx060)	263	15.55
Diabetes With Insulin (ENDx030)	578	10.33	Diabetes With Insulin (ENDx030)	135	7.98
Airway Hyperactivity (RESx040)	540	9.65	Chronic Medical (RESx020)	114	6.74
Vascular Disorders (CARx050)	312	5.58	Seizure Disorder (NURx050)	87	5.14
High Blood Pressure (CARx030)	301	5.38	HIV/AIDS (INFx030)	81	4.79
Chronic Medical (RESx020)	252	4.51	High Blood Pressure (CARx030)	80	4.73
Thyroid Disorders (ENDx050)	188	3.36	Thyroid Disorders (ENDx050)	60	3.55
Seizure Disorder (NURx050)	138	2.47	Vascular Disorders (CARx050)	39	2.31
Glaucoma (EYEx030)	100	1.79	Addiction (PSYx020)	37	2.19



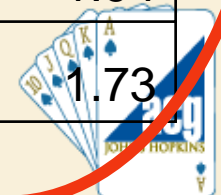
Given the Differences in Morbidity Burden, No Surprise That “Other” Patients Tend to Be Costlier

Cost Category	SSI	Chronic	Diabetes		
			All	Pathway	Other
<i>Total</i>	\$9,912	\$14,310	\$18,086	\$18,607	\$21,967
<i>Pharmacy</i>	\$2,240	\$3,195	\$3,953	\$4,527	\$3,762



Predicted Use Differs Depending On Whether Basis is Pharmacotherapy or Diagnosis

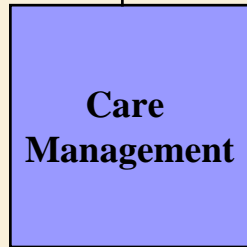
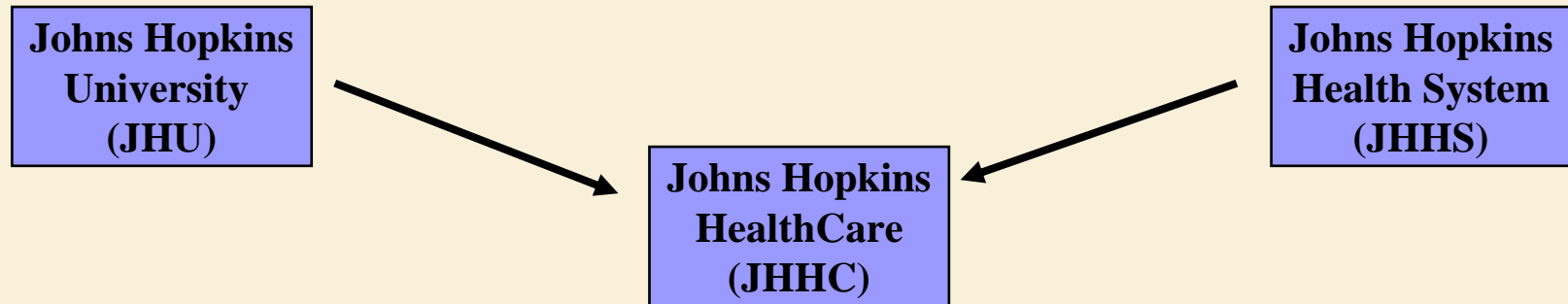
Predictive Scores	SSI	Chronic	Diabetes		
			All	Pathway	Other
For High Total Use					
<i>Dx Model</i>	1.00	1.41	1.69	1.79	2.02
<i>Rx Model</i>	1.00	1.33	1.84	2.07	1.73
For High Pharmacy Use					
<i>Dx Model</i>	1.00	1.43	1.54	1.56	1.94
<i>Rx Model</i>	1.00	1.39	1.77	1.97	1.73



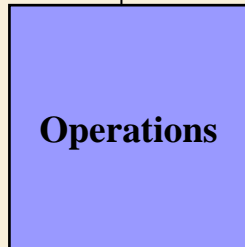
Implications for Designing a Care Management Program

