



New Dimensions for Handheld Devices

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SOL Preworkshop — 24 June 2003



Proposed Outline

- Settle in, introductions, surface individual objectives
- Who we are at IHI
- Preworkshop paradigm: design choice
 - De-stress productionizing handhelds
 - Stress concepts, trends
- Survey of current utilities & markets
- Key trends in 2003-2005



Proposed Outline (cont'd)

- Key (and interwoven) trends
 - [BREAK]
 - Evidence based medicine
 - The networked handheld
 - Patient safety
 - Patient tracking
 - For practice: [YourOnCall](#)
 - For education: Clerkship Companion
- Group Discussion & Look at *Your Apps*

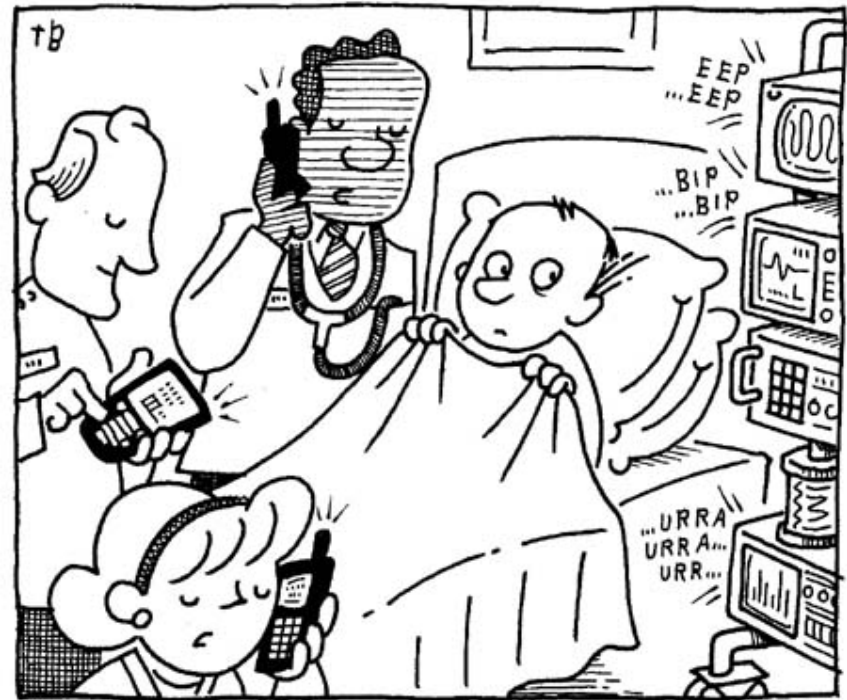
● ● ● | Emphases: Who We Are

- “Next Generation”
Content –the order of
the day
- Experience of IHI
 - End Users First and
Foremost
 - Developers



● ● ● | Hence emphases on

- Usability
 - HCI
 - Mobile, wireless, & mobile-wireless space
 - Newer form factors
- ... all of which are in pretty early days just now for healthcare





Economics

- IAIMS Last Month: the Complaint
 - Just when we're ready to integrate everything...
 - There's a triple witching hour facing healthcare IT
 - Downturn in economy, institutions' deferred budgets
 - Doctors keeping hands in pockets
 - HIPAA
 - (But are we really ready in any case?)
- Questions for us
 - How do we “slot in” these apps?
 - What's the killer app? ePocrates? InfoRetriever?



Markets

- Who's using what
 - At hardware and software level
 - At content level
- What talks to what
- Why use anything at all

... to figure out what's ripe for plucking,
where's the low-lying fruit?

