Use of Curriculum Mapping Tools to Identify Learning Opportunities and Deficiencies II: KnowledgeMap

Josh Denny, MD, MS

March 7, 2013

The Flexner Report

- Medical education in the United States and Canada, 1910
- Set the foundation for modern medical education
- Current pressures challenge this model:
  - “publish or perish” (researcher)
  - Demand on throughput (clinician)

Part #1: Assessing Curricula

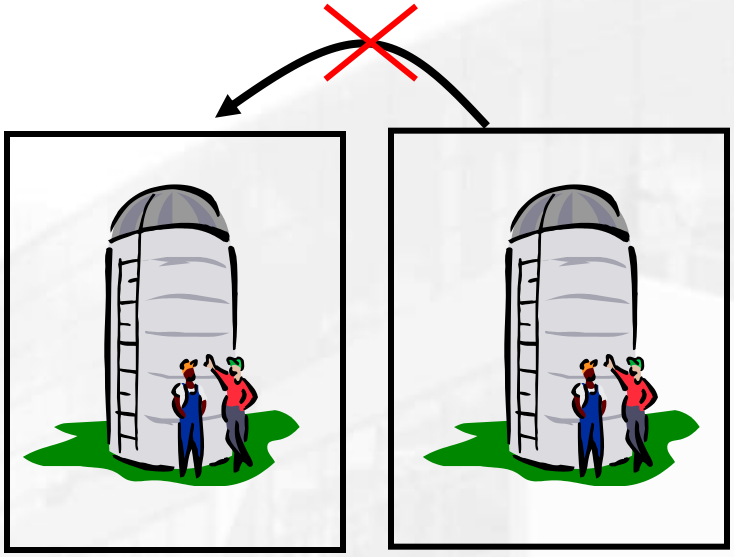
LIAISON COMMITTEE ON MEDICAL EDUCATION

ACGME

- LCME and ACGME require increasing documentation of **curriculum objectives, coverage**, and student **patient experiences**
- Accreditation standards specific content, competencies, amount of training, etc. for periodic reviews
- ED-2:

  "The institution that offers a medical education program is required to establish a system to specify the types of patients or clinical conditions that medical students must encounter and to monitor and verify the medical students' experiences with patients so as to remedy any identified gaps."

Traditional Medical Education Model



First year

Second year

USMLE Board Exams

Clinical education

Guiding questions

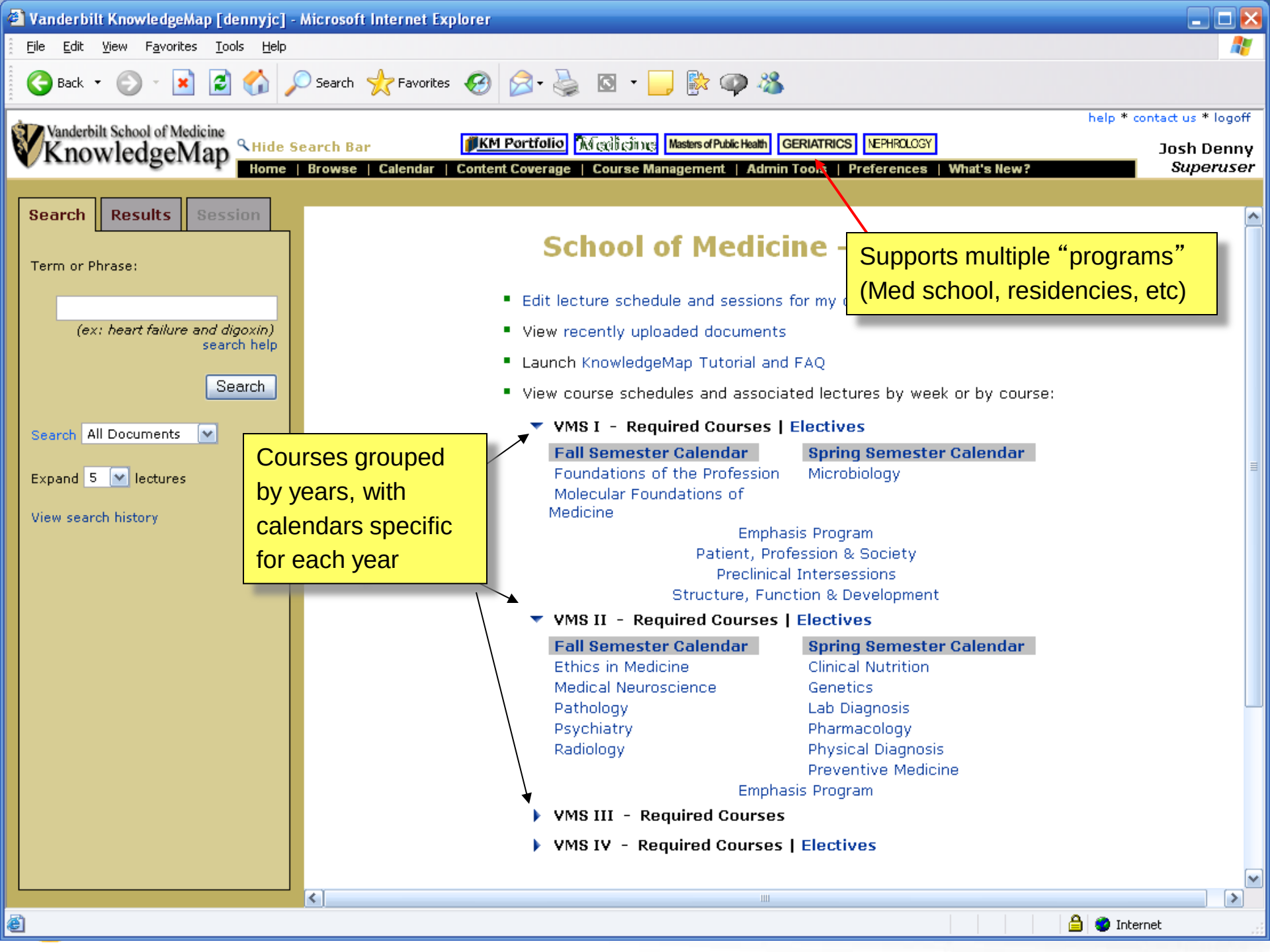
- **Faculty**: "I am teaching about congestive heart disease – what have students already learned about this?"
- **Students**: Studying immunoglobulins, need to find relevant prior concepts like splicing
- **Administrators**: Where do we cover large concepts, like geriatrics?

Traditional Solutions

- Web pages for courses
- Course management software (Blackboard, WebCT)
- Finding what is taught where:
  - Curriculum committee meetings
  - Emails
  - Manual logs
  - External, manually maintained curricular databases such as CurrMIT

An Informatics Model

- Let learners access work at their own rate (finding old and new data)
- Use multiple methods to delivery content
- Faculty are busy – focus on easing content capture, and create tools to accurately capture
- Provide robust searching tools across the entire curriculum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Search All Documents
Expand 5 lectures
View search history
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View recently uploaded documents
Launch KnowledgeMap Tutorial and FAQ
View course schedules and associated lectures by week or by course:
VMS I - Required Courses | Electives
Fall Semester Calendar
Foundations of the Profession
Molecular Foundations of Medicine
Spring Semester Calendar
Microbiology
Emphasis Program
Patient, Profession & Society
Preclinical Intersessions
Structure, Function & Development
VMS II - Required Courses | Electives
Fall Semester Calendar
Ethics in Medicine
Medical Neuroscience
Pathology
Psychiatry
Radiology
Spring Semester Calendar
Clinical Nutrition
Genetics
Lab Diagnosis
Pharmacology
Physical Diagnosis
Preventive Medicine
Emphasis Program
VMS III - Required Courses
VMS IV - Required Courses | Electives
Supports multiple "programs" (Med school, residencies, etc)
Courses grouped by years, with calendars specific for each year
Internet

2007/2008 Structure, Function & Development Schedule

[View previous year]

[edit course sessions | edit links/divisions]

Course Links[edit]: Gross Anatomy sessions | Cell Biology sessions

Labels: Exam or Quiz | Physiology | Gross Anatomy | Cell Biology

Unit #1

Date	Time	Location	Title	Lecturer	Document(s)
10/25	08:00 AM - 08:30 AM	LH 202	Introduction	Arthur F Dalley	
10/25	08:30 AM - 10:30 AM	LH 202	Introduction to Anatomical Donations Program and In-Lab Memorial svc. Intro to Gross Anatomy Lab, Safety and Techology	Arthur F Dalley	
10/25	10:30 AM - 12:00 PM	LH 202	Layered & Segmented Structure of body; Intro to Nerves & Nerve Clasification; Simple Spinal n.	Arthur F Dalley	
10/25	01:00 PM - 02:00 PM	LH 202	(Embryo) Neuromuscular Development 1	Lillian B Nanney	
10/25	02:00 PM - 05:00 PM	IIS 10th Floor	GA Lab: Removal of Skin and Subcutaneious Tissue of Back; Superficial Muscles of the Back and Canial Nerve XI	Arthur F Dalley	
10/26	08:00 AM - 09:00 AM	LH 202	(Embryo) Neuromuscular Development 2	Lillian B Nanney	
10/26	09:00 AM - 10:00 AM	LH 202	Types of Muscle Action and Movements; Freely Moveable Joints	John S Halle	
10/26	10:00 AM - 12:00 PM	IIS 10th Floor	GA Lab: Scapular Region	Arthur F Dalley	
10/29	08:00 AM - 09:00 AM	LH 202	Vertebral Column; Postural Muscles; Spinal Cord and Its Environment	Arthur F Dalley	
10/29	09:00 AM - 10:00 AM	LH 202	Neuromuscular Phys # 1: Membrane Transport; Fluid Compartments; Osmosis	Al George	
10/29	01:00 PM - 02:00 PM	IIS 10th Floor	GA Lab: Deep Back (Perform Laminectomy)	Arthur F Dalley	
10/30	08:00 AM - 09:00 AM	LH 202	Overview of Lymphatic System; Principles of Collateral Circulation	Lillian B Nanney	
10/30	09:00 AM - 11:00 AM	IIS 10th Floor	GA Lab: Complete Dissection of Deep Back; Pectoral Region, Including Removal of Skin from Arm (Excluding Female Breast)	Arthur F Dalley	

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Search | Results | Session

Organization of Eukaryotic Cells
Cathleen C Pettepher, PhD
08/20, 01:00 PM-02:00 PM, LH

Documents

Organization of Eukaryotic Cells (handout) | PDF | Show CUIs
(Lecture Handout)

Organization of Eukaryotic Cells (ppt) | PDF | PDF (b&w) | Show | Show CUIs
(Slides)

Organization of Eukaryotic Cells (pdf) | PDF | Show CUIs
(Slides)

Session Navigation:
◂ Previous | Next ▸

Molecular Foundations of Medicine Schedule

1 **Organization of Eucaryotic Cells**
- Cathleen Pettepher, Ph.D.
- Molecular Foundations of Medicine
- August 20, 2007

2 **Objectives**
- Get general idea of cell organization
  - Describe the major cellular components
- Understand what changes in organelles tell you about dynamics of cells