- Diabetics Represent a Distinct and Important Cohort with Significant Implications for the Cost of Care
- Data Suggest that Case Identification Solely Based on Pharmacy Codes Performs Almost As Well As Diagnostic Codes
- Pharmacotherapy Provided to Pathway Patients Places Them at Higher Level of Predicted Risk
- Given Pharmacy Use is Among More Controllable Dimensions of Healthcare, a Distinct Care Management Intervention May Be Warranted

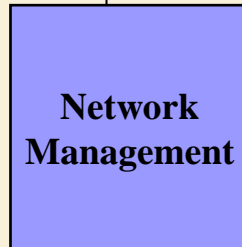




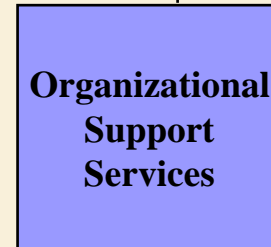
- Care Management
- Quality Improvement
- Utilization Management
- Referral Management
- Outreach
- Disease Management
- Pharmacy Management
- Health Education



- Claims Mgmt.
- Customer Service
- Enrollment Mgmt.
- Systems Mgmt.
- Reporting
- Decision Support



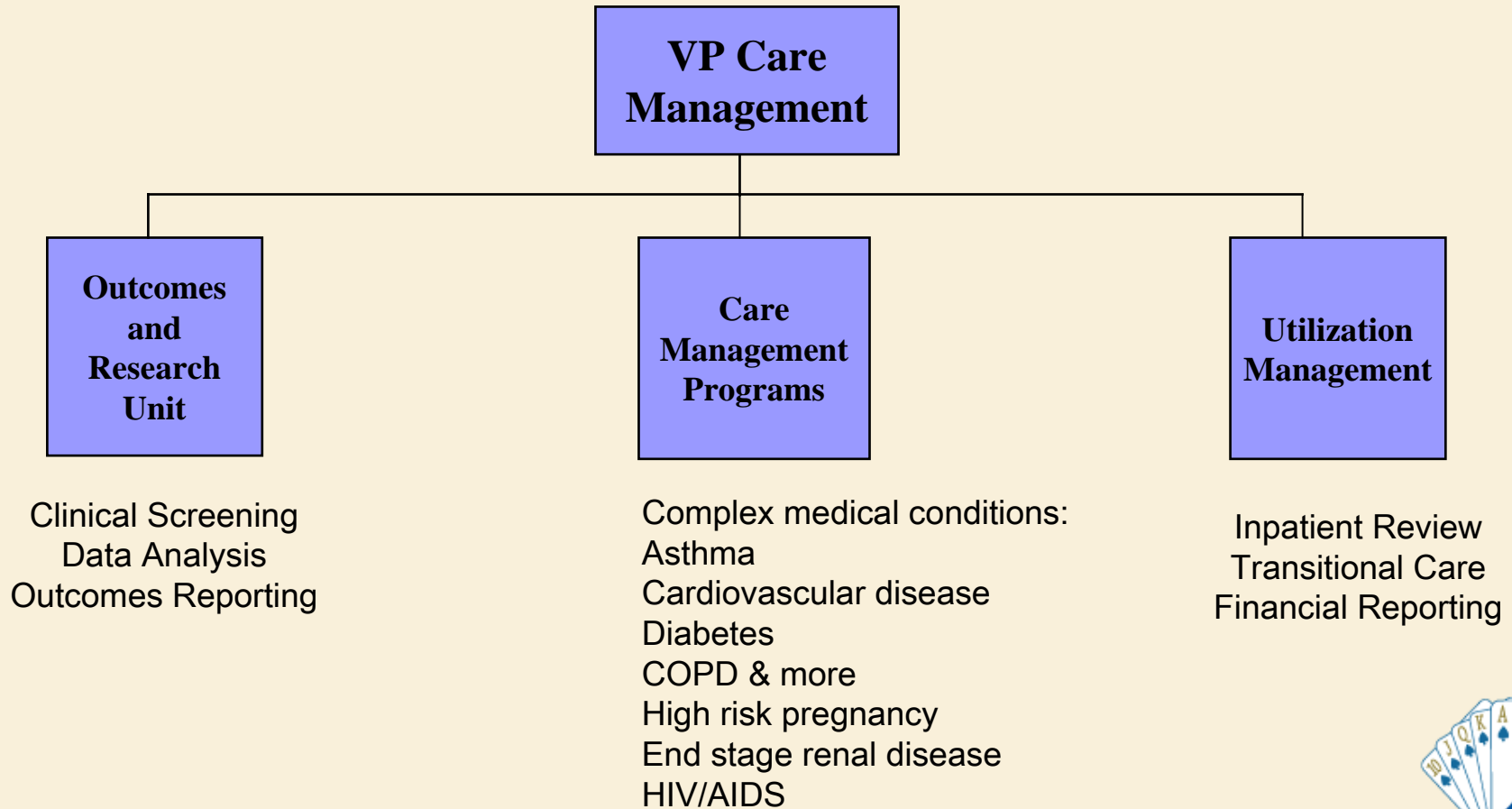
- Contracting
- Credentialing
- Provider Relations
- Provider Education
- Fee Schedules



