RESOLVING CLINICIANS ON-LINE INFORMATION NEEDS: A SHORT HISTORY OF BUTTONS

James J. Cimino, M.D.
Biomedical Informatics and Medicine
Columbia University
February 11, 2005
Objectives

• Studying clinician information needs
• Evolution of infobuttons
• Research agenda
• Evaluation
• The Coumadin Story
• Methods for integration
• Infobuttons in the real world
Everybody is worried about losing their job to automation. They’re afraid they’ll be replaced by a button. But I’m smart. I’m going to get a job in the factory where they make the buttons.

Covell et al.
Information Needs
Results of Observational Study

- 47 physicians
- Observed during a half day of typical practice
- Estimated 2-3 questions per physician per day
- 269 questions raised about patient management
- Only 30% were answered during the patient visit
- Usual resource was another physician
Other Observational Studies

The information needs of practicing physicians in northeastern New York State.
Assessment of physicians' information needs in five Texas counties
Information needs of rural health care practitioners in Hawaii.
Knowledge management in clinical practice: a systematic review of information seeking behavior in physicians
Information needs and information-seeking behaviors of on-call radiology residents
Expanding the concept of medical information: an observational study of physicians' information needs
Curbside consultation practices and attitudes among primary care physicians and medical subspecialists
Information needs of health care professionals in an AIDS outpatient clinic as determined by chart review
Methods for assessing information needs of clinicians in ambulatory care.
Real-time information-seeking behavior of residency physicians
Information seeking in primary care: how physicians choose which clinical questions to pursue and which to leave unanswered
Physicians' use of computer software in answering clinical questions.
Residents' medical information needs in clinic: are they being met?
Findings

• Information needs occur often
• They are often unresolved
• Computer-based resources are underused:
  – Lack of knowledge of existence
  – Lack of access
  – Lack of navigational skills
  – Perceived lack of time
Information Needs of CIS Users

• Stereotypical tasks suggest recurrent needs
• System knows:
  – Who the user is
  – Who the patient is
  – What the user is doing
  – What information the user is looking at
• User is sitting at a computer!
Information for Decision-Making
Information for Decision-Making
Information for Decision-Making
Covel et al. Information Needs

UMLS Project
The purpose of the UMLS is to improve the ability of computer programs to “understand” the biomedical meaning in user inquiries and to use this understanding to retrieve and integrate relevant machine-readable information for users.

- Donald A.B. Lindberg 1986/1993
First Attempt: The Medline Button

- CIS (WebCIS’s predecessor) on mainframe
- BRS/Colleague (Medline) on same mainframe
- Get them to talk to each other
- Search using patient diagnoses and procedures
- Kludge required
CIS Physician Main Menu

Select One Function: 4

1. Display Results
2. Display Selected Results
3. Display Demographic Profile
4. Admission and Discharge History
5. Display Sensitive Results

Enter Patient Medical Record Number: 1925809

or

Enter Patient Name (last, first): 

or

Enter Patient Location:

---
Name: WILLIAMS, JOHHNIE   Sex: F   Birthdate: 02/26/920   MRN: 1925609

Admission Record Detail

Admission Date: 01/03/95   Discharge Date: 02/16/95   Location: M6HS
Doctor: CIMINO, JAMES J   Discharge Summary: N
Primary Diagnosis: 410.71 ACUTE MI, SUBENDO INFARC, INITI

Select Terms You Are interested in:

Diseases:

- 410.71 ACUTE MI, SUBENDO INFARC, INITI
- 780.3 CONVULSIONS
- 507.0 FOOD/VOMIT PNEUMONITIS
- 426.0 ATRIOVENT BLOCK COMPLETE
- 415.1 PULMON EMBOLISM/INFARCT
- 453.6 VENOUS THROMBOSIS NEC
- 428.0 CONGESTIVE HEART FAILURE

F8 = for more information
Select a question:

1. Does Myocardial Infarction cause Convulsions?
2. Is Myocardial Infarction caused by Convulsions?
3. Does Myocardial Infarction occur with Convulsions?
(Myocardial Infarction WITH (ET OR SC)) AND (Convulsions WITH CO)
First Attempt: The Medline Button

- CIS (WebCIS’s predecessor) on mainframe
- BRS/Colleague (Medline) on same mainframe
- Get them to talk to each other
- Search using patient diagnoses and procedures
- Kludge required
- Technical success
- Practical failure
Covel et al. Information Needs

UMLS Project

First Version of UMLS

ICD9 → MeSH

Medline Button

Web-based Generic Queries

Mosaic

WebCIS

PubMED

Web-based Generic Queries
One-Stop Information Shopping?

Health Practitioner

World Wide Web (The Hyperdocument)

Information Resources

Bibliographic Database

Textbook

Expert System
One-**Touch** Information Shopping

Health Practitioner

World Wide Web (The Facilitator)

Information Resources

- Bibliographic Database
- Textbook
- Expert System
This search may take some time, please wait....

Connected to Medline Server, please wait.....

Query submitted, please wait...

95 documents might be available.

If you are not satisfied with the search, you may either go back and change the search criteria, or go to HealthGate for free Medline search

39 documents might be available after first filter process. Please wait for further filtering and loading...

Thank you for your patience, search about CARDIOMEGALY will be shown below ...

<1> Mineralocorticoids, salt, hypertension: effects on the heart. [Review] [16 refs]

<2> Congential giant aneurysms of the left atrial appendage: diagnosis and management. [Review] [17 refs]

<3> Lipomatosus hypertrophy of the atrial septum presenting as a right atrial mass.

<4> Heart disease in acromegaly.