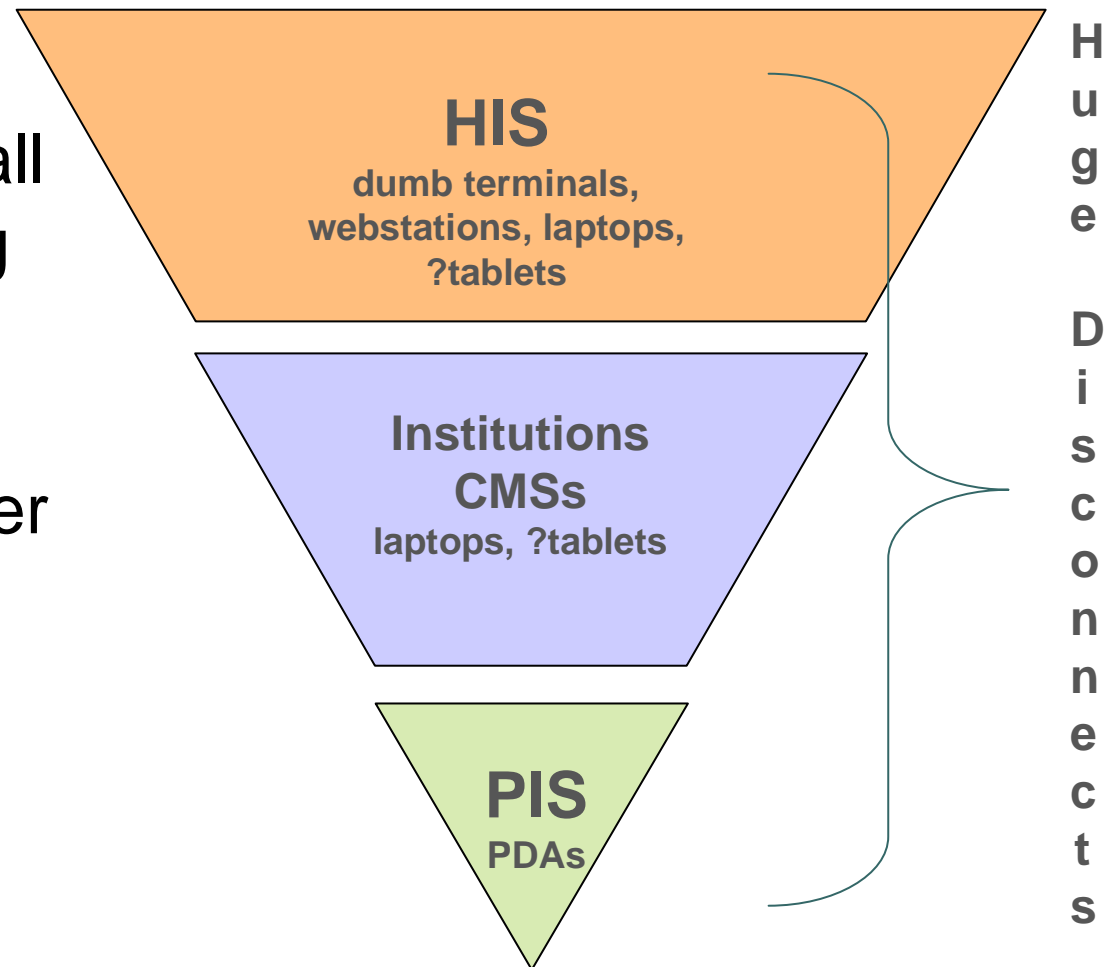
● ● ● | Hardware: what form factor?

As provider organizations implement an increasing number of mobile health care applications, more caregivers will choose personal digital assistants than tablet computers as their mobile hardware. Do you agree or disagree?