3 **Common Ancestor for all Living Organisms**

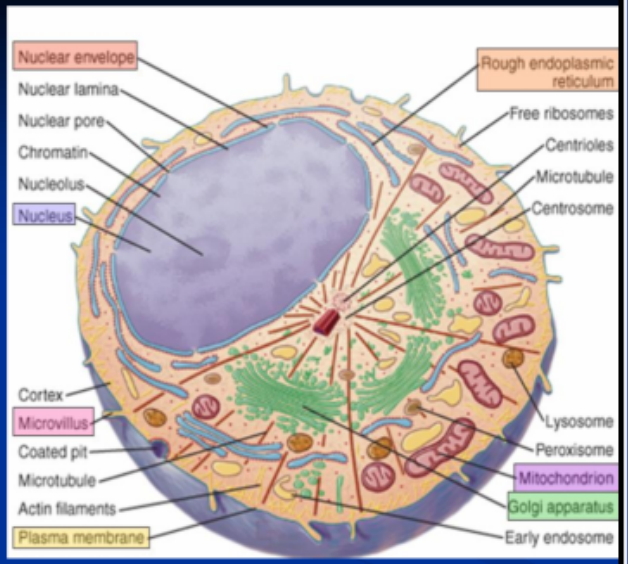
4 **Shared Mechanisms of Biological Function**
- Share a common genetic code and store the information in the form of DNA
- nformation from NA to proteins roteins to eactions wn sugars and

Objectives

Get general idea of cell organization
- Describe the major cellular components

Understand what changes in organelles tell you about dynamics of cells

Develop global perspective on cell organelles
Structure: molecular organization and appearance
How structure relates to function



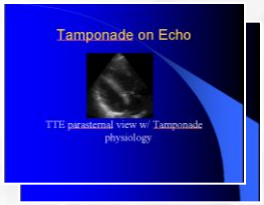
Faculty upload native formats (e.g., PowerPoint) and KM creates other formats automatically

Notes | Slide 2 of 41 | Slide Show

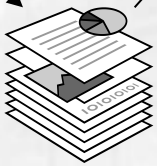
Internet

Document Processing

Document uploaded by lecturer, placed in queue



PDF, MS Word, WordPerfect, HTML, PowerPoint, etc



Document Conversion Server pulls next document off queue, converts to HTML and Text

Document Conversion Server

HTML & PDF versions

Web server

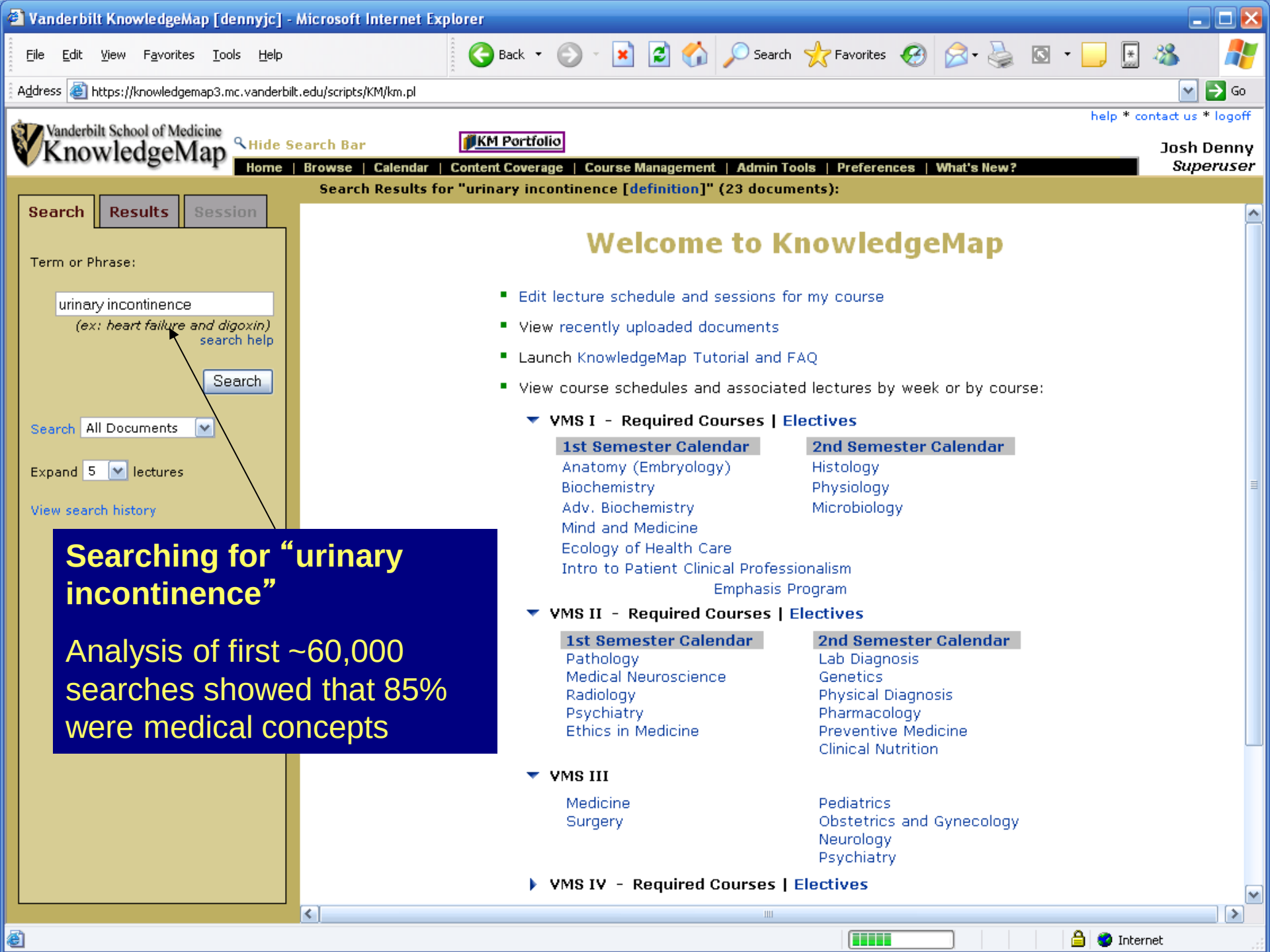
Text version placed in queue

KM Concept Identifier

Identified concepts indexed for searching

Concept vs. Text indexing

- Text indexing
  - Indexing by words of document
  - "Hepatolenticular degeneration" ≠ "Wilson's Disease"
- Concept indexing / Natural language processing
  - Recognizes words in document to a controlled vocabulary
    - Unified Medical Language System, contains >100 vocabularies, >2 million concepts mapped to >8 million English synonyms)
  - "Hepatolenticular degeneration" = "Wilson's disease"
  - Figures out ambiguous concepts:
    - "CHF" – "Congestive Heart Failure" or "Congenital Hepatic Fibrosis"?
    - "BSE" – "Bovine spongiform encephalopathy" or "Breast self exam"
  - Interprets phrases
    - "The aortic valve was stenosed" = "aortic stenosis"
    - "gram negative infection" = "gram-negative *bacterial* infection"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Search Results for "urinary incontinence [definition]" (23 documents):
Search
Results
Session
Term or Phrase:
urinary incontinence
(ex: heart failure and digoxin)
search help
Search
Search All Documents
Expand 5 lectures
View search history
Searching for "urinary incontinence"
Analysis of first ~60,000 searches showed that 85% were medical concepts
Welcome to KnowledgeMap
Edit lecture schedule and sessions for my course
View recently uploaded documents
Launch KnowledgeMap Tutorial and FAQ
View course schedules and associated lectures by week or by course:
VMS I - Required Courses | Electives
1st Semester Calendar
Anatomy (Embryology)
Biochemistry
Adv. Biochemistry
Mind and Medicine
Ecology of Health Care
Intro to Patient Clinical Professionalism
2nd Semester Calendar
Histology
Physiology
Microbiology
Emphasis Program
VMS II - Required Courses | Electives
1st Semester Calendar
Pathology
Medical Neuroscience
Radiology
Psychiatry
Ethics in Medicine
2nd Semester Calendar
Lab Diagnosis
Genetics
Physical Diagnosis
Pharmacology
Preventive Medicine
Clinical Nutrition
VMS III
Medicine
Surgery
Pediatrics
Obstetrics and Gynecology
Neurology
Psychiatry
VMS IV - Required Courses | Electives
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Search Results for "urinary incontinence [definition]" (23 documents):

Search | Results | Session

Term or Phrase:

urinary incontinence

(ex: heart failure and digoxin)
search help

Search

Search All Documents

Expand 5 lectures

View search history

Documents containing the concept "urinary incontinence"

VMS I

- Biochemistry (1 document)
- Gross Anatomy (3 documents)
- Microbiology (1 document)

VMS II

- Lab Diagnosis (3 documents)
- Medical Neuroscience (2 documents)
  - Normal Pressure Hydrocephalus [first hit] 4 hits
  - 1 more...
- Pathology (1 document)
- Pharmacology (4 documents)
- Physical Diagnosis (1 document)

VMS III

- Pediatrics (1 document)
- Psychiatry (1 document)
- Surgery (1 document)
  - Urology: PSA; scrotal pain; urinary complaints [first hit] Harriette Scarpero 3 hits

VMS IV

- Emergency Medicine (2 documents)
  - Neurologic Emergencies [first hit] Susan Marlow 2 hits
  - 1 more...

Done

Internet

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Search | Results | Session

Term or Phrase:

urinary incontinence

(ex: heart failure and digoxin)

search help

Search

Search All Documents

Expand 5 lectures

View search history

Document-specific Tools:

- Get Original Document
- Get Original as PDF
- Similar PubMed Articles
- Find Similar Documents NEW!

KM shows one of lectures that mention "urinary incontinence"

Slide #92: "Urinary Incontinence "

Stress incontinence

Urge incontinence

Mixed incontinence

Slide #93: "Incontinence "

The involuntary loss of urine

Stress incontinence (SUI)- occurs with increases in intraabdominal pressure
Urge incontinence (UUI)- leakage that is preceded by an intense uncontrollable urge to void
Mixed incontinence- both SUI and UUI

Slide #94: "Components of a Thorough Evaluation "

Detailed history*

Questionnaire*

Physical examination*

Other testing: UA, voiding diaries*, pad test*, uroflow, postvoid residual (PVR), urodynamics*

* Recommended minimal standards for pretx eval by AUA

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Search | Results | Session

Term or Phrase:

chf

(ex: heart failure and digoxin)
search help

Search

Search Definition

Expand 5 lectures

View search history

Document-specific Tools:

- Get Original Document
- Get Original as PDF
- Similar PubMed Articles
- Find Similar Documents

Definitions for "chf"

KnowledgeMap Definitions:

Congenital hepatic fibrosis [Approx. 6 documents in KM]: *no definition*

Congestive heart failure [Approx. 281 documents in KM]: Weakness of the heart muscle that leads to a buildup of fluid in body tissues.

Hemorrhagic Fever, Crimean [*no documents*]: A severe, often fatal disease in humans caused by the Crimean-Congo hemorrhagic fever virus (HEMORRHAGIC FEVER VIRUS, CRIMEAN-CONGO).

Three definitions for "CHF" – the system disambiguates each occurrence of "CHF" into one of these three matches when in documents

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Search | Results | Session

Term or Phrase:

chf

(ex: heart failure and digoxin)
search help

Search

Search Definition

Expand 5 lectures

View search history

Document-specific Tools:

- Get Original Document
- Get Original as PDF
- Similar PubMed Articles
- Find Similar Documents

A document matching "**Congestive heart failure**"; the system finds both "congestive heart failure" and "CHF"

CONGESTIVE HEART FAILURE

Heart failure exists when the heart does not provi
This state causes congestion of the tissues, leading

It produces the clinical syndrome of dyspnea, per
an abnormality of myocardial function is responsible for the failure of the heart to pump at a rate commensurate with the requirements of metabolizing tissues. CHF is encountered frequently by the clinician; it accounts for 2? of all hospital admissions and carries a 5-year survival rate of <50?.

