The Future is Here:
An Open Architecture Resource
to Support Infobuttons

James J. Cimino
NIH Clinical Center and
National Library of Medicine
Infobuttons

- Context-aware links between systems
- Typically: connection from clinical information system to on-line knowledge source
- The Web lowered many barriers
- HL7 Standard is lowering more
<table>
<thead>
<tr>
<th>Pharmacy</th>
<th>Date</th>
<th>Time</th>
<th>Status</th>
<th>Route</th>
<th>Dose</th>
<th>Drug Strength</th>
<th>Final Concentration</th>
<th>Effective Time</th>
<th>Patient Name</th>
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<td>20.000000 MG</td>
<td>20.000000 MG</td>
<td>1997-04-16</td>
<td>SANDIEGO, CARMEN</td>
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<tr>
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<td>1997-04-17</td>
<td>10:00</td>
<td>C</td>
<td>PO</td>
<td>20.000000 MG</td>
<td>20.000000 MG</td>
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<td>1997-04-16</td>
<td>SANDIEGO, CARMEN</td>
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<td>DEXAMETHASONE 0.5 MG/5 ML ELIX</td>
<td>1996-08-30</td>
<td>00:00</td>
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<td></td>
<td></td>
<td></td>
<td></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
- Statistics
DrugPoints™ System

OMEPRAZOLE

- **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:
- PRILOSEC

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 Search Clear

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.

- Romero-Gomez M. et al. [See Related Articles]
Infobuttons vs. Infobutton Manager

Clinical System

Resources

Query Knowledge Base

Infobutton Manager

Page of Hyperlinks
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
# NEW YORK-PRESBYTERIAN HOSPITAL
## Adult Potassium Replacement Policy

### AVAILABLE PRODUCTS on NYPH FORMULARY

#### Intravenous

<table>
<thead>
<tr>
<th>Small volume parenterals</th>
<th>Large volume parenterals</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mEq/15 mL unit dose</td>
<td>40 mEq/30 mL unit dose</td>
<td>Tablet, extended release 10 mEq/tablet</td>
<td></td>
</tr>
<tr>
<td>30 mEq/22.5 mL unit dose</td>
<td>6.7 mEq/5 mL, Sugar Free (bulk bottle)</td>
<td>Tablet, extended release 20 mEq/tablet</td>
<td></td>
</tr>
</tbody>
</table>

#### 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 (e.g. 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 digitals should be maintained at a serum potassium ≥ 4 mEq/L.
Specimen  Blood

Volume  4 mL

Minimum Volume  1 mL serum

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)
Prudent diet

Graham A Colditz, MD, DrPH

UpToDate performs a continuous review of over 330 journals and other resources. Updates are added as important new information is published. The literature review for version 12.2 is current through April 2004; this topic was last changed on March 18, 2004. The next version of UpToDate (12.3) will be released in October 2004.

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.
Items 1-20 of 1210


ADVERSE REACTIONS

One of the most severe adverse effects is hyperkalemia (see CONTRAINDICATIONS, WARNINGS, and OVERDOSAGE). There also have been reports of upper and lower gastrointestinal conditions including obstruction, bleeding, ulceration, and perforation (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;
“Infobuttons” are context-specific links from one information system (usually a clinical information system such as an electronic health record) to some other resource that provides information that might be relevant to the initial context. Infobuttons are used to anticipate users’ information needs and provide them with easy ways to obtain answers to resolve those needs. For example, a nurse reviewing a patient’s laboratory results may wish to know the implications of a particular result. Click here to learn more about infobuttons.

In many cases, the number of possible information needs may be large, and they might differ, based on the situation. For example, if the laboratory result being reviewed is a potassium test, then the user might want to know the implications of an abnormality, whereas if it is a syphilis test, the user might want to look up the latest treatment guidelines. If, however, the test is a drug level, then questions might arise about the dose and side effects of the drug, while the user might want to know about special contraindications if the patient is of child-bearing age. The information need may even vary depending on the user (e.g., student, nurse, or physician) and the resource used to resolve the need may vary with the user’s setting (ICU, ER, or clinic) and may depend on the specific guidelines or software licenses of the user’s institution.

In order to address these complexities, we have developed an “Infobutton Manager” that can match the user’s contextual information against a knowledge base of information needs in order to propose a select list of topics that may be most likely of interest. Each topic is, in turn, a customized link to a resource, intended to obtain topic-specific information. For example, if a user is reviewing a patient’s prothrombin type (a test of blood coagulation), the Infobutton Manager will provide links to various references about drugs that affect prothrombin time (such as warfarin sodium). If the patient is an adolescent or adult female, some of the links will be specifically related to pregnancy and breastfeeding recommendations. If the patient is a patient at New York Presbyterian Hospital, a link will be provided to the relevant age-specific hospital guidelines for the use of warfarin sodium. More information about the Infobutton Manager is available here; information about the HL7 standard for infobutton managers is available here.