<5> Aldosterone and heart failure. [Review] [33 refs]

<6> Neurohormonal modulation in heart failure: ACF inhibition and beyond. [Review] [36 refs]
Pulmonary Pathology

At high magnification, the alveoli in this lung are filled with a smooth to slightly floccular pink material characteristic for pulmonary edema. Note also that the capillaries in the alveolar walls are congested with many red blood cells. Congestion and edema of the lungs is common in patients with heart failure and in areas of inflammation of the lung.
From Data to Findings

Serum Specimen → Serum Cholesterol Test → Abnormalities of Serum Cholesterol → Hypercholesterolemia

Serum Specimen

Serum Cholesterol Test

Abnormalities of Serum Cholesterol

Hypercholesterolemia
<table>
<thead>
<tr>
<th>SUMMARY</th>
<th>NAME</th>
<th>VALUE</th>
<th>RANGE</th>
<th>UNITS</th>
<th>MEDLINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>NA</td>
<td>141</td>
<td>135-146</td>
<td>mM/l</td>
<td>MEDLINE</td>
</tr>
<tr>
<td>2.</td>
<td>K</td>
<td>5.2</td>
<td>3.2-4.6</td>
<td>mM/l</td>
<td>MEDLINE</td>
</tr>
<tr>
<td>3.</td>
<td>CL</td>
<td>109</td>
<td>96-108</td>
<td>mM/l</td>
<td>MEDLINE</td>
</tr>
<tr>
<td>4.</td>
<td>CO2</td>
<td>26</td>
<td>23-29</td>
<td>mM/l</td>
<td>MEDLINE</td>
</tr>
<tr>
<td>5.</td>
<td>BUN</td>
<td>26</td>
<td>6-19</td>
<td>mg/dl</td>
<td>MEDLINE</td>
</tr>
</tbody>
</table>
Below is the list of laboratory tests and findings ALREADY included in DXplain's search request:

- ELDERLY (>65 YRS)
- Hyponatremia
- Creatinine, Elevated
- Serum Total Bilirubin Elevated
- Sgot (Aст), Elevated
- no Hypochloremia
- no Blood Urea Nitrogen Decreased
- no Serum Phosphate Elevated
- no Serum Lactic Acid Dehydrogenase Elevated
- MALE
- Hyperkalemia
- Hypocalcemia
- Serum Conjugated Bilirubin Elevated
- Sgpt (Aлт), Elevated
- no Bicarbonate, Increased
- no Blood Urea Nitrogen Elevated
- no Hypouricemia
- no Serum Creatine Phosphokinase Elevated
- Hyperglycemia
- Hypoalbuminemia
- Alkaline Phosphatase, Elevated
- no Hyperchloremia
- no Bicarbonate, Decreased
- no Serum Phosphate Decreased
- no Hyperuricemia

CHECK OUT the terms you don't want to include in the search.

NOTE - the following labtests were NOT included in the request: CHOLESTEROL

If you wish to add terms to the search - Please type them into the following line (separated by ‘+’ !):

Free-text search string:

abdominal pain + weight loss
To see the text associated with each diagnosis hit the button on the left, when you are done hit [back]

<table>
<thead>
<tr>
<th>Disease Information</th>
<th>Explain Disease</th>
<th>Interp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ALCOHOLISM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. DIABETES MELLITUS, NON-INSULIN DEPENDENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. MAGNESIUM DEFICIENCY SYNDROME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. COLITIS, ULCERATIVE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. NON-KETOTIC HYPERGLOMERULAR COMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. RENAL CELL CARCINOMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. NEPHROTIC SYNDROME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. CHOLECYSTITIS, ACUTE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. ENTERITIS, REGIONAL (CROHN'S DISEASE)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. HEART FAILURE, CONGESTIVE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disease Information</th>
<th>Explain Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. SPRUE, TROPICAL</td>
<td></td>
</tr>
<tr>
<td>12. POLYMYALGIA RHEUMATICA</td>
<td></td>
</tr>
<tr>
<td>13. SCLERODERMA, RENAL DISEASE</td>
<td></td>
</tr>
<tr>
<td>14. HYPOVOLMIC SHOCK</td>
<td></td>
</tr>
<tr>
<td>15. CELIAC DISEASE, ADULT</td>
<td></td>
</tr>
<tr>
<td>16. KIDNEY POLYCYSTIC DISEASE</td>
<td></td>
</tr>
<tr>
<td>17. MALNUTRITION</td>
<td></td>
</tr>
<tr>
<td>18. MYELOMA, MULTIPLE</td>
<td></td>
</tr>
<tr>
<td>19. RECTUM, ADENOCARCINOMA</td>
<td></td>
</tr>
<tr>
<td>20. GLOMERULONEPHRITIS, MEMBRANO PROLIFERATIVE</td>
<td></td>
</tr>
</tbody>
</table>
Micromedex Health-Care Series (HCS)

Search with Trade-name:

- PRILOSEC

Search by drug component:

- Omeprazole

MEDLINE (Last 2 Years)

Omeprazole

- Adverse effects
- Toxicity
- Therapy
OMEPIRAZOLE

- **Common Tradenames** *(See Complete Tradename Listing)*
  - PRILOSEC
- **Class**
  - antiulcer, proton pump inhibitor
- **Dosage, Adult (usual)**
  - gastric/duodenal ulcer 20mg/day for 4-8 weeks
  - hypersecretory conditions 60mg QD, up to 120mg TID
  - H pylori 20mg BID or 40mg QD
- **Dosage, Pediatric, (usual)**
  - limited data; dosage ranges reported: 0.3-3.3mg/kg/day
- **Administration**
  - give before meals
- **How Supplied**
  - 10 MG, 20 MG DELAYED-RELEASE CAPSULE
- **Indications**
  - GERD
  - gastric/duodenal ulcer
  - pathological hypersecretory conditions
  - severe erosive esophagitis
  - adjunct to H pylori disease
- **Contraindications**
  - hypersensitivity to omeprazole products
Micromedex Health-Care Series (HCS)

Search with Trade-name:
  - PRILose

Search by drug component:
  - Omeprazole

MEDLINE (Last 2 Years)

Omeprazole
  - Adverse effects
  - Toxicity
  - Therapy
(past 2 Years only)

Details: Omeprazole[MeSH Terms] AND adverse effect

Docs Per Page: 20  Entrez Date limit: No Limit

Citations 1-20 displayed (out of 174 found), page 1 of 9

Display: Abstract report for the articles selected (default all).
Order: documents on this page through Loansome Doc

- Jacobson SH, et al. [See Related Articles]
  Losec was probably the cause of interstitial nephritis.
  PMID: 10222687; UI: 99239193.