I. CAUSES OF CONGESTIVE HEART FAILURE

A. Myocardial Disease (pump defect)

1. Coronary heart disease-- myocardium is impaired by ischemia
2. Cardiomyopathy-- intrinsic myocardial defect
3. Infiltrative diseases:

amyloidosis
sarcoidosis
myocarditis

B. Excessive Workload due to:

1. Increased resistance to ejection which can be due to pressure overload, hypertension, aortic or pulmonary stenosis, or hypertrophic cardiomyopathy.
2. Increased stroke volume; volume overload which can be due to aortic, mitral or tricuspid insufficiency or congenital left-to-right shunts.
3. Increased body demands (high output failure); can occur with thyrotoxicosis, anemia, pregnancy, or arteriovenous fistulas (abnormal shunt between an artery and vein which increases venous return and decreases oxygen to shunted area)

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Infantile Polycystic Kidney Disease
(Autosomal Recessive Polycystic Kidney Disease, ARPKD)

I. General and clinical features:

A. Incidence and relationship to **congenital hepatic fibrosis**: Infantile polycystic kidney disease is closely associated with **congenital hepatic fibrosis** (**CHF**). **CHF** is an important cause of portal hypertension in children and adolescents. In general, in patients who present as neonates and infants, the clinical picture is dominated by renal failure. Patients who present later tend to have liver problems as the major clinical feature. Although at one time thought to represent distinct disorders, different affected members in the same family may present at different ages with either predominant renal or liver abnormalities, attesting to the underlying genetic relationship of these diseases.

Infantile polycystic kidney disease is inherited in an autosomal recessive manner (i.e., parents are not affected), with the reported incidence varying from 1:6000 to 1:40,000.

A document matching "**congenital hepatic fibrosis**"; these instances of "CHF" are interpreted as "congenital hepatic fibrosis instead of "congestive heart failure"

B. Clinical presentation: Can present at any ... n at or shortly after birth.

Can be suspected during prenatal ultras ... ia secondary to associated oligohydramnios.

Presentation shortly after birth can be d... Presentation later in infancy can be due to de... polyuria and dehydration (especially during intercurrent illness).

The kidneys may be sufficiently enlarged to result in a palpable mass. Deteriorating renal function is inevitable, and patients may present later with renal failure/uremia/hypertension.

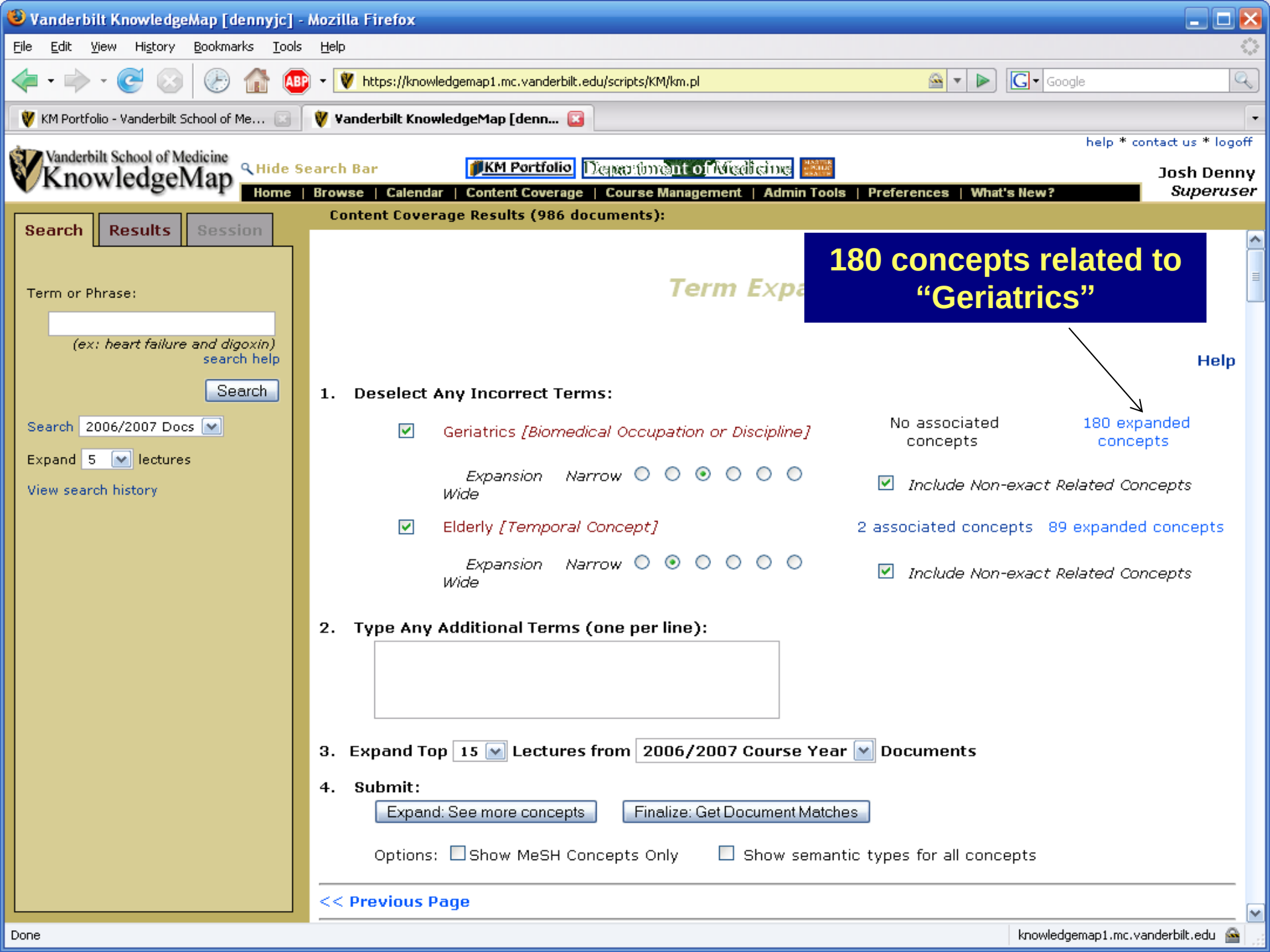
As implied above, patients presenting in later childhood and early adulthood usually present with signs of liver involvement, particularly portal hypertension, which may result in hepatosplenomegaly and bleeding esophageal varices.

II. Pathogenesis:

Recent data has mapped a gene for ARPKD to the short arm of chromosome 6. The specific gene has not been identified/

Internet

How do we find broad concepts like “geriatrics” or “women’s health”?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(ex: heart failure and digoxin)
search help
Search
Search 2006/2007 Docs
Expand 5 lectures
View search history
Content Coverage Results (986 documents):
180 concepts related to "Geriatrics"
Help
1. Deselect Any Incorrect Terms:
Geriatrics [Biomedical Occupation or Discipline]
No associated concepts
180 expanded concepts
Expansion Narrow Wide
Include Non-exact Related Concepts
Elderly [Temporal Concept]
2 associated concepts
89 expanded concepts
Expansion Narrow Wide
Include Non-exact Related Concepts
2. Type Any Additional Terms (one per line):
3. Expand Top 15 Lectures from 2006/2007 Course Year Documents
4. Submit:
Expand: See more concepts
Finalize: Get Document Matches
Options: Show MeSH Concepts Only
Show semantic types for all concepts
<< Previous Page
Done
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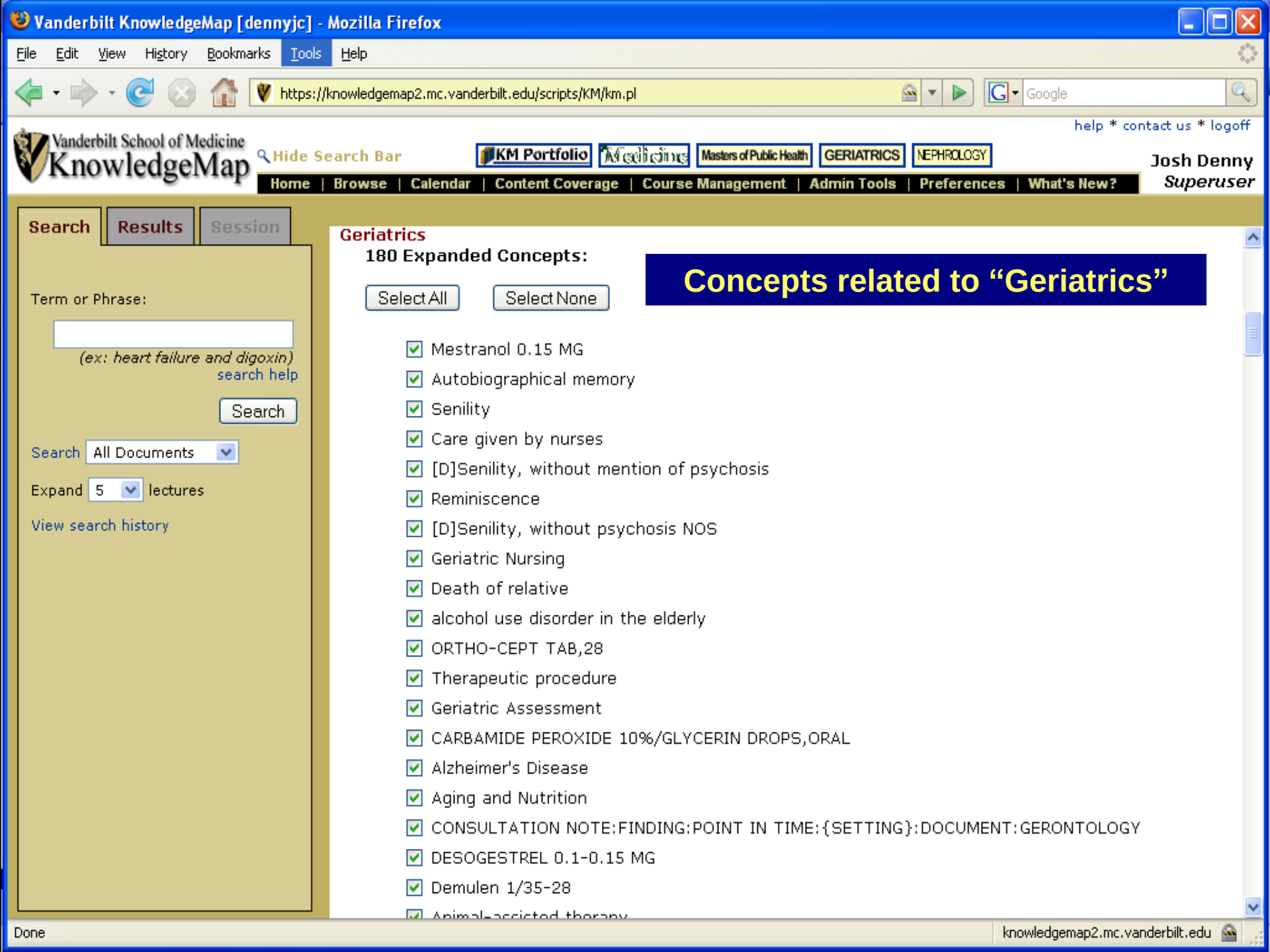
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Term or Phrase:
(ex: heart failure and digoxin)
search help
Search
Search All Documents
Expand 5 lectures
View search history
Geriatrics
180 Expanded Concepts:
Concepts related to "Geriatrics"
Select All
Select None
Mestranol 0.15 MG
Autobiographical memory
Senility
Care given by nurses
[D]Senility, without mention of psychosis
Reminiscence
[D]Senility, without psychosis NOS
Geriatric Nursing
Death of relative
alcohol use disorder in the elderly
ORTHO-CEPT TAB,28
Therapeutic procedure
Geriatric Assessment
CARBAMIDE PEROXIDE 10%/GLYCERIN DROPS,ORAL
Alzheimer's Disease
Aging and Nutrition
CONSULTATION NOTE:FINDING:POINT IN TIME:{SETTING}:DOCUMENT:GERONTOLOGY
DESOGESTREL 0.1-0.15 MG
Demulen 1/35-28
Done
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Search | Results | Session

Term or Phrase:

(ex: heart failure and digoxin)
search help

Search

Search 2006/2007 Docs

Expand 5 lectures

View search history

Content Coverage Results (986 documents):

- Preventive Medicine (32 documents)
- Medical Neuroscience (36 documents)
  - Lecture: Aging and Alzheimer's Disease I [first hit] — Jeanette J Norden — 284 hits
  - 35 more...
- Genetics (3…
- Physical Diagnosis (6…
- Radiology (1…
- Pharmacology (71 documents)
- Psychiatry (18 documents)
  - Dementia / Delirium [first hit] — Bill Regan — 400 hits
  - 17 more...