The Columbia University Infobutton Manager is available here. The page behind the Infobutton Manager and the basic anatomy of a clinical information system is here. Learn more about the technology behind the Infobutton looks and acts like in a more realistic. The Infobutton Manager page that you get is real. Sponsored by: The Department of Biomedical Informatics, Columbia University College of Physicians and Surgeons, The National Library of Medicine, The NIH Clinical Center.

In order to help those interested in customizing the Infobutton Manager for their own use, we are developing a Librarian Infobutton Tailoring Environment (LITE). We are building LITE with the help of a community of volunteers who are potential future LITE users (for example, medical librarians). If you are interested in learning more about LITE and how you can participate, click here.
Open Infobutton

- HL7-compliant Infobutton Manager
- Supports access to HL7 and non-HL7 resources
- Housed at University of Utah (Guilerhme Del Fiol)
- Free for use
Infobuttons for CPRS

395 days since End of FY10

Recent site activity
OpenInfobutton demo edited by Guilherme Del Fiol
The Team edited by Guilherme Del Fiol
Tools and technologies edited by Guilherme Del Fiol
Files

Project updates
OpenInfobutton at the AMIA Summit 2011
The OpenInfobutton project will be presented at the AMIA CRI Summit 2011 on March 11th. The presentation will be part of a panel entitled "Meaningful Use and Personalized Patient Education"
Posted Mar 1, 2011 2:22 PM by Guilherme Del Fiol

OpenInfobutton demo
A live demonstration of OpenInfobutton using a mock-up EHR is now available.
Posted Oct 26, 2011 5:06 PM by Guilherme Del Fiol

Known issues to address
- Adding some form of discussion / forum capability (maybe - core team will decide)
- Fleshing out "The Team" page with developer information
- Features apparently not available on Google Sites (per the "vote for it" page) in rough order of importance to this project
  - Viewer subscription to updates
  - Page level permissions
  - RSS feed
Institution Customization Tasks

- **Institution**
- **Patient (with age and gender)**
- **User (Physician, Nurse, etc.)**
- **Clinical Application with Infobutton Link**

**Page of Links**

**Infobutton Manager**

**The Librarian Infobutton Tailoring Environment (LITE)**

**Institutional Librarian (or other LITE users)**

**Infobutton Manager Knowledge Base**
Librarian Infobutton Tailoring Environment

• Co-developed by NLM and U of Utah

• Infobutton Manager knowledge engineering tool

• Librarian-friendly user interface
  – Define resources
  – Select resources for specific user contexts

• “Publishes” to Open Infobutton

• Currently in development, beta release Q1 2012
Welcome to the LITE (Librarian Infobutton Tailoring Environment) website

LITE is a tool that will help you manage the way that the Infobutton Manager provides information resource links to clinical systems users at your institution. Users at your institution can access the Infobutton Manager through links called infobuttons that are inserted into their clinical information systems, such as electronic medical records. When a user clicks on an infobutton, information (such the application the users is using, the type of user, and the patient age and gender) is passed to the Infobutton Manager. The Infobutton Manager uses this information to provide the user with a list of links to relevant online health information resources, such as textbooks and knowledge bases. The diagram below shows how all the pieces fit together.
Clinical Data Capture and Infobuttons

- Clinical data determine context of information need
- Controlled terms may need transformation for information needs
- Clinical data used to seed retrieval process
- Controlled terms may need translation for resources
Other Translations for Infobuttons

- Gentamicin Sensitivity Test
- Gentamicin Level
- Injectable Gentamicin
- Gentamicin Toxicity
- Expert System
- Decision Rule
- Clinical Data
  - Substance Measured
  - Measures Sensitivity
  - Has ingredient
  - Etiology
  - Drug Information
Pushing the Envelope

Health Record

Universally Coded
Discharge Diagnoses

Locally Coded
Medication Lists

Uncoded Structured
Radiology Reports

Physical Exams
Discharge Summaries

Uncoded Unstructured
Patient Histories
Pushing the Envelope

Health Record

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- Discharge Diagnoses
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Locally Coded
- Structured

Uncoded
- Structured

Uncoded Unstructured
Pushing the Envelope

Health Record

- Universally Coded
  - Discharge Diagnoses
  - Medication Lists
  - Radiology Reports
- Locally Coded
  - Physical Exams
- Uncoded Structured
  - Discharge Summaries
- Uncoded Unstructured
  - Patient Histories
Conclusions

• Decision support is more than alerts and reminders
• Infobuttons require actionable clinical data
• Infrastructure is near to allow everyone to play
• Free!
• Infobuttons = Meaningful Use
The Info-Button Standard: Bringing Meaningful Use to the Patient

By DON KEMPER

Regardless of the U.S. administration’s "meaningful use" requirements, if health information technology (HIT) is to become meaningful for patients, it must include the prescription of information and tools to help each patient better manage his or her own care.

Ask patients what they want from HIT systems, and they will tell you three things:

- "Tell me my diagnosis, what will happen, and what I can do myself to better manage the problem."

- "Tell me my medical tests results and what they mean to me."

- "Tell me my treatment options, and help me participate in the treatment decisions."

