




HARVARD
MEDICAL SCHOOL



BRIGHAM AND
WOMEN'S HOSPITAL


UTHealth[™]
The University of Texas
Health Science Center at Houston
School of Biomedical
Informatics

SHARPC
NCCD

Knowledge-Driven Clinical User Interfaces

Adam Wright, PhD
Dean F. Sittig, PhD

BwhlmrmapiTest,Four

24252934 (BWH) 07/15/1939 (71 yrs.) F

Home Select Desktop Pt Chart: Summary Oncology Custom Reports Admin Sign Results ? Resource Popup

 Customize

Reminders

- Patient 65 yrs or older, due for Pneumovax.
- Patient 50 years old or greater, recommend influenza vaccination.
- Pt is overdue for colonoscopy (rec: q 10 years). FamHx indicates average risk for colorectal cancer.
- Diabetic patient is overdue for HgbA1c measurement (recommended every 6 months).
- Diabetic Patient with renal disease, consider starting angiotensin-converting enzyme inhibitor (ACE-I).
- Patient has CAD or equivalent, consider starting anti-platelet therapy, but potential contraindications exist.
- Patient is overdue for blood pressure assessment (recommended yearly).

Referral requested	Execute
Order HbA1c	Execute
Order ACEI	Execute
Order Aspirin	Execute
Done Elsewhere	Execute

Flowsheets

Add New

Health Monitoring

Enter new hm item

Add New

HM Item	Date Last	Result
HbA1c		
Home glucose monito...		
Hypoglycemia Assess...		
M-alb/creat ratio		
Microalbumin		
Nutrition Referral		
 Ophthalm Exam	10/26/2010	Done
 Podiatry exam	10/26/2010	Done
 Bone Density		
 Colonoscopy		
Alcohol Use Screening		
 Smoking status	10/26/2010	Never used tobacco
 Influenza Vaccine		
 Pneumovax		
Td Booster		
 Zostavax		
 Cholesterol	10/26/2010	Done elsewhere
 Mammogram		
 Pap Smear		

Family History

Add New

Family History Problem	Relative
------------------------	----------

Problems

Enter new problem



Add New

-  Diabetes mellitus
-  Renal insufficiency
-  Coronary artery disease
-  Peptic ulcer disease
-  Torn meniscus

Medications

Enter new medical

Add New

-  Glyburide 5MG TABLET Take 1 Tablet(s) PO BID
-  Hctz (HYDROCHLOROTHIAZIDE) 25 MG (25MG TABLET Take 1

Procedures

Enter new procedi

Add New

-  Tonsillectomy

Allergies

Add New

Allergen	Reaction
Milk Protein - Moderate	- Itching - Rash






Sticky Notes

Add New

Likes to be called 4.

Notes

Add New


Date	Subject	Provider
05/14/2010	 Patient Note	Hanley, William A.
05/14/2010	 Code Status/LST Note (MGH)	Hanley, William A.
05/14/2010	 Code Status/LST Note (MGH)	Hanley, William A.
05/14/2010	 Code Status/LST Note (BWH)	Hanley, William A.
05/14/2010	 Patient Note	Hanley, William A.

Health Profile

Last Known Values

Test Description	Last Known	Date
------------------	------------	------

Figure 3b: Annotated example of automatic clinical summarization



John Q. Smith – 375 Plantation Rd. Luling, TX W: 713-985-4215
67yr white male 5'-9" **195 lbs** (↓4 lbs in 12 mo.) **BMI-28.8**

← Patient photo

↑ View graph of weight

Insurance: [BC/BS TX](#)
↑
Link to pt insurance info

Diabetes Risk Management Summary

View graph of HbA1c's

Glycemic Control: Type 2 DM (dx: 10/1/09): **HbA1c-7.0%** (10/01/10) (↓3.0% in 12 mo.) on metformin (1000 mg BID).
[Glycemic control is acceptable according to ADA guidelines.](#)

View graph of lipid panels

Lipid Control: Hyperlipidemia (dx: 10/01/09): **Total cholesterol-250 mg/dL, HDL 40 mg/dL, LDL 175 mg/dL** (10/1/10) (↑ from 180/60/125 4 mo. ago) on simvastatin (20 mg QD)
ATP III 10 yr risk of MI or death - 23% [Pat Ed: Cardiac Risk Factors](#)
[ATP III guidelines recommend adjusting dosage.](#)