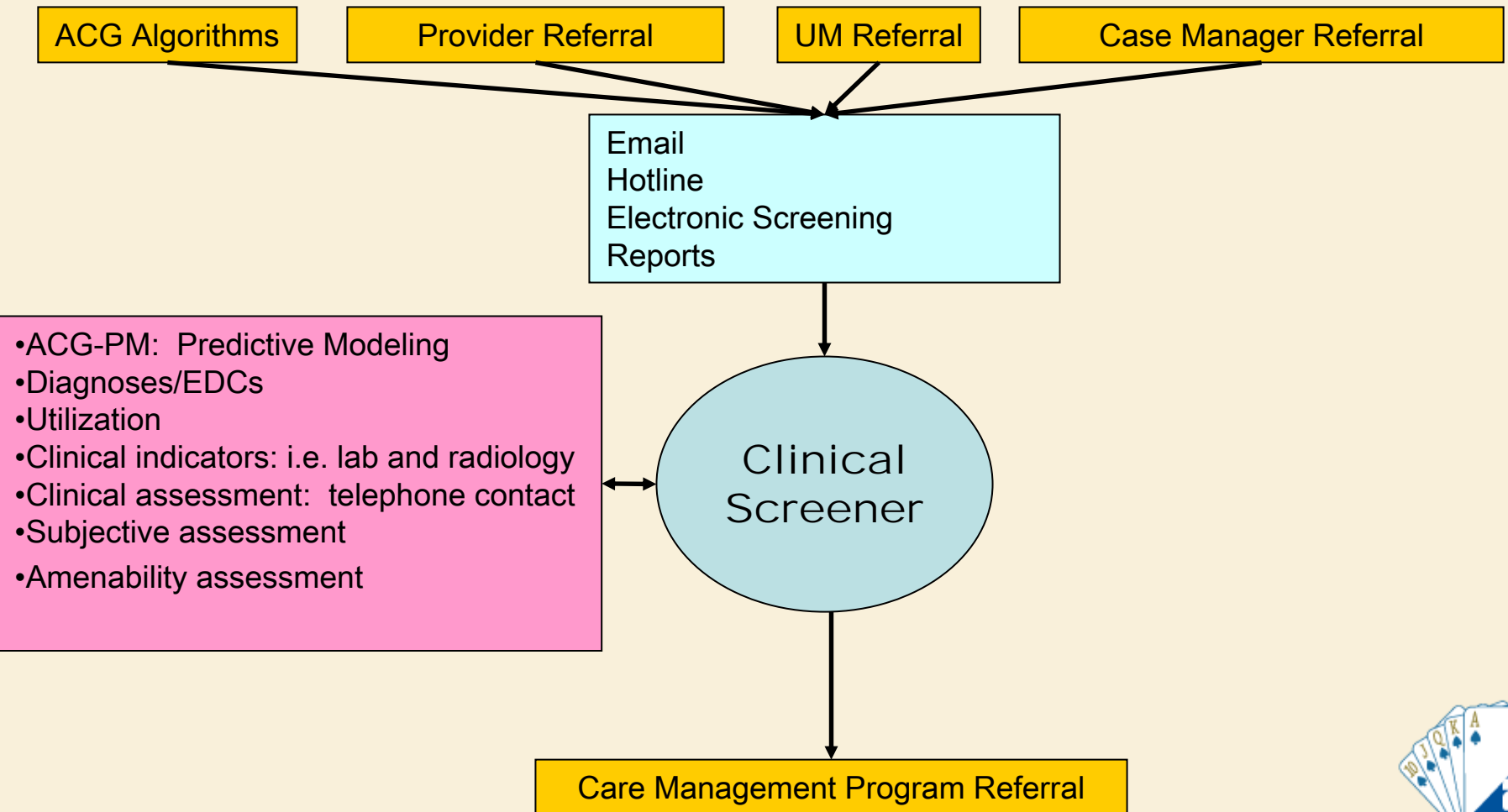
- Training/Performance Improvement
- Client Relations
- Human Resources
- Business Development
- Finance