The soon-to-be-finalized HL7 International Context-Aware Information Retrieval standard (nicknamed the HL7 "Infobutton" standard) makes it far easier for providers of electronic health records (EHRs) and personal health records (PHRs) to deliver just what the patient wants and needs.
Patients Avail Meaningful Use Employing Infobutton

The benefits of Meaningful Use are now available for the patients with the help of HL7’s International Context-aware Knowledge Retrieval Standard.

"Now there is an easier way to help doctors keep their patients fully informed and engaged and extend the benefits of 'meaningful use' under the Recovery and Reinvestment Act," says Don Kemper, Healthwise CEO and co-author of the new paper "Getting Patients to Be More Involved in Information Prescriptions".

The soon-to-be-finalized Health Level 7 (HL7) International Context-aware Knowledge Retrieval Standard (nicknamed the "Infobutton") extends the retrieval of electronic health records (EHRs) and personal health records (PHRs) to deliver the information therapy the patient needs to actively manage his or her health issues.

The HL7 "Infobutton" standard was first developed primarily to deliver contextually relevant decision-support information for providers to be used to request and prescribe the information the patient needs to actively manage his or her health issues.
HL7 Infobutton Standard

Healthwise is a leader in developing the HL7 Infobutton standard. That's the nickname for the Health Level 7 International Context-Aware Knowledge Retrieval standard. This standard has already been adopted and implemented for clinical decision support, and Healthwise pioneered efforts to enable you to use it to meet meaningful-use requirements. Widely adopted since 2007, the Infobutton lets you use the EHR (electronic health record) to deliver a set of standardized information about the patient, the provider, and what happens during a specific care encounter or moment in care. An EHR application can then pull from that set the appropriate information for that particular use case.

For the patient

This same HL7 standard can also be used to trigger relevant, helpful patient education orders—"information prescriptions"—for the patient. The request for information is triggered by information from a clinical encounter. This can happen with the click of a button, or it can be automatically triggered when needed.
Getting Patients to Meaningful Use
Using the HL7 Infobutton Standard for Information Prescriptions

Donald W. Kemper, MPH
Healthwise CEO
Final Meaningful Use Rules Provides Boost to Publishers

THURSDAY, JULY 22, 2010 AT 6:27PM

The rule only requires that >10% of patients receive patient-specific education resources. Still, it is a start and will provide encouragement to more healthcare publishers to invest in creating high quality timely information for patients that can be incorporated into EHRs.

Already, clinical information publishers including EBSCO, Thomson Reuters Healthcare, Elsevier and Wolters Kluwer are in various stages of customizing patient education information for use within electronic records via [Infobuttons][ii] The
GETTING PATIENTS TO MEANINGFUL USE USING THE HL7 “INFobutton” STANDARD FOR INFORMATION PRESCRIPTIONS

Imagine—anytime you have a health care question, face a treatment decision, or need to learn a new self-management skill, all of the tools you need are presented before you in a tailored, personalized, and easy-to-use way. With help from the HL7 “Infobutton standard,” patients should expect no less from each and every health care encounter. And with that same help, physicians can expect to more actively engage patients in their care without derailing clinic workflow. The result will revolutionize the effectiveness of patients taking an active role in their own care.

Report
Don Kemper et al, Healthwise, 25 January 2010

Leave a Reply

Name (required)

Mail (will not be published) (required)

Website
PNC/MLA 2011 Program and Speaker Information

July 15th, 2011

Author: Susan J. Barnes

Have you been thinking, “Gee, Boise sounds great, but what’s going to happen at the actual meeting on October 17 and 18?”

Well, now you can look at the preliminary program and also read about the speakers who will be sharing their knowledge with us about:

- How baby boomers and librarians can help save health care
- Whether smartphones and tablets are the best gadgets yet
- Boise and its colorful characters
- New models of innovation in our health care environment

...and that doesn’t even include the great talks and posters from our own members! Remember, we want you to share your knowledge, too! Proposals are due August 1 for Papers/Presentations, Posters, and STAT Talks.

The preliminary program also lists the great lineup of CE classes that will take place on Saturday and Sunday, October 15-16:

- Clinical Application of Evidence-Based Practice
- Behind Closed Doors: Politics in the Library
- Meaningful Use of Health Information Technology: Overview and Opportunities for Librarians
- Valuing Your Library
- Decision Support, Infobuttons and Beyond: Deeply Integrating Library Services into New Information Systems and Clinician Workflows

Matching the Program and Your Personal Interests: Make the Most of the PNC/MLA Conference
A Game-Changing Standard: The Infobutton

By Amy Eckenroth

U.S. Department of Health & Human Services
Don Kemper, MPH
Healthwise CEO

CMS in its wisdom recently over-ruled the HIT Policy Committee’s recommendation to include "patient-specific education resources" as a "meaningful use" provision. Its reason for exclusion: "...there is currently a paucity of knowledge resources that are integrated within EHRs, that are widely available, and that meet these criteria, particularly in multiple languages."

The rising use of the Health Level 7 (HL7) “Infobutton” to easily integrate patient-specific education resources into EHRs is sufficient for CMS to reconsider the exclusion.