Print patient ed sheet

Link to medication list

View graph of BP's

Blood Pressure Control: Hypertension (dx: 10/01/09): **BP-135/90** (today) (↓ from 150/105 in 12 mo.) on Hydrochlorothiazide (25 mg QD)
[JNC VII guidelines recommend adding a medication.](#)

Link to medication list

Visit History: Clinic – Urgent Follow-up ([6/15/10](#)); ED – Hospital – chest pain ([6/1/10](#)); Clinic – Well Visit ([2/1/09](#)); Clinic – Physical ([10/1/09](#))




Link to related note

Bwhlmrmpltest,Four

24252934 (BWH) 07/15/1939 (71 yrs.) F

[Home](#) [Select](#) [Desktop](#) [Pt Chart: Summary](#) [Oncology](#) [Custom](#) [Reports](#) [Admin](#) [Sign](#) [Results](#) ? [Resource](#) [Popup](#) [Customize](#)**Reminders**

- Patient 65 yrs or older, due for Pneumovax.
- Patient 50 years old or greater, recommend influenza vaccination.
- Pt is overdue for colonoscopy (rec: q 10 years). FamHx indicates average risk for colorectal cancer.
- Diabetic patient is overdue for HgbA1c measurement (recommended every 6 months).
- Diabetic Patient with renal disease, consider starting angiotensin-converting enzyme inhibitor (ACE-I).
- Patient has CAD or equivalent, consider starting anti-platelet therapy, but potential contraindications exist.
- Patient is overdue for blood pressure assessment (recommended yearly).

Referral requested		Execute
Order HbA1c		Execute
Order ACEI		Execute
Order Aspirin		Execute
Done Elsewhere		Execute






Flowsheets[Add New](#)**Health Monitoring**[Enter new hm item](#)[Add New](#)

HM Item	Date Last	Result
HbA1c		
Home glucose monito...		
Hypoglycemia Assess...		
M-alb/creat ratio		
Microalbumin		
Nutrition Referral		
 Ophthalm Exam	10/26/2010	Done
 Podiatry exam	10/26/2010	Done
 Bone Density		
 Colonoscopy		
Alcohol Use Screening		
 Smoking status	10/26/2010	Never used tobacco
 Influenza Vaccine		
 Pneumovax		
 Td Booster		
 Zostavax		
 Cholesterol	10/26/2010	Done elsewhere
 Mammogram		
 Pap Smear		



Family History[Add New](#)

Family History Problem	Relative
------------------------	----------

Problems[Enter new problem](#)[Add New](#)

-  Diabetes mellitus
-  Renal insufficiency
-  Coronary artery disease
-  Peptic ulcer disease
-  Torn meniscus

Medications[Enter new medical](#)[Add New](#)

-  Glyburide 5MG TABLET Take 1 Tablet(s) PO BID
-  Hctz (HYDROCHLOROTHIAZIDE) 25 MG (25MG TABLET Take 1

Procedures[Enter new procedi](#)[Add New](#)

-  Tonsillectomy






Allergies[Add New](#)

Allergen	Reaction
Milk Protein - Moderate	- Itching - Rash

Sticky Notes[Add New](#)

Likes to be called 4.

Notes[Add New](#)

Date	Subject	Provider
05/14/2010	 Patient Note	Hanley, William A.
05/14/2010	 Code Status/LST Note (MGH)	Hanley, William A.
05/14/2010	 Code Status/LST Note (MGH)	Hanley, William A.
05/14/2010	 Code Status/LST Note (BWH)	Hanley, William A.
05/14/2010	 Patient Note	Hanley, William A.