- Freeman HJ. [See Related Articles]
  Therapy for ulcers and erosions associated with nonsteroidal anti-inflammatory drugs.
  PMID: 10206732; UI: 99217414.
Infobutton Use vs. Other Resources

• Six months of log files

• 38,763 health resources
  – 14,036 anonymous health resources
  – 19,913 health resources from WebCIS
  – 4,814 infobuttons

• 2,607 users
  – 51% resident physicians
  – 34% attending physicians
  – 5% nurses
  – 10% other (pharmacists, administrators, etc.)
Information Use Contexts

- Laboratory: 51%
- Radiology: 9%
- Clinic Notes: 7%
- Pathology: 3%
- Visit Lists: 2%
- Pharmacy: 2%
- Discharge Summary: 2%
- Other: 24%
Information Resource Usage

12% IBs

- Micromedex
- Pharmacy IB
- Sensitivity IB
- Culture IB
- Ovid Medline
- Online Formulary
- Ov id Medline
- Harrison's
- PubMed
- Journals
- MedlinePlus
- ICD9-CM
- Other Resources
What resources do they like?
Education at the Moment of Need
Education at the Moment of Need

1. Understand Information Needs
Education at the Moment of Need

1. Understand Information Needs
2. Get Information From EMR

MRSA
Education at the Moment of Need

1. Understand Information Needs
2. Get Information From EMR
3. Resource Selection

MRSA
Education at the Moment of Need

1. Understand Information Needs
2. Get Information From EMR
3. Resource Selection
4. Resource Terminology
Education at the Moment of Need

1. Understand Information Needs
2. Get Information From EMR
3. Resource Selection
4. Resource Terminology
5. Automated Translation
Education at the Moment of Need

1. Understand Information Needs
2. Get Information From EMR
3. Resource Selection
4. Resource Terminology
5. Automated Translation
6. Querying

MRSA
Education at the Moment of Need

1. Understand Information Needs
2. Get Information From EMR
3. Resource Selection
4. Resource Terminology
5. Automated Translation
6. Querying
7. Presentation

MRSA
Research Issues

• What are the information needs?
What are the Information Needs?

- Observations:
  - Four days, three sites, 159 minutes of videotape
  - 154 information needs
- 1/3 information about the patient
  - Abdominal CT was abnormal, what are LFTs?
- 1/3 institutional information
  - What specimen do I collect for this test?
- 1/3 health information
  - What does this pill look like?
  - What are the patient instructions?
- Computers used 50% of the time
- 81/154 needs not satisfied
Research Issues

• What are the information needs?
• Which context information is important?
Context-Dependent Information Needs

Context

Age, Sex, Role, Training, Task, Data, Institution
Research Issues

- What are the information needs?
- Which context information is important?
- What resources can satisfy needs?
- How can retrieval be automated?
  - What context data are used?
  - How are the data translated?
The Medical Entities Dictionary (MED)
Research Issues

- What are the information needs?
- Which context information is important?
- What resources can satisfy needs?
- How can retrieval be automated?
  - What context data are used?
  - How are the data translated?
  - How are the data transmitted?
Infobuttons vs. Infobutton Manager

Clinical System

Infobutton

Context

Infobutton Manager

Page of Hyperlinks

Resources
Heuristic Evaluation

- Expert evaluation
- Used to identify potential problems
- Principled system analysis
- Problems ranked by severity
- Evaluation with limited heuristic set
- Paper-based evaluation
# Evaluation Methodology

<table>
<thead>
<tr>
<th>Heuristic</th>
<th>Reviewer 1</th>
<th>Reviewer 2</th>
<th>Reviewer 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consistency</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Visibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Match</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4. Minimalist</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. Memory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6. Feedback</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Flexibility and Efficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Error Message</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Prevent Errors</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>10. Closure</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>11. Reversible Actions</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>12. Language</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>13. Control</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>14. Document</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
## Definitions

<table>
<thead>
<tr>
<th>Heuristic</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistency</td>
<td>The users should not have to wonder whether different words, situations or actions mean the same thing</td>
</tr>
<tr>
<td>Match</td>
<td>The image of the system perceived by the users should match the model the users have about the system</td>
</tr>
<tr>
<td>Minimalist</td>
<td>This involves judging whether any extraneous information is a distraction and a slow-down</td>
</tr>
<tr>
<td>Memory</td>
<td>Users should not have to memorize a lot of information to carry out tasks.</td>
</tr>
<tr>
<td>Language</td>
<td>The language should be presented in a form, easily understandable by the intended user.</td>
</tr>
</tbody>
</table>
Paper-based Evaluation

• Evaluators given narrative of a scenario
• Screen shots of scenario included
• Heuristics applied to screen shots
Results

- 18 screen shots
- 4 evaluators
  - clinical
  - sociology
- 108 comments on design and layout
Heuristics:
- Match
- Minimalist
<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>135</td>
<td>136-146</td>
<td>mEq/L</td>
</tr>
<tr>
<td>K</td>
<td>3.9</td>
<td>3.6-5.0</td>
<td>mEq/L</td>
</tr>
<tr>
<td>Cl</td>
<td>105</td>
<td>102-109</td>
<td>mEq/L</td>
</tr>
<tr>
<td>Co2</td>
<td>19</td>
<td>25-33</td>
<td>mEq/L</td>
</tr>
<tr>
<td>BUN</td>
<td>18</td>
<td>7-20</td>
<td>mg/dL</td>
</tr>
<tr>
<td>Glucose</td>
<td>110</td>
<td>70-105</td>
<td>mg/dL</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.1</td>
<td>0.5-0.9</td>
<td>mg/dL</td>
</tr>
<tr>
<td>Calcium</td>
<td>8.4</td>
<td>8.4-9.8</td>
<td>mg/dL</td>
</tr>
</tbody>
</table>

Status: Final, Accno: S59157BMET 025P
Heuristics:
- Consistency
- Language
- Match
- Minimalist
Questions of Interest
From the Columbia University Infobutton Manager®

Concept of interest: FSH
Preferred Name for Searching: FOLLITROPIN
Date of Patent Data: 2002-05-25 03:52

Frequently Asked Questions:
What does the CPMC Lab Manual say about this test?
How does the CPMC Lab Manual say I should collect a specimen for this test?

Other Common Questions:
What is the differential diagnosis of abnormalities of FOLLITROPIN?

Search Other Resources:
Lab Tests Online
UpToDate
Harrisons Principles of Internal Medicine
PubMed
National Guidelines Clearinghouse

Sponsored by:
The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine

Send comments to: James I. Cimino, MD
Questions of Interest

From the Columbia University Infobutton Manager

Concept of Interest: DIGOXIN
Date of Patient Data: 2002-05-25 03:52

Frequently Asked Questions:
- What does the CPMC Lab Manual say about this test?
- What is its toxicity?
- How does the CPMC Lab Manual say I should collect a specimen for this test?
- What are the adverse reactions according to Micromedex?