Searching for documents matching those 180 Geriatric concepts

VMS III

- Pediatrics (32 documents)
- Obstetrics and Gynecology (18 documents)
- Medicine (28 documents)
- Psychiatry (25 documents)
- Surgery (2 documents)
- Intersessions (31 documents)

VMS IV

- Geriatrics (163 documents)
  - Chapter 44 - Infectious Diseases [first hit] — Joshua Charles Denny — 371 hits
  - Chapter 50 - Kidney Diseases and Disorders [first hit] — Joshua Charles Denny — 323 hits

Done

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A Geriatric document

VMS II - 20
Author: *Jeanette J Norden*
Submitted *September 6, 2006*

Get Original Document
Similar PubMed Articles
Jump to first hit ▶

Lecture: Aging and Alzheimer's Disease I

NORMAL AGING▸ OF THE BRAIN/ALZHEIMER'S DISEASE▸

Insight into aging▸ of the brain and Alzheimer's disease▸ is the result of a massive research effort; work on Alzheimer's disease▸, in particular, represents a rapidly evolving area of research; new and often conflicting data are generated daily; the purpose of this set of lectures is to provide you with the requisite background information necessary to allow you to continue to assimilate new findings as they are generated, and to provide you with a synopsis of both an historical and current (albeit changing) understanding of Alzheimer▸ 's disease

* Recommended reading:

" DeBaggio, Thomas. Losing My Mind. The Free Press, 2002

" Bayley, John. Elegy for Iris. Picador Press, 1999

" Jozefowicz and Holloway: Case 26 "The Gopher Hunter"

I. Maturational events which occur normally in the nervous system

Done
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How well does KM find metaconcepts?

- Identified gold standard set of 380 documents as containing high, medium or low relevance to each topic
- Used KM to generate a variable number of subconcepts for each broad concept and calculated a relevance score for each document.

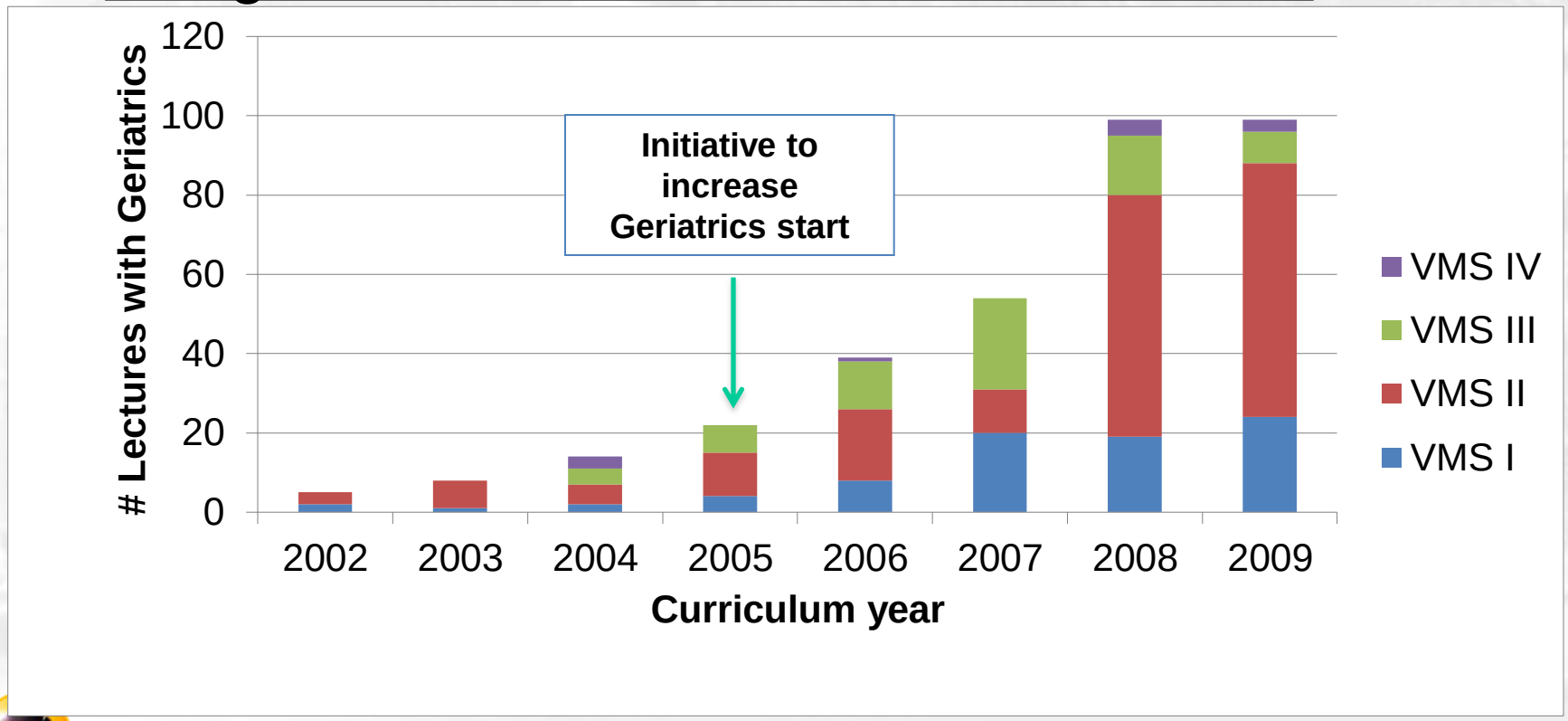
Topic	ROC area
Genetics	0.98
Women's Health	0.93
Dermatology	0.95
Radiology	0.97