Health Profile**Last Known Values**

Test Description	Last Known	Date
------------------	------------	------

Problem List Suggestion

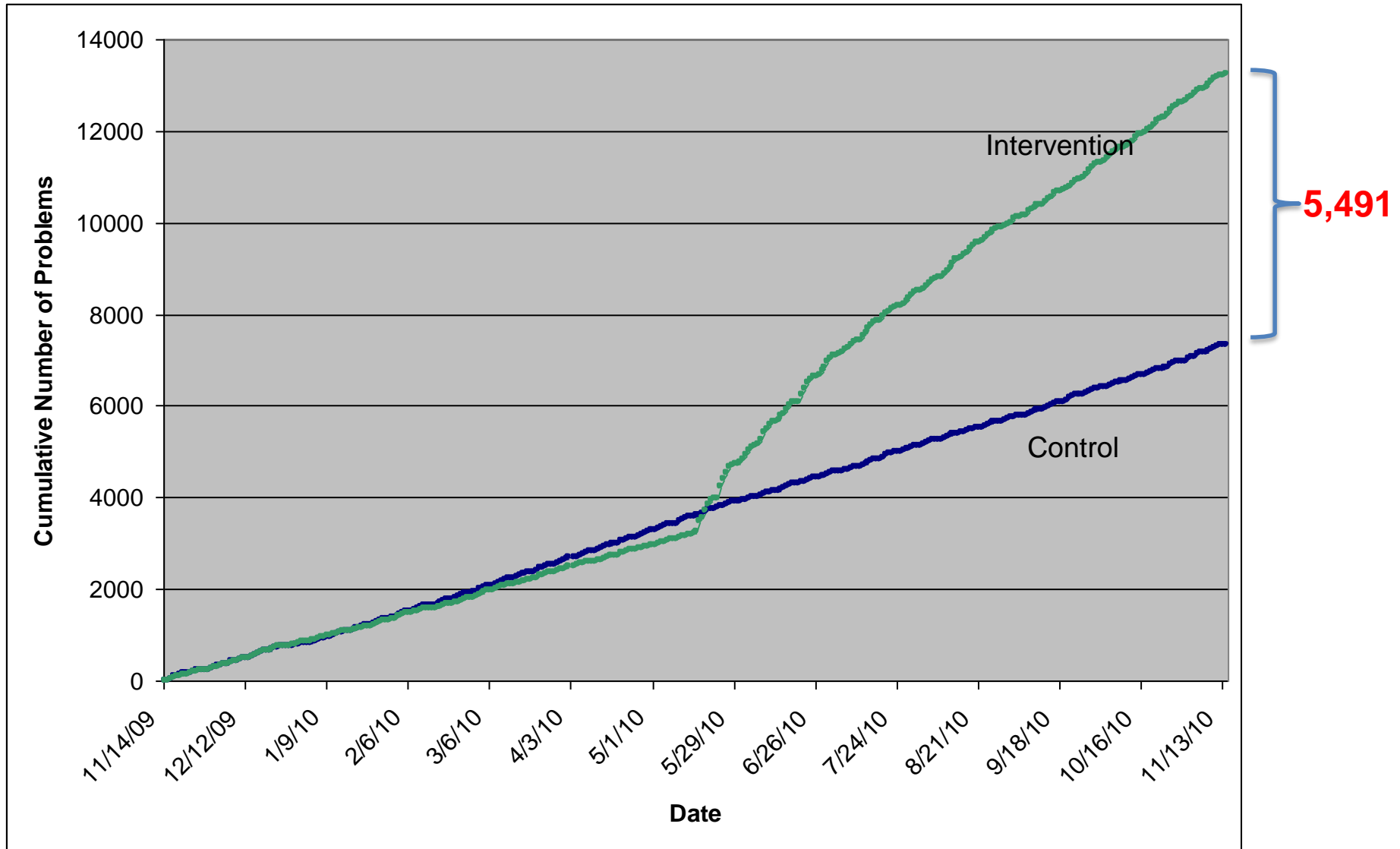
Based on patient's clinical and billing data, the patient may have the following problems. Upon save, checked items will be added to the problem list. Unchecked items will not be added, and you will not be prompted again.