Other Common Questions:
- What is the differential diagnosis when it is abnormal?

Search Other Resources:
- Lab Tests Online
- UpToDate
- Harrison's Principles of Internal Medicine
- Micromedex
- PubMed
- National Guidelines Clearinghouse

Sponsored by:
The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine

Send comments to: James J. Cinino, MD
Pharmacy  · (2001-09-21 to 2000-12-02) · Newer · Older

<table>
<thead>
<tr>
<th>Ordered on</th>
<th>Order</th>
<th>Dose</th>
<th>Freq</th>
<th>Route</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001-09-21 09:27</td>
<td>ERYTHROPOIETIN IN/40000 U/ML CT</td>
<td>40000 U</td>
<td>TODAY</td>
<td>SC</td>
<td>DC</td>
</tr>
<tr>
<td>2001-09-21 09:27</td>
<td>ERYTHROPOIETIN IN/40000 U/ML CT</td>
<td>40000 U</td>
<td>TODAY</td>
<td>SC</td>
<td>DC</td>
</tr>
<tr>
<td>2001-09-21 09:26</td>
<td>POTASSIUM CL IV/PR-PMIX 10 MEC/100ML</td>
<td>10 MEQ</td>
<td>IDOSE</td>
<td>IV</td>
<td>DC</td>
</tr>
<tr>
<td>2001-05-22 22:03</td>
<td>CAPTOPRIL TAB 12.5 MG</td>
<td>6.25 MG</td>
<td>IDOSE</td>
<td>ORAL</td>
<td>DC</td>
</tr>
<tr>
<td>2000-12-02 15:00</td>
<td>COLDYTE SOLN 4000 ML</td>
<td>1 EA</td>
<td>5XDAY</td>
<td>ORAL</td>
<td>DC</td>
</tr>
<tr>
<td>2000-12-02 15:00</td>
<td>COLDYTE SOLN 4000 ML</td>
<td>1 EA</td>
<td>5XDAY</td>
<td>ORAL</td>
<td>DC</td>
</tr>
</tbody>
</table>
Questions of Interest
From the Columbia University Infobutton Manager

Concept of Interest: CAPTOPRIL TAB 12.5 MG
Preferred Name for Searching: Captopril
Date of Patient Data: 2001-05-22-22.03

Frequently Asked Questions:

- What is the patient information from Lexi-Comp?
- What is the Spanish patient information from Lexi-Comp?
- What does it look like? (from Lexi-Comp)
- What are the forms and strengths according to Micromedex?
- What is the dosing and administration information from Micromedex?
- How do I treat overdosage according to Micromedex?
- What does this drug interact with according to Micromedex?
- What are the contraindications according to Micromedex?
- What are the adverse reactions according to Micromedex?

Other Common Questions:

- What does RxList say?

Search Other Resources:

- UpToDate
- Harrison's Principles of Internal Medicine

Marcas estadounidenses: Capoten®
Marcas canadienses: Apo-Captopril, Capoten®trade;
Marcas mexicanas: Caprila®, Capoten®, Capoten®
Captopira, Cardipril®, Captopril®, Ecapresan, Ecaten®, Lenpryl®,
Precapril, Rompir®

Categoría terapéutica: Inhibidor de la enzima conversora de la angiotensina (ECA)

¿Qué advertencias debo tener en cuenta antes de tomar este medicamento?

- No tome este medicamento si está embarazada. El consumo de este medicamento durante el segundo y tercer trimestre puede causar defectos de nacimiento. Si queda embarazada mientras está tomando este medicamento...
Diagnostic Ultrasound of Kidney 1999-11-8 9:6

**Document Number**: TX

**Examination Type**: RENAL

**Clinical Information**: CHECK KIDNEY

**Impression**

1. No evidence of **hydronephrosis**. If vascular **occlusion** is a clinical concern further evaluation with **angiography** or MRA is recommended.

A limited renal **ultrasound** was performed. There are no prior ultrasounds available for comparison.

The right kidney measures 13 cm. The left kidney measures 13 cm. There is no evidence of a focal renal **mass**, **calculi**, or **hydronephrosis**.

Arterial flow is identified within both renal arteries. There was pulsatility of flow within both renal veins, possibly due to **cardiac disease**. If the clinical suspicion is **occlusion** of the renal arteries or renal veins, further evaluation with digital **angiography** or MRA is recommended.

The bladder is collapsed. The prostate measures 4.5 cm x 2.7 cm x 3.4 cm.
Questions of Interest
From the Columbia University Infobutton Manager

Concept of Interest: **hydronephrosis**

Frequently Asked Questions:
- OneLook (definition)
- Merriam-Webster (definition)
- Cancerweb (definition)
- Medicine on the Net (definition)

Search Other Resources:
- UpToDate
- Harrison's Principles of Internal Medicine
- PubMed
- National Guideline Clearinghouse

Sponsored by:
The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine

*Send comments to James J. Cimino, MD*
The Coumadin Story

• Chair of Medicine wants link to Coumadin protocol
• First, I have to find the guidelines
Found: 31 match(es)

1. Discharge review questions 4 Central

Updated 29-Mar-2004
on:
Location: Infonet Home / Patient Education / Cardiology & Cardiothoracic (CUMC &

2. Approved Resource List

Updated 04-Mar-2004
on:
Location: Infonet Home / Patient Education

3. Biopsy/excisional biopsy in ambulatory care

Updated 02-Mar-2004
on:
Location: Infonet Home / Patient Education / Health Matters: Fact Sheets / B

4. Axillary lymph node surgery (CUMC)

Updated 02-Mar-2004
on:
Location: Infonet Home / Patient Education / Health Matters: Fact Sheets / A

