Overview of KnowledgeMap and Learning Portfolio
KnowledgeMap

• A web based knowledge management tool
• Displays all the curricular documents
• Automatically locates all medical concepts in each lecture
Courses grouped by years, with calendars specific for each year

Supports multiple "programs" (Med school, residencies, etc)
## 2007/2008 Structure, Function & Development Schedule

### Course Links [edit]
- Gross Anatomy sessions
- Cell Biology sessions

### Labels:
- Exam or Quiz
- Physiology
- Gross Anatomy
- Cell Biology

### Unit #1

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Title</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/25</td>
<td>08:00 AM - 08:30 AM</td>
<td>LH 202</td>
<td>Introduction</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/25</td>
<td>08:30 AM - 10:30 AM</td>
<td>LH 202</td>
<td>Introduction to Anatomical Donations Program and In-Lab Memorial Inc. Intro to Gross Anatomy Lab, Safety and Technology</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/25</td>
<td>10:30 AM - 12:00 PM</td>
<td>LH 202</td>
<td>Layered &amp; Segmented Structure of body; Intro to Nerves &amp; Nerve Classification; Simple Spinal n.</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/25</td>
<td>01:00 PM - 02:00 PM</td>
<td>LH 202</td>
<td>(Embryo) Neuromuscular Development 1</td>
<td>Lillian B. Nanney</td>
</tr>
<tr>
<td>10/25</td>
<td>02:00 PM - 05:00 PM</td>
<td>ILS 10th Floor</td>
<td>G4 Lab: Removal of Skin and Subcutaneous Tissue of Back; Superficial Muscles of the Back and Canal Nerve XI</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/26</td>
<td>08:00 AM - 09:00 AM</td>
<td>LH 202</td>
<td>(Embryo) Neuromuscular Development 2</td>
<td>Lillian B. Nanney</td>
</tr>
<tr>
<td>10/26</td>
<td>09:00 AM - 10:00 AM</td>
<td>LH 202</td>
<td>Tenses of Muscle Action and Movements; freely Moveable Joints</td>
<td>John S. Halle</td>
</tr>
<tr>
<td>10/26</td>
<td>10:00 AM - 12:00 PM</td>
<td>ILS 10th Floor</td>
<td>G4 Lab: Scapular Region</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/29</td>
<td>08:00 AM - 09:00 AM</td>
<td>LH 202</td>
<td>Vertebral Column; Postural Muscles; Spinal Cord and Its Environment</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/29</td>
<td>09:00 AM - 10:00 AM</td>
<td>LH 202</td>
<td>Neuromuscular Phys # 1: Membrane Transport; Fluid Compartments; Osmosis</td>
<td>Al George</td>
</tr>
<tr>
<td>10/29</td>
<td>01:00 PM - 02:00 PM</td>
<td>ILS 10th Floor</td>
<td>G4 Lab: Deep Back (Perform Laminctomy)</td>
<td>Arthur F. Dalley</td>
</tr>
<tr>
<td>10/30</td>
<td>08:00 AM - 09:00 AM</td>
<td>LH 202</td>
<td>Overview of Lymphatic System; Principles of Collateral Circulation</td>
<td>Lillian B. Nanney</td>
</tr>
<tr>
<td>10/30</td>
<td>09:00 AM - 11:00 AM</td>
<td>ILS 10th Floor</td>
<td>G4 Lab: Complete Dissection of Deep Back; Pectoral Region, Including Removal of Skin from Arm (Excluding Female Breast)</td>
<td>Arthur F. Dalley</td>
</tr>
</tbody>
</table>
Faculty upload native formats (e.g., PowerPoint) and KM creates other formats automatically.

Can still view slideshow from HTML view of PowerPoint files.

Objectives

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

Understand what changes in organelles tell you about dynamics of cells

Develop global perspective
- Structure: molecular organization
- Function: how structure relates to function
**Document Processing**

Document uploaded by lecturer, placed in queue

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

Text version placed in queue

Web server

HTML & PDF versions

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

Identified concepts indexed for searching

KM Concept Identifier
Concept vs. Text indexing

• **Text indexing**
  – Examples: Google, Yahoo
  – Indexing by words of document
  – “Hepatolenticular degeneration” ≠ “Wilson’s Disease”

• **Concept indexing – used in NLP systems like KM**
  – Indexing by “concepts”
  – “Hepatolenticular degeneration” = “Wilson’s disease”
  – Recognizes words in document to a controlled vocabulary, such as the Unified Medical Language System (UMLS)
    • “CHF” → C00018802
    • “Congestive Heart Failure” → C00018802
Searching for "CHF"

Definitions for "chf"

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

**Congestive heart failure** [Approx. 261 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).
Search results for “congestive heart failure”
CONGESTIVE HEART FAILURE

Heart failure exists when the heart does not pump blood effectively. This state causes congestion of the tissues, leading to swelling.

It produces the clinical syndrome of dyspnea, peripheral edema, and pulmonary edema. CHF is the pathologic state in which 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 27% 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-- myoccardium 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)
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 16000 to 140000.