[+ Expand All](#)


Add	Problem Description	
<input checked="" type="checkbox"/>	Coronary arteriosclerosis: Patient is taking a platelet aggregation inhibitor and has been billed at least once for CAD.	<input type="text" value="Enter Customizable Description..."/>
<input checked="" type="checkbox"/>	Congestive heart failure: Patient is on at least two CHF medications and has been billed at least twice for CHF.	<input type="text" value="Enter Customizable Description..."/> + Related terms
<input checked="" type="checkbox"/>	Diabetes mellitus: Patient has a HbA1c $\geq 7.0\%$.	<input type="text" value="Enter Customizable Description..."/> + Related terms
<input checked="" type="checkbox"/>	Hypertensive disorder: Patient has been billed for hypertension and is on an antihypertensive agent.	<input type="text" value="Enter Customizable Description..."/> + Related terms
<input checked="" type="checkbox"/>	Hypothyroidism: Patient is on thyroid hormone.	<input type="text" value="Enter Customizable Description..."/>

[Explanations](#)


Addition of MAPLE Problems



Use Cases

- ▶ Automated summarization
 - ▶ Problem inference
 - ▶ Indication-based ordering
 - ▶ Clinical decision support
 - ▶ Medication reconciliation
 - ▶ Patient education
 - ▶ EHR search
 - ▶ Many more...
- 

Building Knowledge Bases

- ▶ Association rule mining
 - ▶ Crowd-sourcing
 - ▶ Ontologies
 - ▶ Manual construction
 - ▶ Literature mining
 - ▶ Ensemble methods
- 

Association Rule Mining

- ▶ Pt 1: {lisinopril, multivitamin, hypertension}
- ▶ Pt 2: {insulin, metformin, lisinopril, diabetes, hypertension}
- ▶ Pt 3: {insulin, metformin, diabetes}
- ▶ Pt 4: {metformin, PCOS}

Association Rule Mining

- ▶ Pt 1: {lisinopril, multivitamin, hypertension}
- ▶ Pt 2: {insulin, metformin, lisinopril, diabetes, hypertension}
- ▶ Pt 3: {insulin, metformin, diabetes}
- ▶ Pt 4: {metformin, PCOS}

Association Rule Mining

- ▶ Pt 1: {lisinopril, multivitamin, hypertension}
- ▶ Pt 2: {insulin, metformin, lisinopril, diabetes, hypertension}
- ▶ Pt 3: {insulin, metformin, diabetes}
- ▶ Pt 4: {metformin, PCOS}

Association Rule Mining

- ▶ Pt 1: {lisinopril, multivitamin, hypertension}
- ▶ Pt 2: {insulin, metformin, lisinopril, diabetes, hypertension}
- ▶ Pt 3: {insulin, metformin, diabetes}
- ▶ Pt 4: {metformin, PCOS}

Association Rule Mining

- ▶ Pt 1: {lisinopril, multivitamin, hypertension}
- ▶ Pt 2: {insulin, metformin, lisinopril, diabetes, hypertension}
- ▶ Pt 3: {insulin, metformin, diabetes}
- ▶ Pt 4: {metformin, PCOS}

Crowd-sourcing

Medication Details

[R] TEST, ANTHONY V 31 YO DOR: 02Aug1980 AUDIT 8/19/2011

Order Entry ☐ Record w/o Ordering

Aricept 5 MG Oral Tablet Link to: [1] Alzheimer's Disease

Co-Pay and Coverage Detail

Sig Status: Active

SIG: ☒ Personal ☐ New Structured ☐ New Free Text Dosage Calculator

ALL ☐ TAKE 1 TABLET DAILY AS DIRECTED. Days: 30; Qty: 30; Refill: 6
GD ☐ TAKE TABLET DAILY

Days: Qty: Tablet Refill: Evaluate ☐ DAY

☒ Save as default for selected SIG

Send To Retail ☐ Pharmacy: TEST PHARMACY ☐ Rx Benefit: ☐ Split Rx

Additional Details

Pharmacy Instructions: (210 chars) Cite Result

Ordered By: THOMAS, ERIC

Managed By: THOMAS, ERIC Supervised By: Auth: Not Required

Rx Date: 18Aug2011 Expires: 18Aug2012 Therapy Start: 18Aug2011 End:

Replaced: Link Unverified Order:

Medication History

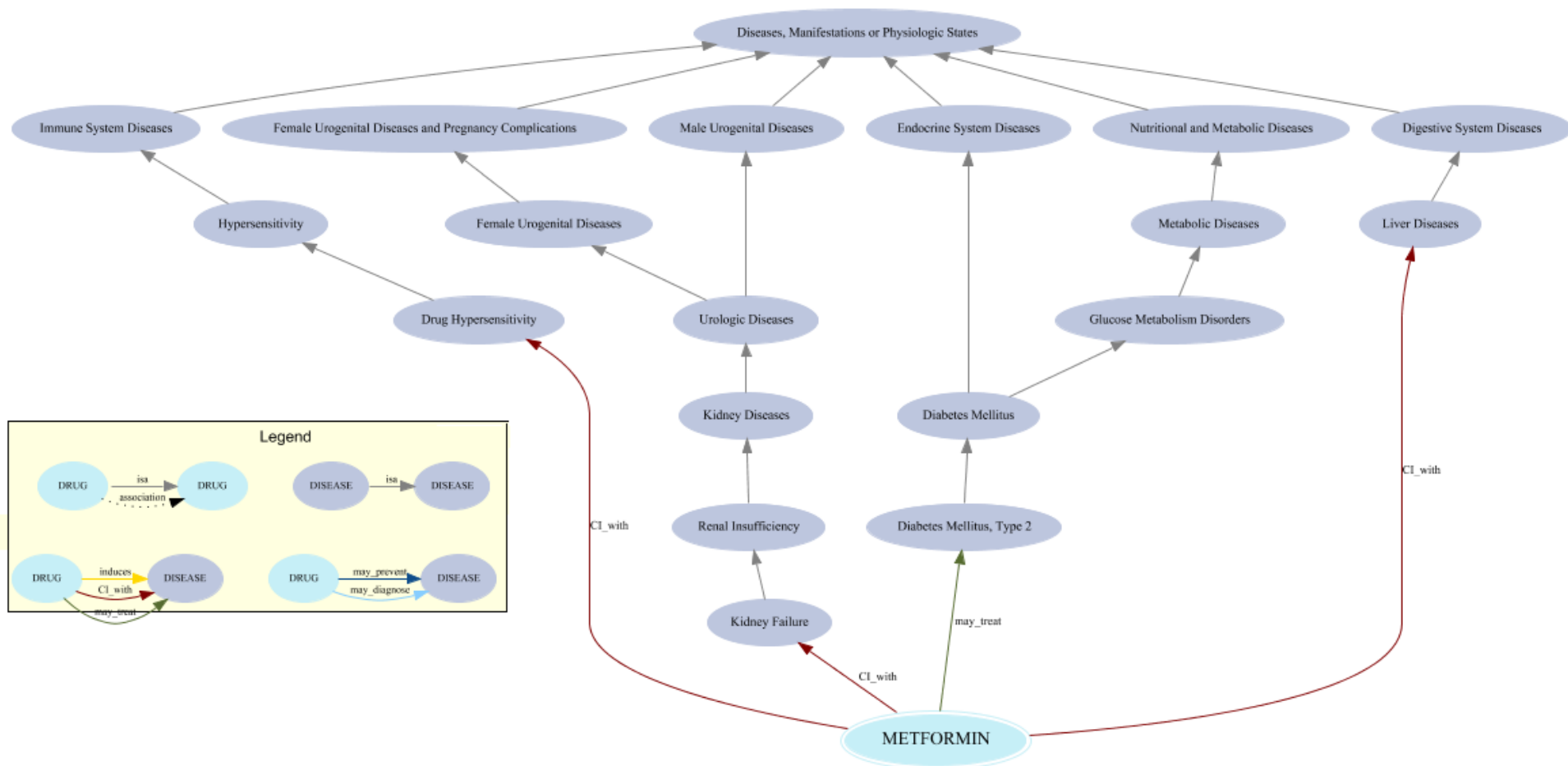
There are no items to show in this view

Add New Problem

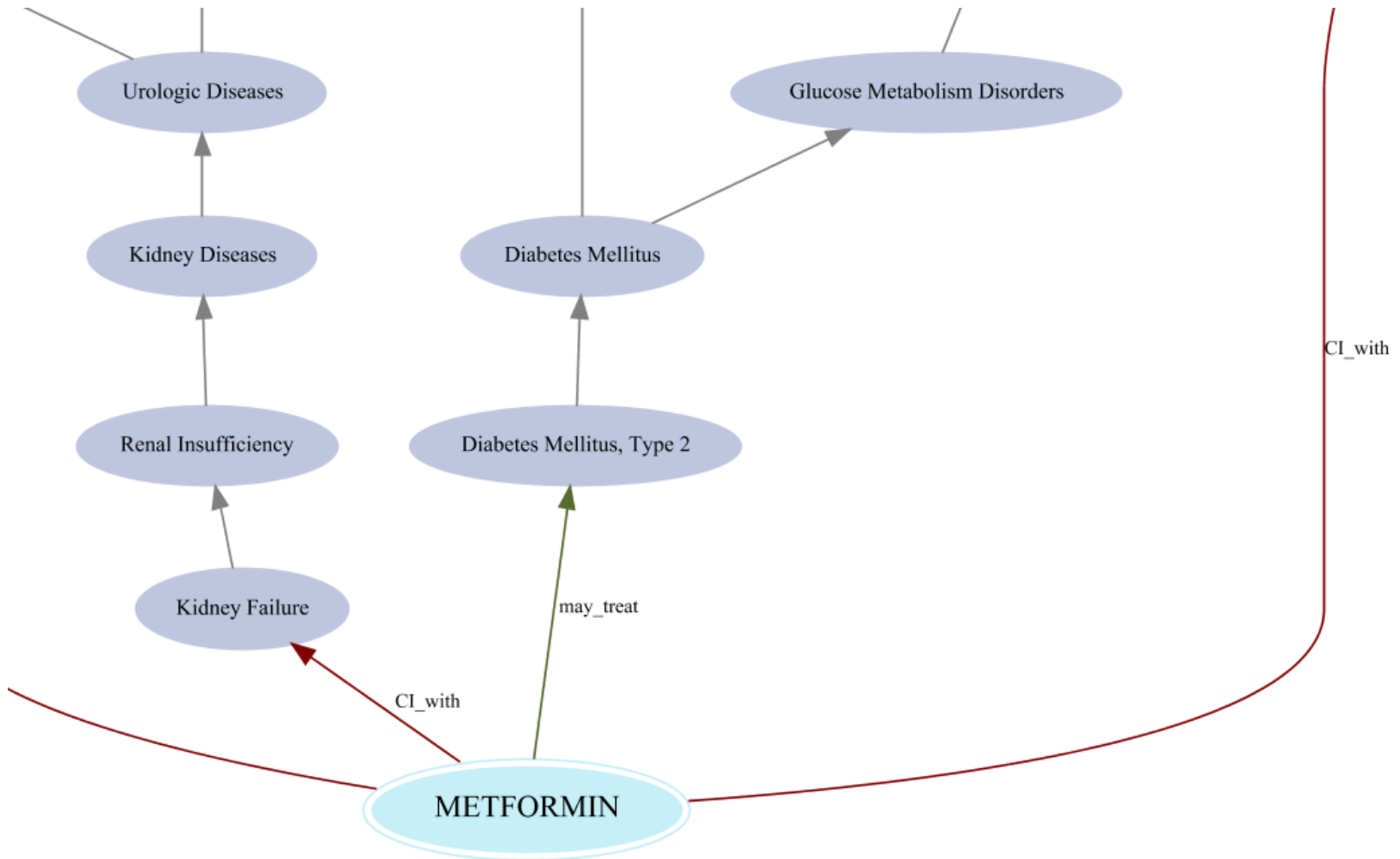
- ☒ Alzheimer's Disease 331.0
- A Fall E888.9
- A Fall From A Wall E882
- Abdominal Pain 789.00
- Abdominal Pain 789.00
- Accelerated Essential Hypertension 401.0
- Accident Caused By Controlled Fire In Private Dwelling E895
- Acoustic Trauma (Explosive) 388.11
- Acquired Deformity Of Knee 736.6
- Acute Nasopharyngitis 460
- Abtrial Septal Defect 745.5
- Cat Bite E906.3
- Cervical Spondylosis (C1 - C2) 721.0
- Coronary Artery Disease 414.00
- Depression Chronic
- Depression With Anxiety 300.4
- Factor VIII Deficiency (Hemophilia) 286.0
- Fracture Of The Patella 822.0
- Health Maintenance V70.0
- Hypertension 401.9
- Ischemic Stroke 434.90
- Joint Pain, Localized In The Wrist 719.43
- Memory Lapses Or Loss 780.93
- Parkinson's Disease 332.0
- Seizure Disorder 345.90
- Sore Throat 462
- Tropical Acne 706.1
- Vomiting (Symptom) 787.03
- Wrist Sprain 842.00