5. Secondary prevention for heart disease
The Coumadin Story

- Chair of Medicine wants link to Coumadin protocol
- First, I have to find the guidelines
- Then I have to add the question to the IM table
<table>
<thead>
<tr>
<th>URL</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.ndist.com/cgi/ndist.cgi?drug=%3E">http://www.ndist.com/cgi/ndist.cgi?drug=&gt;</a></td>
<td>What does FoList say?</td>
</tr>
<tr>
<td><a href="http://www.ntsid.com/application/vocab.asp?search=%3E&amp;submit=Go">http://www.ntsid.com/application/vocab.asp?search=&gt;&amp;submit=Go</a></td>
<td>UpToDate</td>
</tr>
<tr>
<td>harrisons.cgi?search_name=&gt;</td>
<td>Harrison's Principles of Internal Medicine</td>
</tr>
<tr>
<td><a href="http://infonet.nyp.org/Pharmacy/Forms/Medication/INR-policy-final-adult.pdf">http://infonet.nyp.org/Pharmacy/Forms/Medication/INR-policy-final-adult.pdf</a></td>
<td>What is the NYPH guideline for managing adult patients with elevated INR due to warfarin?</td>
</tr>
<tr>
<td><a href="http://infonet.nyp.org/Pharmacy/Forms/Medication/INR-policy-pediatric.pdf">http://infonet.nyp.org/Pharmacy/Forms/Medication/INR-policy-pediatric.pdf</a></td>
<td>What is the NYPH guideline for managing pediatric patients with elevated INR due to warfarin?</td>
</tr>
<tr>
<td><a href="http://infonet.nyp.org/Pharmacy/Pharmacy-M/HeparinGuidelinesWeb.pdf">http://infonet.nyp.org/Pharmacy/Pharmacy-M/HeparinGuidelinesWeb.pdf</a></td>
<td>What is the NYPH guideline for prescribing intravenous unfractionated heparin in adults?</td>
</tr>
<tr>
<td><a href="http://infonet.nyp.org/Pharmacy/Pharmacy-M/Pediatrics/PEDguideFinal4WEB.pdf">http://infonet.nyp.org/Pharmacy/Pharmacy-M/Pediatrics/PEDguideFinal4WEB.pdf</a></td>
<td>What is the NYPH guideline for prescribing intravenous unfractionated heparin in pediatric patients?</td>
</tr>
<tr>
<td>micromedex_onah.cgi?search_name=&gt;&amp;anchor=FDRSUP01&amp;topic=What+are+the+forms+and+strengths+of</td>
<td>What are the forms and strengths according to Micromedex?</td>
</tr>
</tbody>
</table>
The Coumadin Story

- Chair of Medicine wants link to Coumadin protocol
- First, I have to find the guidelines
- Then I have to add the question to the IM table
- Finally, I link the question to the context
<table>
<thead>
<tr>
<th>LabDetail,LabSummary</th>
<th>MD,Others</th>
<th>Y,M,E</th>
<th>M,F</th>
<th>32863</th>
<th>INTERNATIONAL NORMALIZED RATIO (INR) CALCULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>InPatientDrugs,OutPatientDrugs,OutPatDrugOrd</td>
<td>MD,Others</td>
<td>Y,M,E</td>
<td>M,F</td>
<td>31433</td>
<td>WARFARIN PREPARATION:</td>
</tr>
<tr>
<td>LabDetail,LabSummary</td>
<td>MD,Others</td>
<td>Y,M,E</td>
<td>M,F</td>
<td>32163</td>
<td>PLASMA PROTHROMBIN TESTS</td>
</tr>
<tr>
<td>LabDetail,LabSummary</td>
<td>MD,Others</td>
<td>Y,M,E</td>
<td>M,F</td>
<td>32863</td>
<td>INTERNATIONAL NORMALIZED RATIO (INR) CALCULATION</td>
</tr>
<tr>
<td>LabDetail,LabSummary</td>
<td>MD,Others</td>
<td>I,C,A,N</td>
<td>M,F</td>
<td>32163</td>
<td>PLASMA PROTHROMBIN TESTS</td>
</tr>
<tr>
<td>InPatientDrugs,OutPatientDrugs,OutPatDrugOrd</td>
<td>MD,Others</td>
<td>I,C,A,N</td>
<td>M,F</td>
<td>31433</td>
<td>WARFARIN PREPARATION:</td>
</tr>
<tr>
<td>LabDetail,LabSummary</td>
<td>MD,Others</td>
<td>Y,M,E</td>
<td>M,F</td>
<td>32162</td>
<td>PLASMA THROMBOPLA</td>
</tr>
<tr>
<td>InPatientDrugs,OutPatientDrugs,OutPatDrugOrd</td>
<td>MD,Others</td>
<td>Y,M,E</td>
<td>M,F</td>
<td>31386</td>
<td>HEPARIN</td>
</tr>
</tbody>
</table>
The Coumadin Story

• Chair of Medicine wants link to Coumadin protocol
• First, I have to find the guidelines
• Then I have to add the question to the IM table
• Finally, I link the question to the context
• Voilá!
### Laboratory

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
<th>Time</th>
<th>Result</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROTHROMBIN</td>
<td>1999-03-01</td>
<td>06:14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CULTURE &amp; SMEAR SITE</td>
<td>1999-01-25</td>
<td>18:24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABC</td>
<td>1999-01-25</td>
<td>17:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 7 PROFILE</td>
<td>1999-01-25</td>
<td>07:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT/INR STAT LAB</td>
<td>1999-01-16</td>
<td>17:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MISCELLANEOUS CHEMISTRY DISPLAY</td>
<td>1999-12-31</td>
<td>09:15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELECTROLYTES, SERUM</td>
<td>1999-12-31</td>
<td>09:15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABC</td>
<td>1999-12-31</td>
<td>09:15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEPATIC FUNC PANEL</td>
<td>1999-12-31</td>
<td>09:15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESTRODIOL</td>
<td>1999-12-31</td>
<td>09:15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### PT/INR STAT LAB 1999-01-16 17:00

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROTHROMBIN</td>
<td>12.9</td>
<td>10.8-13.6</td>
<td>sec</td>
</tr>
<tr>
<td>INR</td>
<td>1.17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Status: Final, Acone: M35016SLFT 990T
Questions of Interest
From the Columbia University Infobutton Manager

Concept of Interest: PROTHROMBIN
Preferred Name for Searching: COAGULATION TISSUE FACTOR INDUCED.INR
Date of Patient Data: 1999-01-16 17:00

Frequently Asked Questions:
- What is the NYPH guideline for managing adult patients with elevated INR, due to warfarin?
- What does the CPMC Lab Manual say about this test?
- How does the CPMC Lab Manual say I should collect a specimen for this test?

Other Common Questions:
- What is the differential diagnosis when it is abnormal?