Denny, Smithers, Armstrong , Spickard, JGIM, Oct, 2005

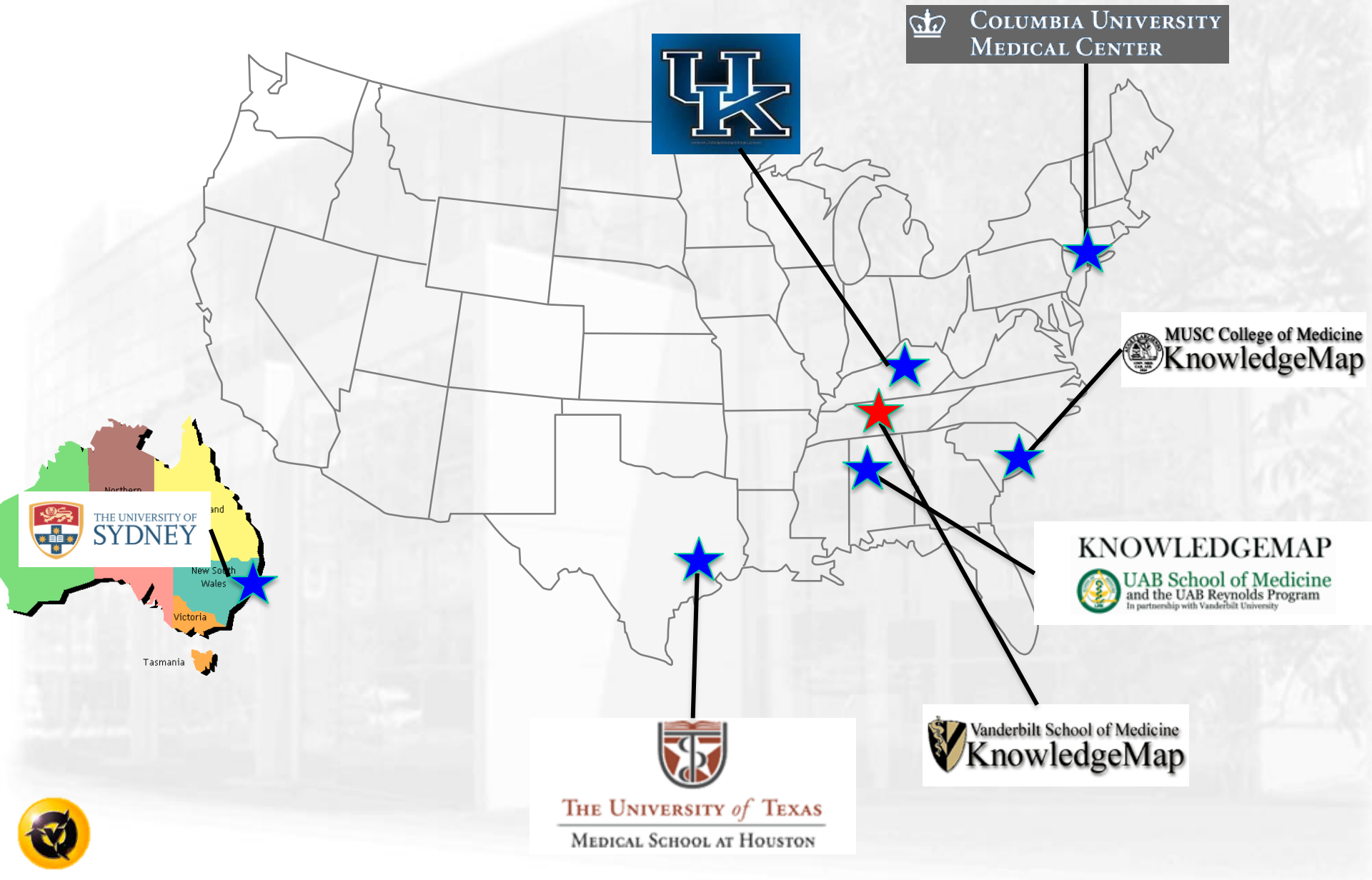
Finding broad curricular topics

- Used for LCME, creating/rearranging courses, revising curriculum

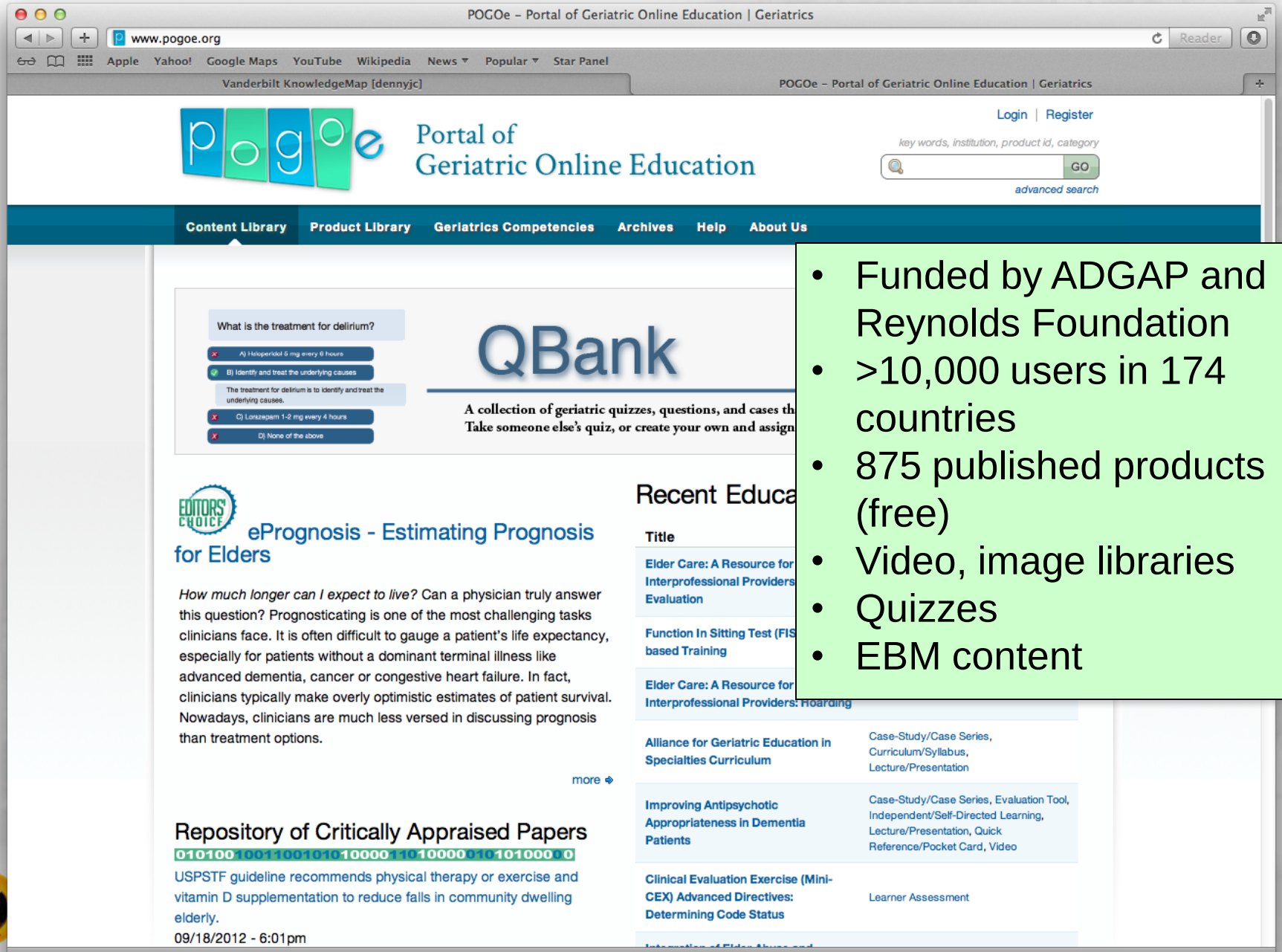
Using to infuse Geriatrics in the curriculum:



KM has been adopted by others



POGOe.org, a free geriatrics site based on KM



- Funded by ADGAP and Reynolds Foundation
- >10,000 users in 174 countries
- 875 published products (free)
- Video, image libraries
- Quizzes
- EBM content

Part #2: Assessment in Clinical Years

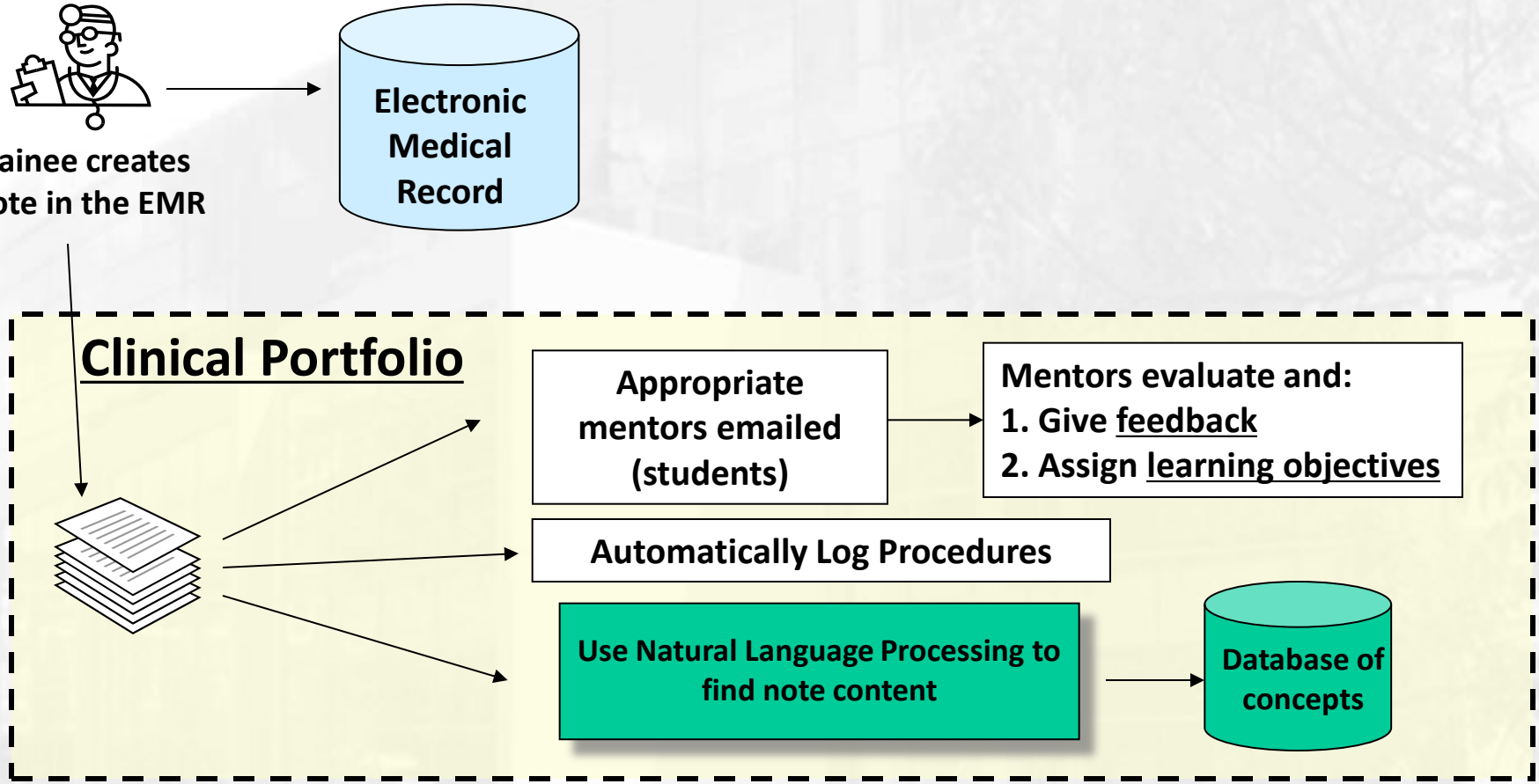
- Testing based: USMLE, NCLEX, Residency Board Exams
- Experience Based:
  - ACGME and RRC
  - Nursing requirements
- Both current methods tend to aggregate at high levels
- Experience is an important part of competency

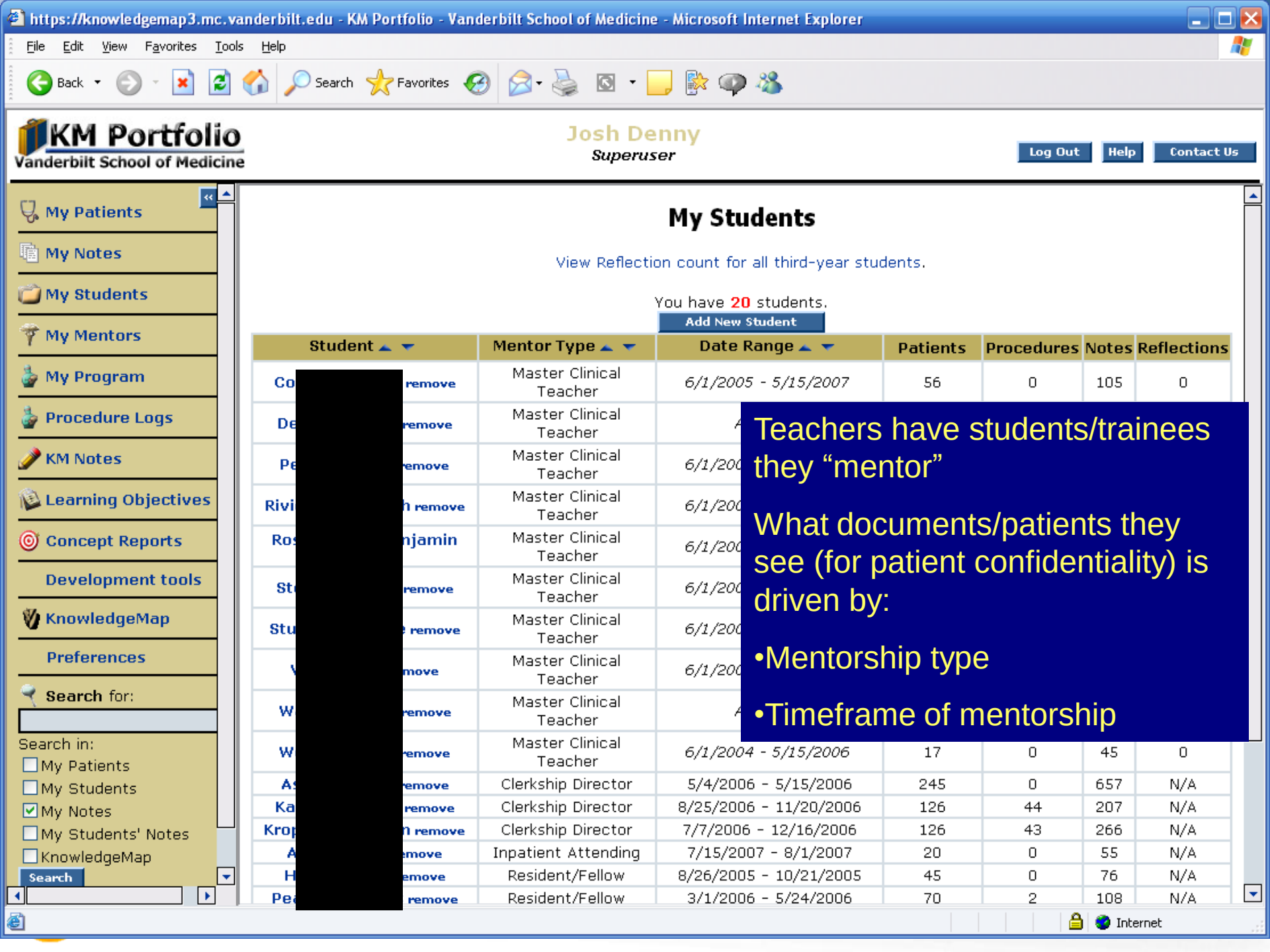
Components of "Learning Portfolio"

- Clinical notes
- Mentor feedback on notes and other documents
- Logs of procedures/patients
- Reflections
- Tests/academic work
- Essays and other documents