Ontologies

METFORMIN Disease



Ontologies



Manual Construction

Breast Cancer

Problems of interest:

breast biopsy
breast cancer
breast mass
breast cancer lobular in situ
breast cancer ductal in situ
TNM staging

Labs of interest:

BRCA1+BRCA2 Gene Analysis
Last mammogram (from HM)
Her 2
ER status

Drugs of interest:

Antineoplastic - Selective Estrogen Receptor Modulators (SERMs)
Antineoplastic - Aromatase Inhibitors
Selective Estrogen Receptor Modulators (SERMs)
Antineoplastic - Estrogen Receptor Antagonist
Antineoplastic - Epidermal Growth Factor Recept Blocker, R-MC Antibody
 Epidermal Growth Factor Recept Blocker (HER-1 Type), Rec-MC Antibody
 Epidermal Growth Factor Recept Blocker (HER-2 Type), Rec-MC Antibody
ANP - Human Vascular Endothelial Growth Factor Inhib Rec-MC Antibody

Literature Mining

Diabetologia (2006) 49: 289–297
DOI 10.1007/s00125-005-0097-z

ARTICLE

A. Ramachandran · C. Snehalatha · S. Mary ·
B. Mukesh · A. D. Bhaskar · V. Viswanathan
Indian Diabetes Prevention Programme Group

The Indian Diabetes Prevention Programme: modification and impact on Indian subjects with impaired glucose tolerance

Received: 20 August 2005 / Accepted: 14 September 2005 / Published online: 14 September 2006
© Springer-Verlag 2006

Abstract *Aims/hypothesis:* The primary prevention of type 2 diabetes in American, Finnish and Chinese prospective community-based studies showed that progression to diabetes could be delayed in native Asian Indians with leaner and more insulin resistance. *Methods:* We randomized 577 subjects with IGT (mean 25.8 ± 3.5 kg/m²) into four groups: control, Group 2 was given diet and exercise (LSM), Group 3 was treated with metformin (LSM) and Group 4 was given LSM and metformin. The primary outcome measure was type 2 diabetes incidence. The follow-up period was 30 months. The relative incidences of diabetes were 10.4% and 39.5% in Groups 1–4, respectively.



WIKIPEDIA
The Free Encyclopedia

[Main page](#)
[Contents](#)
[Featured content](#)
[Current events](#)
[Random article](#)
[Donate to Wikipedia](#)
[Wikimedia Shop](#)

Interaction
[Help](#)
[About Wikipedia](#)
[Community portal](#)
[Recent changes](#)
[Contact page](#)

[Tools](#)

Article

Talk

Read

Edit

View history

Search



[Create account](#) [Log in](#)

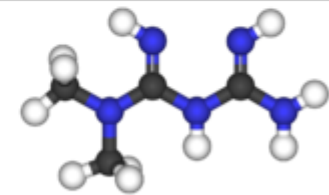
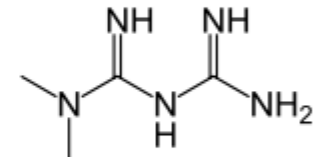
Metformin

From Wikipedia, the free encyclopedia

Metformin (BP, pronounced /ˈmɛtˈfɔːrmin/, *met-FAWR-min*; sold as **Glucophage**) is an oral antidiabetic drug in the biguanide class. It is the first-line drug of choice for the treatment of type 2 diabetes, in particular, in overweight and obese people and those with normal kidney function.^{[1][2][3]} Its use in gestational diabetes has been limited by safety concerns. It is also used in the treatment of polycystic ovary syndrome, and has been investigated for other diseases where insulin resistance may be an important factor. Metformin works by suppressing glucose production by the liver.