Search Other Resources
- Lab Tests Online
- UpToDate
- Harrisons Principles of Internal Medicine
- PubMed
- National Guidelines Clearinghouse

Sponsored by:
<table>
<thead>
<tr>
<th>INR value</th>
<th>Clinical Presentation</th>
<th>Recommended Intervention(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INR &gt; 3 but ≤ 5</td>
<td>Low bleeding risk based on INR value (assuming target INR is 2-3*)</td>
<td>INR 3.1-3.9 Day 1: subtract 5-10% of total weekly dose (TWD) Weekly: reduce TWD by 5-10% Re-Check INR in 72 hours**</td>
</tr>
<tr>
<td>INR &gt; 5 but ≤ 9</td>
<td>At risk for bleeding based on elevated INR value (No additional risk for bleeding based on Appendix A)</td>
<td>INR 4.0-5.0 Day 1: no warfarin Weekly: reduce TWD by 10-20% Re-check INR in 72 hours** Hold warfarin*** Monitor INR daily until it reaches upper limit of the therapeutic range* Weekly: reduce TWD by 20-50% Re-check INR in 72 hours***</td>
</tr>
<tr>
<td>INR &gt; 9</td>
<td>No significant bleeding At risk for bleeding based on elevated INR value (No additional risk for bleeding based on Appendix A)</td>
<td>Hold warfarin*** Give vitamin K 0.5 mg IV or approximately 1 mg PO (one quarter of a commercially available 5 mg tablet)** Admit the patient to the hospital Monitor INR frequently over the next 24-48 hrs (at least daily) until it reaches the upper limit of the therapeutic range* Re-institute warfarin after decreasing the TWD by 20-50% Re-check INR daily until re-stabilized, then weekly</td>
</tr>
<tr>
<td>INR &gt; 5</td>
<td>Significant risk for bleeding At risk for bleeding based on elevated INR value And At risk for bleeding based on characteristics outlined in Appendix A</td>
<td>Hold warfarin Give vitamin K 0.5 mg IV or approximately 1 mg PO (one quarter of a commercially available 5 mg tablet)** Monitor INR frequently over the next 24-48 hrs (at least daily) until it reaches the upper limit of the therapeutic range* Re-institute warfarin after decreasing the TWD by 20-50% Re-check INR daily until re-stabilized, then weekly</td>
</tr>
<tr>
<td>INR &gt; 3*</td>
<td>Bleeding</td>
<td>Hold warfarin Give vitamin K by IV infusion ADDITIONAL DOSE: 1-5 mg Give FFP</td>
</tr>
</tbody>
</table>

*Values reflect the target range for INR.**INR values above this range may require immediate medical intervention.***INR values above this range may require additional medical intervention.
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

- Question has “hardcoded” URL
  e.g.:
  “www.columbia.edu/potassium.pdf”
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

Questions of Interest

From the Columbia University Infobutton Manager

Concept of Interest: K
Preferred Name for Searching: POTASSIUM
Date of Patient Data: 2004-08-19 11:44

Frequently Asked Questions:
- What are the NYPH Guidelines for potassium replacement in adults?
- What does the CPMC Lab Manual say about this test?
- What is its toxicity?
- How does the CPMC Lab Manual say I should collect a specimen for this test?
- What is the anion gap for this (and other related results)?
- What are the adverse reactions according to Micromedex?

Other Common Questions:
- What is the differential diagnosis when it is abnormal?

Search Other Resources:
- Lab Tests Online
- UpToDate
- Harrisons Principles of Internal Medicine
- Micromedex
- PubMed
- National Guidelines Clearinghouse

Sponsored by:
The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine
Adult Potassium Replacement Policy

AVAILABLE PRODUCTS on NYPH FORMULARY

<table>
<thead>
<tr>
<th>Intravenous</th>
<th>Oral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small volume parenterals</td>
<td>Large volume parenterals</td>
</tr>
<tr>
<td>(for intermittent piggyback infusion)</td>
<td>(for continuous maintenance infusion)</td>
</tr>
<tr>
<td>10 mEq in 50 mL Sterile Water for Injection</td>
<td>20 mEq in 0.9% NaCl 1000 mL</td>
</tr>
<tr>
<td>10 mEq in 100 mL Sterile Water for Injection</td>
<td>40 mEq in Dextrose 5%, 1000 mL</td>
</tr>
<tr>
<td>20 mEq in 50 mL Sterile Water for Injection</td>
<td>20 mEq in Dextrose 5% and Sodium Chloride 0.45%, 1000 mL</td>
</tr>
<tr>
<td>20 mEq in 100 mL Sterile Water for Injection</td>
<td>40 mEq in 0.9% NaCl 1000 mL</td>
</tr>
<tr>
<td></td>
<td>40 mEq in Dextrose 5% and Sodium Chloride 0.45%, 1000 mL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mEq/15 mL unit dose</td>
<td>40 mEq/30 mL unit dose</td>
</tr>
<tr>
<td>30 mEq/22.5 mL unit dose</td>
<td>6.7 mEq/5 mL, Sugar Free (bulk bottle)</td>
</tr>
</tbody>
</table>

Tablet, extended release 10 mEq/tablet
Tablet, extended release 20 mEq/tablet

DOSING RECOMMENDATIONS

- Deviations from dosing parameters outlined in this policy MUST be approved by an ICU attending or fellow
- Replacement by oral or enteral route is preferred for non-critical potassium replacement. Use intravenous intermittent piggyback infusion only when rapid correction is necessary or the patient is unable to take oral medication.
- Standing orders of intermittent intravenous infusions on general care areas are not acceptable (eg. KCl 20mEq IV BID)

<table>
<thead>
<tr>
<th>Serum K+</th>
<th>Total Replacement Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 3 mEq/L</td>
<td>40 - 80 mEq</td>
</tr>
<tr>
<td>3.1 - 3.4 mEq/L</td>
<td>40 - 60 mEq</td>
</tr>
<tr>
<td>3.5 - 3.9 mEq/L</td>
<td>20 - 40 mEq</td>
</tr>
<tr>
<td>4 - 4.2 mEq/L cardiac patient</td>
<td>10 mEq</td>
</tr>
</tbody>
</table>

To accomplish an appropriate intermittent piggyback infusion dose utilizing the potassium chloride small volume parenterals available, “runs” are acceptable, providing the order adheres to administration rate and concentration parameters for the unit and IV access respectively. (e.g. KCl 20 mEq/50 ml over 1 hour x3)

- Generally, serum potassium rises 0.1 mEq/L for every 10 mEq of potassium administered.
- Patients taking diuretics should be maintained at a serum potassium ≥ 3.5 mEq/L.
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

- Translate concept of interest to controlled term
- Find controlled term in data dictionary
- Obtain term attribute for constructing URL from data dictionary
- Construct URL, e.g.:
  - www.columbia.edu/lab/<>\'.html
  - www.columbia.edu/lab/cl001900.html
Interactions With On-line Resources

• Simple link
• Concept-based link
• Simple search
• Concept-based search
• Intelligent agent
• Calculator

Questions of Interest

From the Columbia University Infobutton Manager®

Concept of Interest: K
Preferred Name for Searching: POTASSIUM
Date of Patient Data: 2004-08-19 11:44

Frequently Asked Questions:

What are the NYPH Guidelines for potassium replacement in adults?
What does the CPMC Lab Manual say about this test?
What is its toxicity?
How does the CPMC Lab Manual say I should collect a specimen for this test?
What is the antihypertension gap for this (and other related results)?
What are the adverse reactions according to Micromedex?