We will focus on these

Learning Portfolio – leveraging EMR to capture experience

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Search for:
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My Patients
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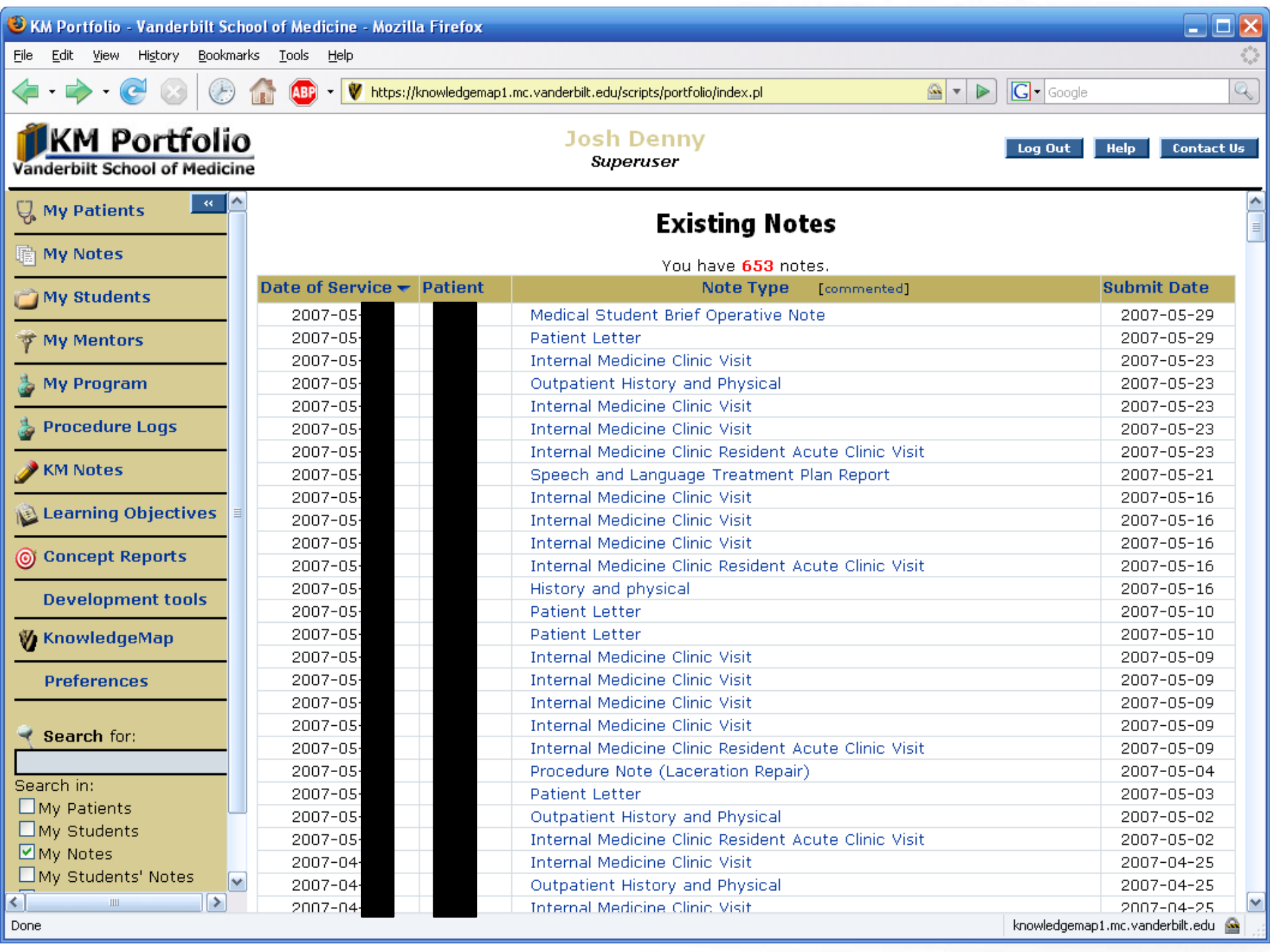
My Notes
My Students' Notes
KnowledgeMap
Search
My Students
View Reflection count for all third-year students.
You have 20 students.
Add New Student
Student
Mentor Type
Date Range
Patients
Procedures
Notes
Reflections
Master Clinical Teacher 6/1/2005 - 5/15/2007 56 0 105 0
Master Clinical Teacher 6/1/2004 - 5/15/2006 17 0 45 0
Clerkship Director 5/4/2006 - 5/15/2006 245 0 657 N/A
Clerkship Director 8/25/2006 - 11/20/2006 126 44 207 N/A
Clerkship Director 7/7/2006 - 12/16/2006 126 43 266 N/A
Inpatient Attending 7/15/2007 - 8/1/2007 20 0 55 N/A
Resident/Fellow 8/26/2005 - 10/21/2005 45 0 76 N/A
Resident/Fellow 3/1/2006 - 5/24/2006 70 2 108 N/A
Teachers have students/trainees they "mentor"
What documents/patients they see (for patient confidentiality) is driven by:
•Mentorship type
•Timeframe of mentorship
Internet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Search for:
Search in:
My Patients
My Students
My Notes
My Students' Notes
Existing Notes
You have 653 notes.
Date of Service
Patient
Note Type [commented]
Submit Date
2007-05-[redacted] [redacted] Medical Student Brief Operative Note 2007-05-29
2007-05-[redacted] [redacted] Patient Letter 2007-05-29
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-23
2007-05-[redacted] [redacted] Outpatient History and Physical 2007-05-23
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-23
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-23
2007-05-[redacted] [redacted] Internal Medicine Clinic Resident Acute Clinic Visit 2007-05-23
2007-05-[redacted] [redacted] Speech and Language Treatment Plan Report 2007-05-21
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-16
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-16
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-16
2007-05-[redacted] [redacted] Internal Medicine Clinic Resident Acute Clinic Visit 2007-05-16
2007-05-[redacted] [redacted] History and physical 2007-05-16
2007-05-[redacted] [redacted] Patient Letter 2007-05-10
2007-05-[redacted] [redacted] Patient Letter 2007-05-10
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-09
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-09
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-09
2007-05-[redacted] [redacted] Internal Medicine Clinic Visit 2007-05-09
2007-05-[redacted] [redacted] Internal Medicine Clinic Resident Acute Clinic Visit 2007-05-09
2007-05-[redacted] [redacted] Procedure Note (Laceration Repair) 2007-05-04
2007-05-[redacted] [redacted] Patient Letter 2007-05-03
2007-05-[redacted] [redacted] Outpatient History and Physical 2007-05-02
2007-05-[redacted] [redacted] Internal Medicine Clinic Resident Acute Clinic Visit 2007-05-02
2007-04-[redacted] [redacted] Internal Medicine Clinic Visit 2007-04-25
2007-04-[redacted] [redacted] Outpatient History and Physical 2007-04-25
2007-04-[redacted] [redacted] Internal Medicine Clinic Visit 2007-04-25
Done
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Quick Search for:

Search in:
- [x] My Patients
- [x] My Students
- [ ] My Notes
- [x] KnowledgeMap

Search

Note Comments: Medical Student Admission History and Physical

Learning Objectives covered:	Cough
General Comments:	**[Anonymous, attending]** Excellent writeup - a few minor points to consider - see comments in text.

Document comments: *Hover over comments in yellow*

Vanderbilt University Medical Center [redacted]
MEDICAL STUDENT
Admission History and Physical MR# [redacted]
Case# [redacted]

Date of services: [redacted]
Primary Care Physician: [redacted]

Chief Complaint: fever, cough, chest pain

History of present illness:
Mr. [redacted] is a [redacted] year old male with PMH significant for HIV (VL 87,000 & CD4 329 in 8/05, last CD4 286 per pt), or
TB (received 6 mo treatment w/ 4 medi
chronic back pain who presents with
sputum, and chest pain 2/2 cough. Th
health until approximately 1.5 wks ag
became more incessant, and he started
occured simultaneously with his cough
coughing up yellow-green tinged mucous. He developed fever as high as 102 a few days ago at home and began experiencing a sore throat, headache, arthralgias, and myalgias. He has taken tylenol at home, but it has not alleviated his symptoms. He says he had mild diarrhea for a few days prior to developing fever, but he denies having abdominal pain, n/v, or blood in his stool. He says he has had chronic dysuria for 3-4 yrs., but he denies burning with urination or frequency. He has not been taking good po for the past few days, and feels he has lost weight over the past few months. He denies sick contacts (besides his partner who has known MAC infection), recent travel, or exposure to animals. He started a new ART regimen approximately 3 months ago including tenofovir, ritonavir and atazanavir, and didanosine.

Anonymous
Smart to provide us the pertinent PMH in the topic sentence as the topic sentence is key to get your reader right into the relevant material. The parenthesis are good to give us a read on how severe the HIV and complicating infections have been in the past. However, it is a bit too much detail. You can list these items in the PMH and for the topic sentence just say something like "with HIV (last CD4 329, recurrent pneumonias, treated TB, without all the detail)

RCT evaluation of mentor feedback on student notes

Survey of Residents and Attending physicians

Compared with prior rotations:	Electronic	Paper	p
"I reviewed more notes"	40%	12%	0.014
"I provided more feedback"	40%	12%	0.010
"I was more satisfied with feedback given"	33%	10%	0.045

Analysis of student write-ups

- Evaluated 142 write-ups using 13-point rating scale
- Performance on "Assessment and Plan" ratings improved in electronic feedback group (p=0.036)

Spickard et al. J Gen Int Med. 2008;23(7):979-84

Procedures tracked by notes created, and managed/viewed by residencies or clerkships
(also used to track some diagnoses)

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- My Comments
- My Mentors
- My Program
- Procedure Logs
- KM Notes
- Learning Objectives
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Search for:

Search in:
- [ ] My Patients
- [ ] My Trainees
- [x] My Notes
- [ ] My Trainees' Notes
- [ ] KnowledgeMap

Search

Search a Population

Showing program view on: Mar 6 2013

Include procedures performed on or after: Jan 1 2005

Change Date

Actions
Data dump of these results
Options:
Microsoft Excel

Internal Medicine Procedures Performed

Edit Program Requirements

Name	Year	Art Line	Arthro	C.line	ETT	LP	NGT	Para	Pelvic	PA Cath	Rectal	Thora
[redacted]	PGY4	7/5	0/3	34/5	0	13/5	0	9/3	5/5	4	0/5	16/5
	PGY4	4/5	0/3	23/5	1	4/5	0	4/3	0/5	1	0/5	3/5
	PGY4	6/5	1/3	24/5	1	3/5	0	17/3	0/5	2	0/5	5/5
	PGY4	4/5	0/3	29/5	1	12/5	0	10/3	0/5	2	0/5	7/5
	PGY3	0/5	0/3	17/5	2	7/5	0	8/3	0/5	2	0/5	6/5
	PGY3	0/5	10/3	11/5	0	8/5	0	13/3	0/5	0	0/5	5/5
	PGY3	1/5	0/3	21/5	0	8/5	0	15/3	0/5	0	0/5	4/5
	PGY3	5/5	0/3	17/5	1	11/5	0	7/3	5/5	1	0/5	19/5
	PGY3	0/5	0/3	11/5	1	2/5	0	14/3	0/5	0	0/5	9/5
	PGY3	0/5	2/3	4/5	0	1/5	0	9/3	0/5	0	0/5	1/5
	PGY3	1/5	0/3	2/5	0	2/5	0	2/3	0/5	0	0/5	0/5
	PGY3	3/5	1/3	29/5	3	9/5	0	3/3	0/5	2	0/5	12/5
	PGY3	8/5	2/3	15/5	1	5/5	0	6/3	0/5	7	0/5	2/5
	PGY3	2/5	0/3	17/5	1	7/5	0	1/3	0/5	0	0/5	2/5
	PGY3	1/5	0/3	33/5	0	15/5	0	30/3	0/5	0	0/5	12/5
	PGY3	4/5	0/3	28/5	0	10/5	0	10/3	0/5	2	0/5	3/5
	PGY3	3/5	0/3	13/5	2	4/5	0	18/3	0/5	0	0/5	8/5
	PGY3	0/5	0/3	20/5	0	9/5	0	7/3	0/5	3	0/5	4/5
	PGY3	9/5	0/3	12/5	0	5/5	0	7/3	6/5	0	0/5	7/5
	PGY3	3/5	1/3	16/5	0	8/5	0	6/3	0/5	3	0/5	12/5
	PGY3	6/5	0/3	21/5	0	8/5	0	7/3	0/5	3	0/5	3/5
	PGY3	0/5	1/3	22/5	1	9/5	0	18/3	0/5	1	0/5	7/5
	PGY3	1/5	0/3	17/5	0	8/5	0	4/3	0/5	0	0/5	4/5
	PGY3	1/5	0/3	28/5	0	2/5	0	27/3	0/5	0	0/5	7/5
	PGY3	0/5	0/3	4/5	0	0/5	0	3/3	0/5	0	0/5	4/5
	PGY3	5/5	1/3	27/5	1	4/5	0	5/3	0/5	0	0/5	7/5