Metformin is the only antidiabetic drug that has been conclusively shown to prevent the cardiovascular complications of diabetes. It helps reduce LDL cholesterol and triglyceride levels, and is not

Metformin



Other names [hide]

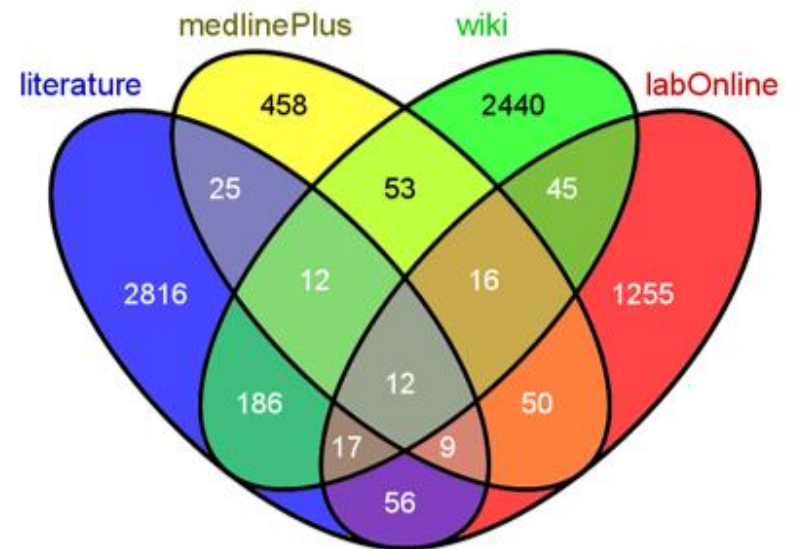
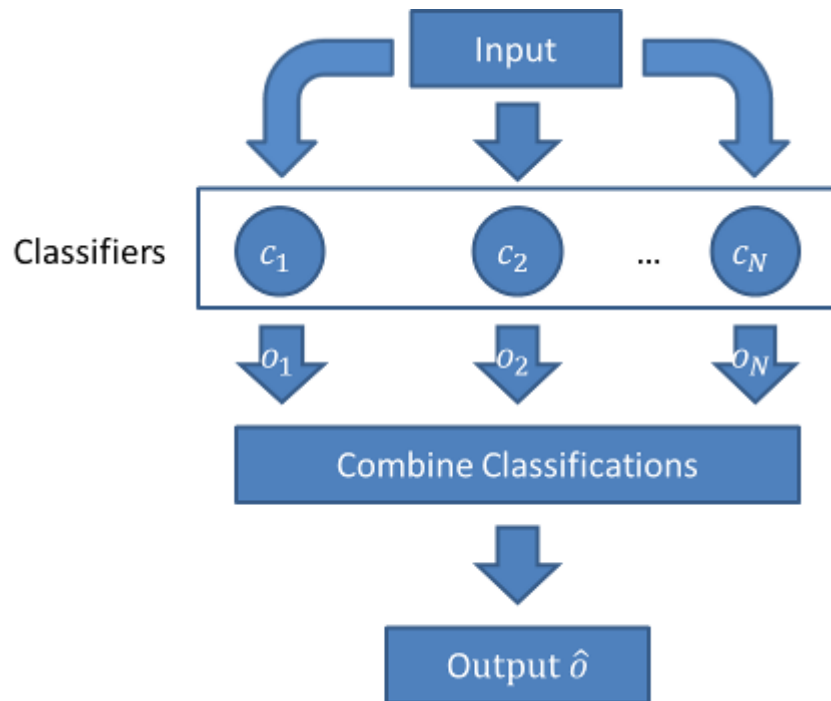
N,N-Dimethylimidodicarbonimidic diamide

Identifiers

CAS number

657-24-9 ✓

Ensemble Methods



Thank you!

Adam Wright: adam_wright@harvard.edu

Dean Sittig: dean.f.sittig@uth.tmc.edu

www.sharpc.org

References: <https://sbmi.uth.edu/nccd/research/sharpc/P3.htm>