Other Common Questions:

What is the differential diagnosis when it is abnormal?

Search Other Resources:

Lab Tests Online
UpToDate
Harrisons Principles of Internal Medicine
Micromedex
PubMed
National Guidelines Clearinghouse

Sponsored by:

The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine
Specimen  Blood
Volume  4 mL

Container  Gold top tube or gold top Microtainer™

Collection  Avoid very small needles if possible. Avoid stasis, use of tourniquet, hand-clenching, if possible, and potassium-containing tubes such as potassium oxalate.

Reference Range  Adults: 3.6-5.0 mmol/L

Critical Values  High: >6.0 mmol/L; low: <2.9 mmol/L

Use  Evaluate electrolyte balance; potassium level should be followed especially in elderly patients, those on intravenous hyperalimentation, in patients on diuretic therapy, and in cases of renal disease, particularly renal failure, patients on hemodialysis, and those with interstitial nephritis or nephropathy; evaluate hypertension; potassium should be monitored during treatment of acidosis, including ketoacidosis in diabetes mellitus; evaluate muscular weakness and irritability, mental confusion, weakness; manage leukemia, diseases of gastrointestinal tract, evaluate and prevent cardiac arrhythmias; evaluate alcoholism with delirium tremens; detect, diagnose, and manage mineralocorticoid excess (primary aldosteronism, Cushing's syndrome, tumor with ectopic ACTH production, some cases of congenital adrenal hyperplasia)

Methodology  Ion-selective electrode (ISE)
Interactions With On-line Resources

- Simple link
- Concept-based link
- **Simple search**
- Concept-based search
- Intelligent agent
- Calculator

Insert concept of interest into CGI function call as a parameter

e.g.:

```plaintext
www.Uptodate.com/search.cgi?term=<>
+ POTASSIUM
www.Uptodate.com/search.cgi?term=POTASSIUM
```
Interactions With On-line Resources

• Simple link
• Concept-based link
• Simple search
• Concept-based search
• Intelligent agent
• Calculator

Questions of Interest

From the Columbia University Infobutton Manager

Concept of Interest: K
Preferred Name for Searching: POTASSIUM
Date of Patient Data: 2004-08-19 11:44

Frequently Asked Questions:

- What are the NYPH Guidelines for potassium replacement in adults?
- What does the CPMC Lab Manual say about this test?
- What is its toxicity?
- How does the CPMC Lab Manual say I should collect a specimen for this test?
- What is the anion gap for this (and other related results)?
- What are the adverse reactions according to Micromedex?

Other Common Questions:

- What is the differential diagnosis when it is abnormal?

Search Other Resources:

- Lab Tests Online
- UpToDate
- Harrisons Principles of Internal Medicine
- Micromedex
- PubMed
- National Guidelines Clearinghouse

Sponsored by:

The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine
Prudent diet

INTRODUCTION
The clinical encounter often includes questions from patients about the proper diet. Much of the advice has historically been disease-specific or ephemeral, with little basis in sound research. Early dietary guidelines were based upon clinical deficiencies; these have more recently been extended to include concerns regarding over-nutrition and recommendations to reduce the intake of fat and cholesterol.

An explosion of prospective epidemiologic studies of diet and chronic diseases has facilitated major advances in our understanding of the contribution of diet to the pathogenesis of disease [1]. These studies are complemented by randomized trials and studies of nutrient action in animal models. Building on international correlation studies and retrospective case-control studies, the prospective cohorts offer the potential to evaluate diet-disease relationships using validated measures of diet; they are free from recall bias and allow investigators to correct for measurement error. Advances have been observed in cancer, cardiovascular disease, and a range of other major chronic conditions.

Graham A Colditz, MD, DrPH
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

- Translate concept of interest to controlled term
- Obtain term translation from data dictionary
- Insert translated term into CGI function call as a parameter

  e.g.:
  
  pubmed.gov/search.cgi?term=<>[MeSH+Terms]
  + Potassium
  
  pubmed.gov/search.cgi?term=Potassium[MeSH+Terms]
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

Questions of Interest

From the Columbia University Infobutton Manager®

Concept of Interest: K
Preferred Name for Searching: POTASSIUM
Date of Patient Data: 2004-08-19 11:44

Frequently Asked Questions:
- What are the NYPH Guidelines for potassium replacement in adults?
- What does the CPMC Lab Manual say about this test?
  - What is its toxicity?
- How does the CPMC Lab Manual say I should collect a specimen for this test?
- What is the anion gap for this (and other related results)?
- What are the adverse reactions according to Micromedex?

Other Common Questions:
- What is the differential diagnosis when it is abnormal?

Search Other Resources:
- Lab Tests Online
- UpToDate
- Harrisons Principles of Internal Medicine
- Micromedex
- PubMed
- National Guidelines Clearinghouse

Sponsored by:

The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine


Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

- Resource is not a simple document or search CGI
- Log-on, navigation or other interaction required
- Multiple context parameters used
- Agent:
  - parses context parameters
  - interacts with resource
  - parses results
  - presents summary
  - may modify links
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

Questions of Interest

From the Columbia University Infobutton Manager

Concept of Interest: K
Preferred Name for Searching: POTASSIUM
Date of Patient Data: 2004-08-19 11:44

Frequently Asked Questions:
- What are the NYPH Guidelines for potassium replacement in adults?
- What does the CPMC Lab Manual say about this test?
- What is its toxicity?
- How does the CPMC Lab Manual say I should collect a specimen for this test?
- What is the upper limit for this (and other related results)?
  - What are the adverse reactions according to Micromedex?