Tracking experience: Vanderbilt Core Clinical Curriculum (VC3)

25 Core Clinical Problems (CCP)

Abdominal pain	Headache
Abnormal uterine bleeding	Jaundice
Abnormal vaginal discharge	Loss of consciousness
Abnormalities of mood	Obesity
Altered mental status	Pelvic pain
Back pain	Pharyngitis
Breast disease	Rash
Chest pain	Seizures
Cough	Shock
Dysuria	Shortness of breath
Fever	Substance abuse
GI bleeding	Trauma
	Weight loss

Extracting "knowledge" from clinical notes

H&P entered by user

CC: SOB
HPI: This is a 65yo w/ h/o CHF, … no chest pain

…

Clinical Note Section Tagger

```
<chief_complaint>
   SOB
</chief_complaint>
<history_present_illness>
  This is a 65yo w/ h/o CHF.... Denies
  chest pain.
</history_present_illness>
```

KnowledgeMap Concept Identifier

Structured Output
Text labeled with Unified Medical Language System concepts, organized by section

```
<chief_complaint>
   C0392680: Shortness of Breath
</chief_complaint>
<history_present_illness>
    C0018802: Congestive Heart Failure
     C0008031: Chest Pain, Negated
</history_present_illness>
```

Denny et al. JAMIA 2003, 2009; AMIA 2008; JBI 2009
Xu et al. JAMIA 2010
Doan et al. JAMIA 2010

Student view of how many VC3 topics they've completed. (Teachers can see this also.)

Mapping of a note to a VC3 topic happens **manually** and **automatically** for high scoring documents.

- My Patients
- My Notes
- My Mentors
- My Reflections
- Procedure Logs
- KM Notes
- Learning Objectives
- KnowledgeMap
- Preferences

Search for:

Search in:
- [x] My Patients
- [ ] My Notes
- [ ] My Trainees' Notes
- [x] KnowledgeMap

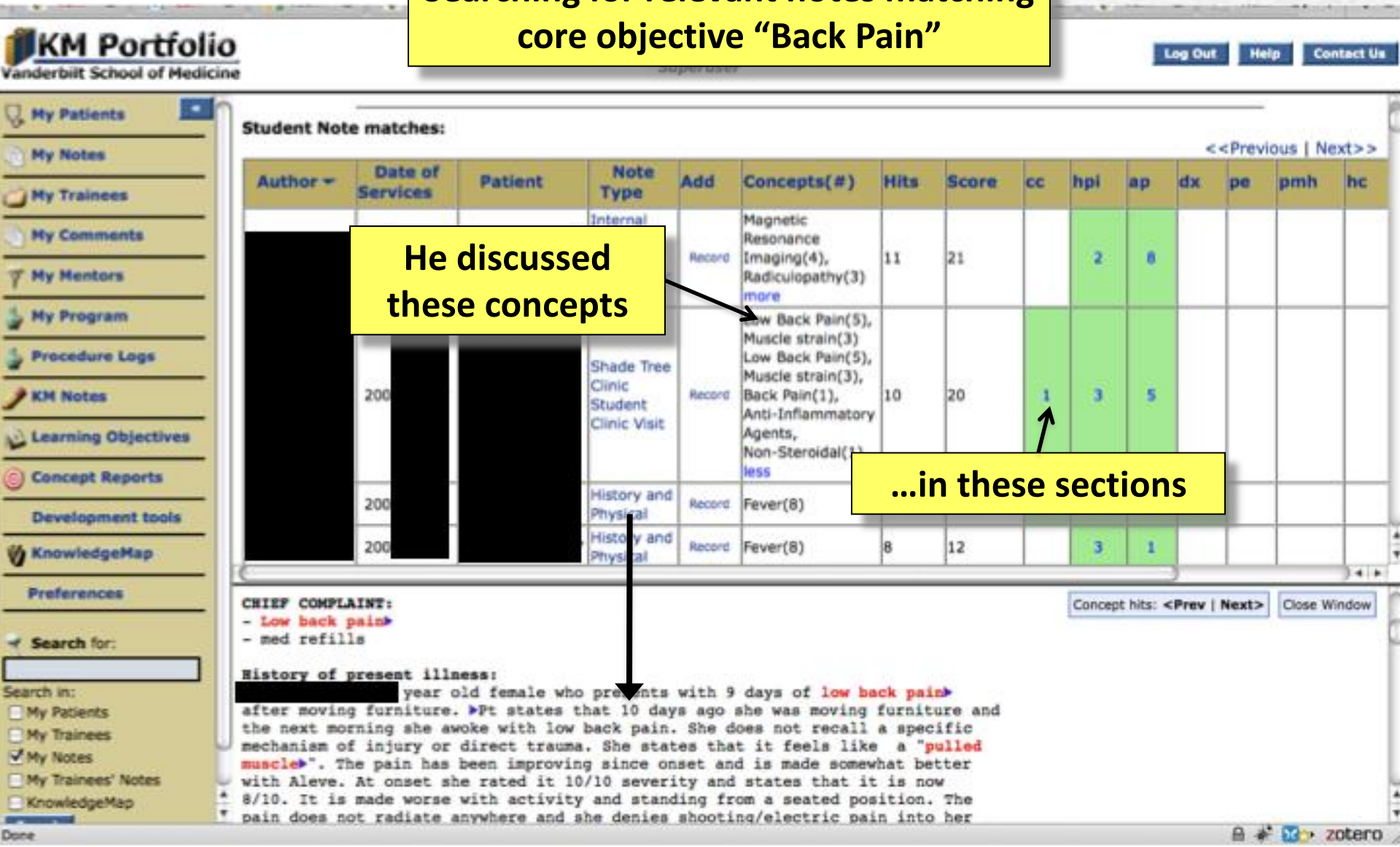
Search

Learning Objectives

Learning Objective	Date Recorded	Event Recorded
Abdominal Pain [Find matching notes]	10/17/2008 11/1/2008	Pediatric Surgery Consultation Note Medical Student Admission History and Physical
Altered Mental Status		*None recorded*
Back Pain [Find matching notes]	10/17/2008	Return Clinic Visit Progress Note
Breast Disease		*None recorded*
Chest Pain [Find matching notes]	5/9/2008 5/23/2008 10/19/2008	Medical Student Admission History and Physical Medical Student Admission History and Physical Medical Student Admission History and Physical
Coma		*None recorded*
Cough [Find matching notes]	10/20/2008 10/20/2008	Medical Student Admission History and Physical Medical Student Admission History and Physical
Depression [Find matching notes]	11/2/2008 11/2/2008	Medical Student Progress Note History and physical
Dysuria [Find matching notes]	11/2/2008 11/2/2008 11/2/2008	Pediatric Infectious Disease Initial Consultation Medical Student Admission History and Physical Clinic Visit
Fever [Find matching notes]	10/17/2008 10/17/2008	Medical Student Admission History and Physical Progress Note Daily Progress Note
Gastrointestinal Bleeding [Find matching notes]		*None recorded*
Heart Murmurs		*None recorded*
Jaundice [Find matching notes]	11/2/2008 11/2/2008	History and physical Progress Note Daily Progress Note
Menstrual abnormalities		*None recorded*
Mood Disorder		*None recorded*
Pelvic Pain		*None recorded*
Pharyngitis		*None recorded*

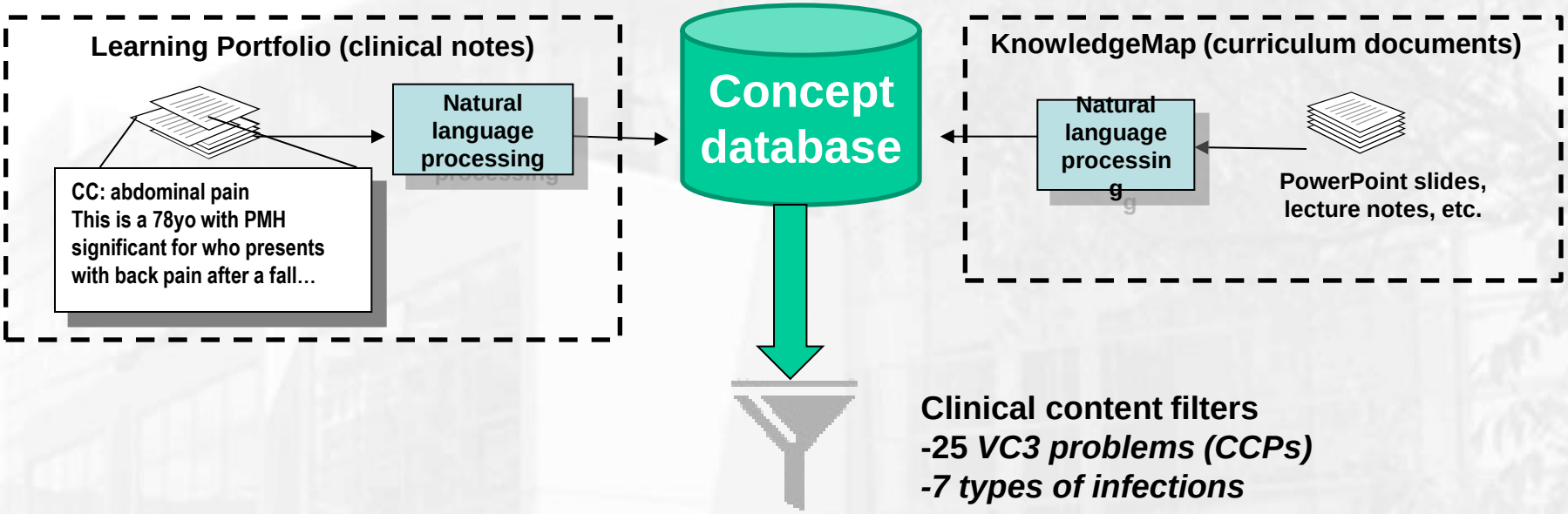
Done knowledgemap3.mc.vanderbilt.edu

Searching for relevant notes matching core objective "Back Pain"