B. Clinical presentation: Can present at any time, but often becomes apparent in infancy or shortly after birth.

Can be suspected during prenatal ultrasound, due to the presence of dilated renal collecting systems (ectopy) and solid areas of hepatic tissue secondary to associated oligohydramnios.

Presentation shortly after birth can be due to respiratory distress, 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.
• What about a broad concepts like Geriatrics or Women’s Health?

• What concepts represent Geriatrics and where are they covered in the curriculum?
Broad search for "geriatrics"

1. Deselect Any Incorrect Terms:
   - Geriatrics [Biomedical Occupation or Discipline]
   - Elderly [Temporal Concept]

2. Type Any Additional Terms (one per line):

3. Expand Top 15 Lectures from 2006/2007 Course Year

4. Submit:
   - Expand: See more concepts
   - Finalize: Get Document Matches

Options: Show MeSH Concepts Only
Show semantic types for all concepts
Terms related to “geriatrics”

- Mestranol 0.15 MG
- Autobiographical memory
- Senility
- Care given by nurses
- Senility, without mention of psychosis
- Reminiscence
- 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
- Animal-assisted therapy
Location of 273 terms related to geriatrics submitted at once.
Lecture: Aging and Alzheimer's Disease I

NORMAL AGING vs. 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:

1. Maturational events which occur normally in the nervous system.
Increasing Geriatric Content in Curriculum

- New initiatives: “intersessions” in third year, chronic care course, focused introductions of lectures in core classes, general VUSM focus for Geriatric education
KM Portfolio: Harnessing the Electronic Medical Record (EMR) for Education
One tack – leverage EMR to capture experience

Student types a note in the EMR

Document indexed by patient

Electronic Medical Record

Clinical Portfolio

Document indexed by student

Appropriate mentors emailed

Mentors evaluate and:
1. Give feedback
2. Assign learning objectives

Section tagging Preprocessor

KnowledgeMap Indexer

Database of concepts
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>
A listing of students a faculty member mentors
A mentor and mentee must sign up for each other over an official period of time to cement the authorized teacher-learner relationship to allow teachers access to learner's notes.
A listing of the student’s notes

<table>
<thead>
<tr>
<th>Date of Service</th>
<th>Patient</th>
<th>Note Type</th>
<th>Submit Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Medical Student Brief Operative Note</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Outpatient History and Physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Speech and Language Treatment Plan Report</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>History and physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Procedure Note (Laceration Repair)</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Outpatient History and Physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Procedure Note (Laceration Repair)</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Outpatient History and Physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Procedure Note (Laceration Repair)</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Outpatient History and Physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Procedure Note (Laceration Repair)</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Outpatient History and Physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Procedure Note (Laceration Repair)</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Outpatient History and Physical</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Internal Medicine Clinic Resident Acute Clinic Visit</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Procedure Note (Laceration Repair)</td>
<td></td>
</tr>
<tr>
<td>2007-01-01</td>
<td></td>
<td>Patient Letter</td>
<td></td>
</tr>
</tbody>
</table>
Mentor feedback on a student note

**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**

**MEDICAL STUDENT**

**Admission History and Physical**

**MRN**

**Case#**

**Date of services:**

**Primary Care Physician:**

**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 1983, last CD4 286 per pt.), on TB (received 6 mo treatment w/ 4 meds), chronic back pain who presents with [redacted], and chest pain 2/2 cough. The health until approximately 1.5 wks ago became more incessant, and he started to occur simultaneously with his 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 tylencol 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 pt 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.
RCT evaluation of mentor feedback on student notes

Survey of Residents and Attending physicians

<table>
<thead>
<tr>
<th>Compared with prior rotations:</th>
<th>Electronic</th>
<th>Paper</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I reviewed more notes”</td>
<td>40%</td>
<td>12%</td>
<td>0.014</td>
</tr>
<tr>
<td>“I provided more feedback”</td>
<td>40%</td>
<td>12%</td>
<td>0.010</td>
</tr>
<tr>
<td>“I was more satisfied with feedback given”</td>
<td>33%</td>
<td>10%</td>
<td>0.045</td>
</tr>
</tbody>
</table>

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)

J Gen Int Med. 2008;23(7):979-84
Showing a student’s notes matching core objective “**Rash**”

He discussed these concepts

...in these sections
Medical Student Admission History and Physical

Admission History and Physical

Date of services: 2008
Primary Care Physician: Amy Perry (Bellevue)

Chief Complaint: Asthma attack

History of present illness:

[Redacted] is a 14 month old boy with h/o reactive airway disease who presents with 4 days of rash, 3 days of fever, and new onset wheezing and cold symptoms. Friday evening, mom noticed some spots on the face and belly, and by Saturday morning he had a diffuse macular rash that covered him from head to toe. The rash has been mildly pruritic, has not peeled, and has not involved the palms and soles or the diaper area. He was seen by his PCP and prescribed Acyclovir for the rash and oral lesions. Later on Saturday,
Can track specific diagnoses for students and housestaff and see where it is mentioned in the note.