Other Common Questions:
- What is the differential diagnosis when it is abnormal?

Search Other Resources:
- Lab Tests Online
- UpToDate
- Harrisons Principles of Internal Medicine
- Micromedex
- PubMed
- National Guidelines Clearinghouse

Sponsored by:
The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine
ADVERSE REACTIONS

One of the most severe adverse effects is hyperkalemia (see CONTRAINDICATIONS, WARNINGS, and OVERDOSAGE). There have also been reports of upper and lower gastrointestinal conditions including obstruction, bleeding (see CONTRAINDICATIONS and WARNINGS).

The most common adverse reactions to oral potassium salts are nausea, vomiting, flatulence, abdominal pain/discomfort, and diarrhea. These symptoms are due to irritation of the gastrointestinal tract and are best managed by taking the dose with meals, or reducing the amount taken at one time.

Skin rash has been reported rarely.

OVERDOSAGE

The administration of oral potassium salts to persons with normal excretory mechanisms for potassium rarely causes serious hyperkalemia. However, if excretory mechanisms are impaired or if intravenous administration is too rapid, potentially fatal hyperkalemia can result (see CONTRAINDICATIONS and WARNINGS). It is important to recognize that hyperkalemia is usually asymptomatic and may be manifested only by an increased serum potassium concentration (6.5-8.0 mEq/L) and characteristic electrocardiographic changes (peaking of T-waves, loss P-waves, depression of S-T segments, and prolongation of QT intervals). Late manifestations include muscle paralysis and cardiovascular collapse from cardiac arrest (9-12 mEq/L).

Treatment measures for hyperkalemia include the following:

1. Elimination of foods and medications containing potassium and of any agents with potassium-sparing properties;
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

- No resource available
- Interaction too complex
- Create self-contained agent:
  - parses context parameters
  - constructs Web page
  - presents results
  - may have Infobuttons of its own
Interactions With On-line Resources

- Simple link
- Concept-based link
- Simple search
- Concept-based search
- Intelligent agent
- Calculator

Questions of Interest

From the Columbia University Infobutton Manager

Concept of Interest: K
Preferred Name for Searching: POTASSIUM
Date of Patient Data: 2004-08-19 11:44

Frequently Asked Questions:
- What are the NYPH Guidelines for potassium replacement in adults?
- What does the CPMC Lab Manual say about this test?
- What is its toxicity?
- How does the CPMC Lab Manual say I should collect a specimen for this test?

- What is the anion gap for this (and other related results)?
- What are the adverse reactions according to Micromedex?

Other Common Questions:
- What is the differential diagnosis when it is abnormal?

Search Other Resources:
- Lab Tests Online
- UpToDate
- Harrisons Principles of Internal Medicine
- Micromedex
- PubMed
- National Guidelines Clearinghouse

Sponsored by:

The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine
Instructions:
To reuse this calculator enter the appropriate values for the electrolytes below.
If the value for potassium is omitted, the calculator will use 4 mmol/l, then display the results.

**Anion Gap Calculator**
Date of Patient Data: 2004-07-29 14:50

<table>
<thead>
<tr>
<th>Electrolyte</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium (Na)</td>
<td>136 mmol/l</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>4.5 mmol/l</td>
</tr>
<tr>
<td>Chloride (Cl)</td>
<td>102 mmol/l</td>
</tr>
<tr>
<td>Bicarbonate (HCO3)</td>
<td>25 mmol/l</td>
</tr>
<tr>
<td><strong>The anion gap is:</strong></td>
<td>13.5 mmol/l</td>
</tr>
<tr>
<td><strong>The normal anion gap is:</strong></td>
<td>16 ± 4 mmol/l</td>
</tr>
</tbody>
</table>

Search [UpToDate](http://www.uptodate.com) for Anion Gap

Sponsored by:
The Department of Biomedical Informatics
Columbia University College of Physicians and Surgeons
A Grant from the National Library of Medicine
Discussion

• Resources are available
• Simple interactions are usually possible
• Interaction method (format) issues:
  – “Give me a page” vs. “Give me the answer”
  – Standards needed for asking questions
  – Standards needed for passing parameters
• Representation (terminology) issues:
  – Clinical systems use homegrown “standards”
  – Resources (except PubMed) don’t use any standards (i.e., they are indexed by text word)
You know it, and we know it – fast access to clinical knowledge is a must when it comes to improving patient care. That’s why InfoButton Access gives physicians, nurses, and pharmacists an amazingly simplified way to get decision support. But beyond being relevant and reliable, InfoButton Access will put what they need to know right in their workflow applications. Talk about maximizing efficiencies!

But there are lots of ways InfoButton Access will optimize patient outcomes...

- **will**... stop clinicians from searching high and low by putting patient- and context-specific information directly into their workflow – with one click.
- **will**... add value to your existing investments by partnering with your CPOE, EMR, and HIS applications and maximize your Micromedex subscriptions.
- **will**... make care consistent across your entire organization by increasing user satisfaction, which means more clinicians using evidence-based resources.
- **will**... set new standards for efficiency by combining two systems into one integrated solution – that’s the power of knowledge applied!

Interested in learning more? **will** tell you more, just [click here](http://www.micromedex.com).

[am available through our partners...](http://www.micromedex.com)
Next Steps

- Repeat the observational study
- Look at system logs to see if:
  - Infobutton use is rising (1000/month in first 8 months)
  - Use of other resources is falling (not yet; 8000/month)
- Order entry Infobuttons
- Collaborations: LDS/IHC, Regenstrief and NYSPI
- Infobutton Manager to be an ANSI standard
Conclusions

• Information needs arise while using CIS
• Infobuttons are easy to build
• Build it and they may not come
• Can retrievals be standardized?
• Will information needs be satisfied?
• Will care improve?
• Resources exist
• Creative solutions required
• Need to engage resource providers
• Infobutton manager provides a platform for exploration
Button.

- Jimmy Cimino, 1956
Acknowledgments

• The Columbia team:
  – Jianhua Li
  – Sue Bakken
  – Vimla Patel
  – Mureen Allen
  – Leanne Currie
  – Mark Graham
• LDS/IHC: Guilherme del Fiol, Stan Huff
• Regenstrief: Marc Overhage
• NYSPI: Tom White
• National Library of Medicine research grant
• National Library of Medicine training grant
• National Institute of Nursing Research

www.dmi.columbia.edu/homepages/ciminoj/Infobuttons.html