Part #3: Evaluating and integrating

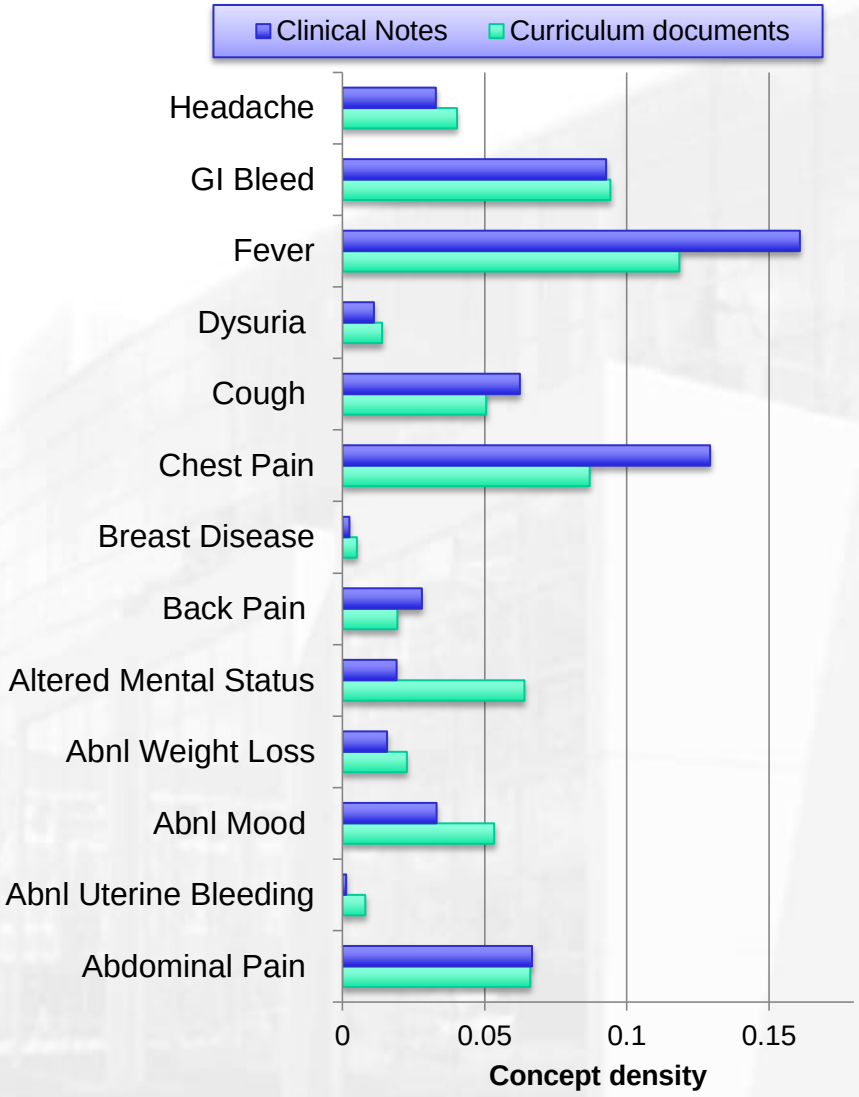
Study 1: Curriculum vs. Notes

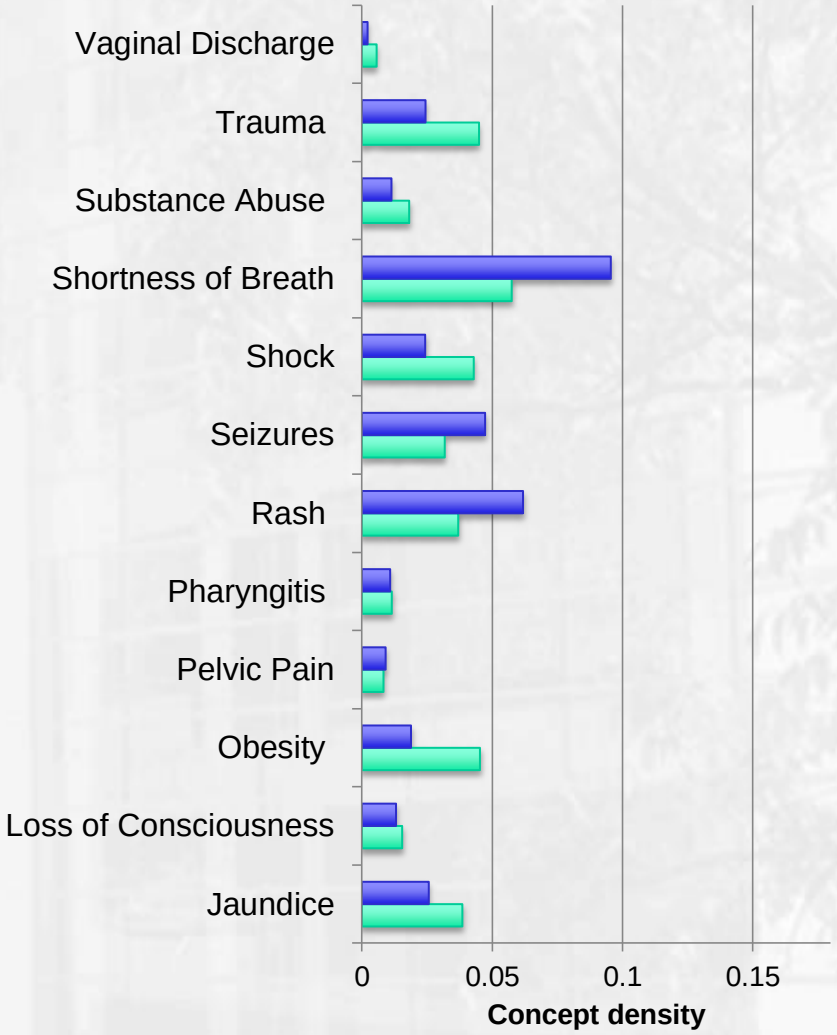


Compare content,
identify discrepancies

Coverage of VC3 Topics

300k notes
15k lecture documents

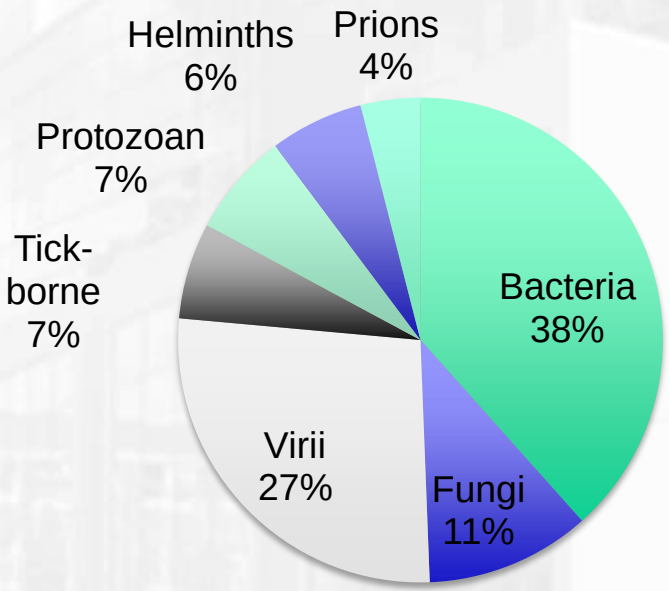




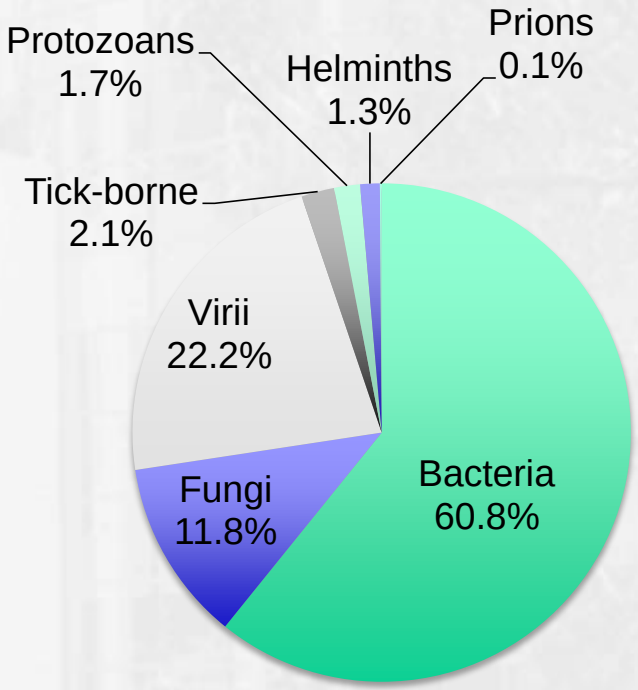
Denny et al. AMIA 2010

Coverage of Infectious Diseases

Curriulum Documents



Clinical Notes



Denny et al. AMIA 2010

Study 2: Automated Education Advisors

Student types a note in the EMR

NLP

Database of Note Concepts

NLP Rules Engine

Customized Emails

- **Key facts about the diagnosis**
- **Whether or not they met some criteria**
- **Links to key references about the topic (on KM)**
- **Links to documents most relevant to their note**

- Current Email Advisors:
  - Advanced directives (pts > 65, if they don't mention them)
  - Altered mental status (must say AMS concept in key section of note)

Step 1. Student sees a patients, writes a note

CHIEF COMPLAINT: confusion, weakness, and lethargy
HISTORY OF PRESENT ILLNESS: Mrs. X is a 70 year old female with metastatic undifferentiated carcinoma, likely lung in origin, who was recently discharged from the hospital s/p left femoral fracture and biopsy due to a fracture who now presents with increasing confusion, weakness, and lethargy.
…
PHYSICAL EXAMINATION: General: waxing and waning alertness,
…
SUMMARY: This is a 72 year old female with metastatic lung carcinoma admitted for delirium most likely secondary to hypercalcemia.
…
ASSESSMENT AND PLAN:
1. Hypercalcemia Hyperparathyroidism… malignancy…
6. Disp -Will keep hospitalized until altered mental status improves…

Step 2. Portfolio finds AMS concepts found in note

CHIEF COMPLAINT: **confusion**, **weakness**, and **lethargy**
HISTORY OF PRESENT ILLNESS: Mrs. X is a 70 year old female with **metastatic undifferentiated carcinoma**, likely lung in origin, who was recently discharged from the hospital s/p left femoral fracture and biopsy due to a fracture who now presents with increasing **confusion**, **weakness**, and **lethargy**.
…
PHYSICAL EXAMINATION: General: **waxing and waning alertness**,
…
SUMMARY: This is a 72 year old female with metastatic lung carcinoma admitted for **delirium** most likely secondary to **hypercalcemia**.
…
ASSESSMENT AND PLAN:
1. **Hypercalcemia Hyperparathyroidism**… **malignancy**…
6. Disp -Will keep hospitalized until **altered mental status** improves…

CHIEF COMPLAINT: **confusion, weakness,** and **lethargy**
HISTORY OF PRESENT ILLNESS: M... Y... 70 ... female with
metastati... origin, who
was recen... moral

Step 3. Portfolio finds related curriculum documents and emails the student

You are getting this email as part of a project to improve your understanding of **altered mental status**. This email is generated based on your note: Medical Student Admission History and Physical, written on 2011-01-15 19:42:15.

Key facts about Altered Mental Status:

•The differential diagnosis of altered mental status is extensive including dementia, delirium, substance induced, drug side effects, infection, intracranial lesions or strokes, trauma, and metabolic entities such as liver disease or hypoglycemia.

•Alzhiemer's disease, vascular dementia, and dementia with Lewy bodies are the most common forms of degenerative dementias seen in late life.

KM documents most like yours:

•Typical Laboratory Results in the Differential Diagnosis of Hypercalcemia | Joshua Charles Denny | Geriatrics Review Syllabus (Geriatrics)

•Hypercalcemia | Natasha Janelle Schneider | Outpatient Medicine Curriculum (Core Lecture Series)

•Fluid Management for Students | Kyle Bertram Brothers | Pediatrics (VMS III)

•Pharmacological Concepts | Joseph A Awad | Pharmacology (VMS II)

Other searches that may be relevant to this patient:

•Differential diagnosis of metobolic (liver ds, electrolytes, gluocose abnormalities) as causes of AMS. (4 overlapping concepts)

•Differential diagnosis of delerium as a cause of AMS. (2 overlapping concepts)

•Signs and symptoms of AMS (2 overlapping concepts)

•Evaluation of AMS (1 overlapping concepts)

Acknowledgements

System Design and Research

- Anderson Spickard, III, MD MS
- Toufeeq Ahmed, PhD, MS
- Randy Miller, MD
- Jeff Smithers, MD
- Peter Speltz
- Glenn Stein, MS
- Terry Payne
- Lisa Bastarache, MS

Support

- Vanderbilt Dean's Office
- National Library of Medicine
- Reynolds Foundation
- National Board of Medical Examiners

Questions?