JHHC Care Management Priority Partners



Care Management and Clinical Screening



Clinical Screener Role

- Registered Nurse
 - Managed care, inpatient, outpatient clinic/primary care office, utilization management or telephone triage experience
- Clinical predictive modeling “expert”
- Data-based decision-making
- Flexibility with identification algorithms
- Streamlined referral process
- Resulting in.....
 - Efficient and effective targeting of high-risk health plan enrollees



Algorithm Examples

1. Enrollees ≥ 18 years of age with

- Cardiovascular disease, asthma, or diabetes AND
- 3 or more chronic medical conditions* OR
- 1 or more chronic conditions and an Adjusted Clinical Groups Predictive Modeling Score (ACG-PM) ≥ 0.3

2. Enrollees ≥ 21 years of age with

- Geographic Area: PG County, Baltimore City, Baltimore CTY AND
- Not active in ESRD, HIV/AIDS, Omega Life, PWM AND
- Claims history shows positive for substance abuse
- ≥ 1 chronic condition
- ACG-PM ≥ 0.8



Determining Members at Risk

- Algorithms for defining and screening high-risk members are unique to an organization
- Factors to consider
 - Population characteristics
 - Contractual arrangements
 - Resources available
 - Staff expertise
 - Existing programs / design
 - Risk stratification methods
 - New program development
- Underlying organizational structure should support flexibility with algorithms to incorporate new information quickly

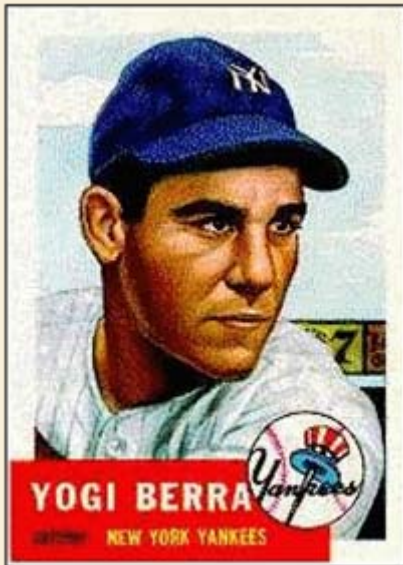


Incorporating these findings into JHHC care management structure

- Dissemination of analysis results
- High level coordination between outcomes and research unit and care management programs unit
 - Development of screening algorithms
 - Development of specialized intervention
 - Development of outcomes documentation and measurement
 - Education of nurse case managers and screeners
- Coordination with IT for any systems changes



Questions??



“If you ask me anything I don’t know, I’m not going to answer.”

Yogi Berra



Improving Your Hand in Care Management

May 4-7, 2008 - The Mirage - Las Vegas, Nevada

For More Information See Our
Web Site

www.acg.jhsph.edu