	Amount	Percent	
Responded Agree	11	60.66 %	
Responded Disagree	7	39.34 %	

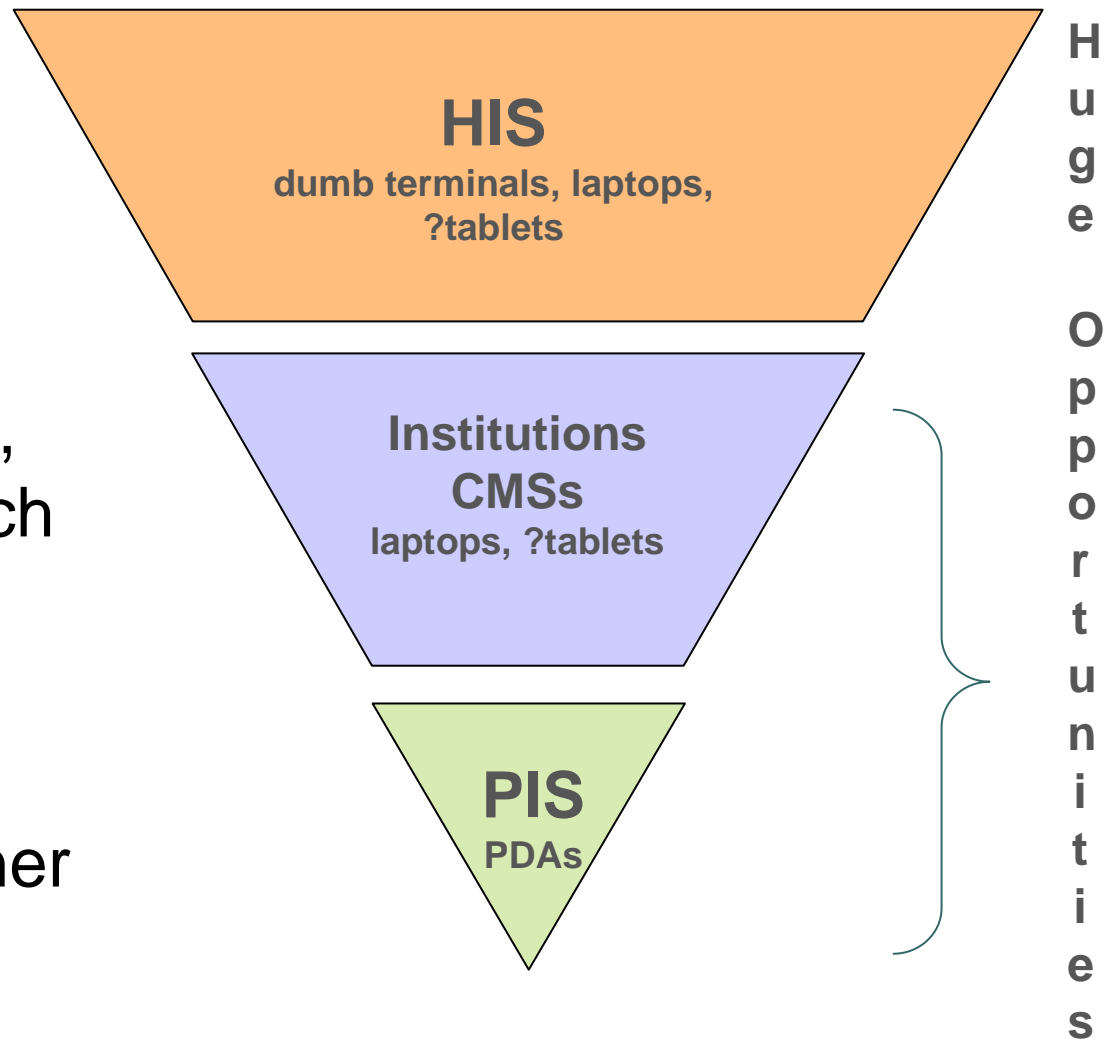
● ● ● | It matters little because

- The segments all need something different
- And they barely talk to each other



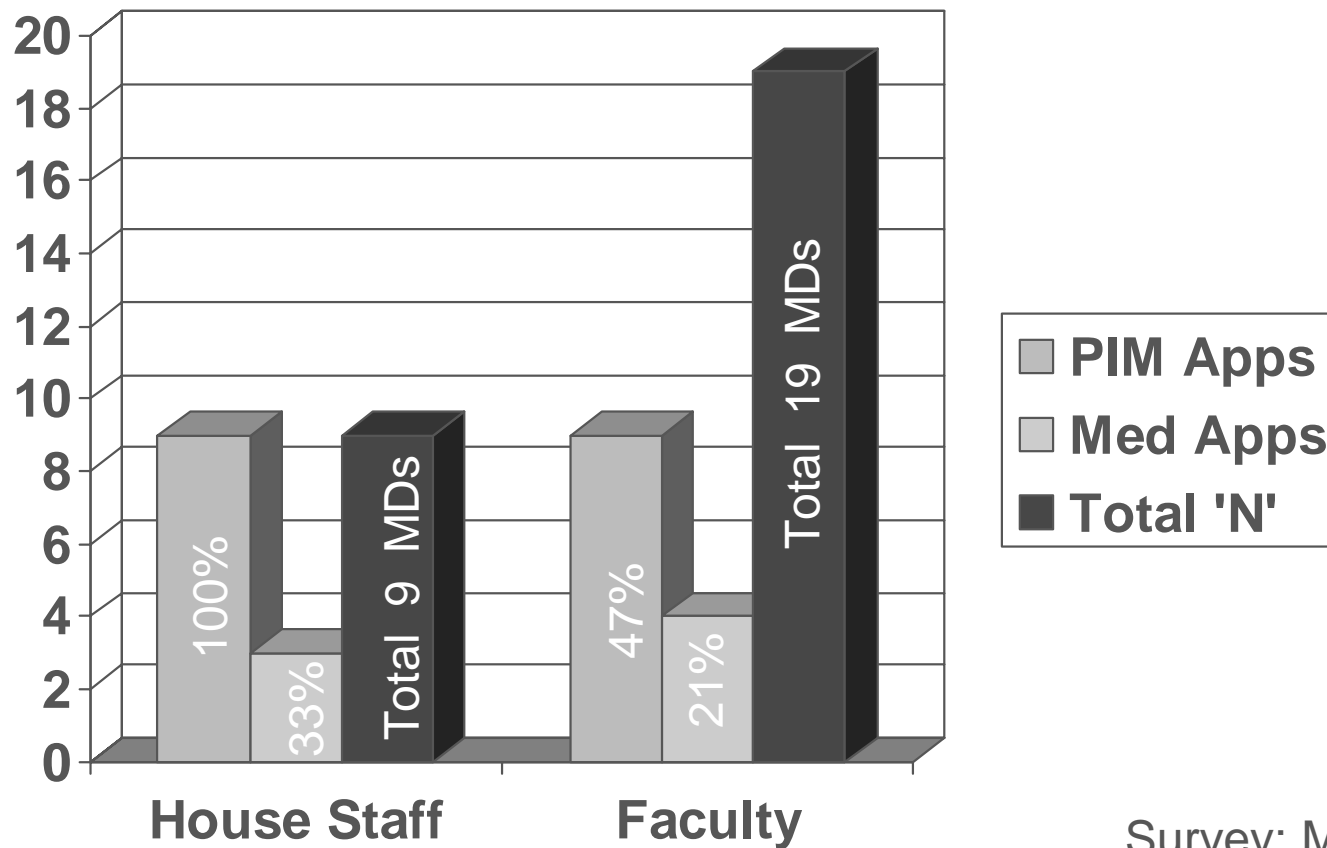
● ● ● | It matters little because

- The segments all need something different
- And they barely talk to each other, they're pretty much hived off
- And the HW just fits in, in context-appropriate manner





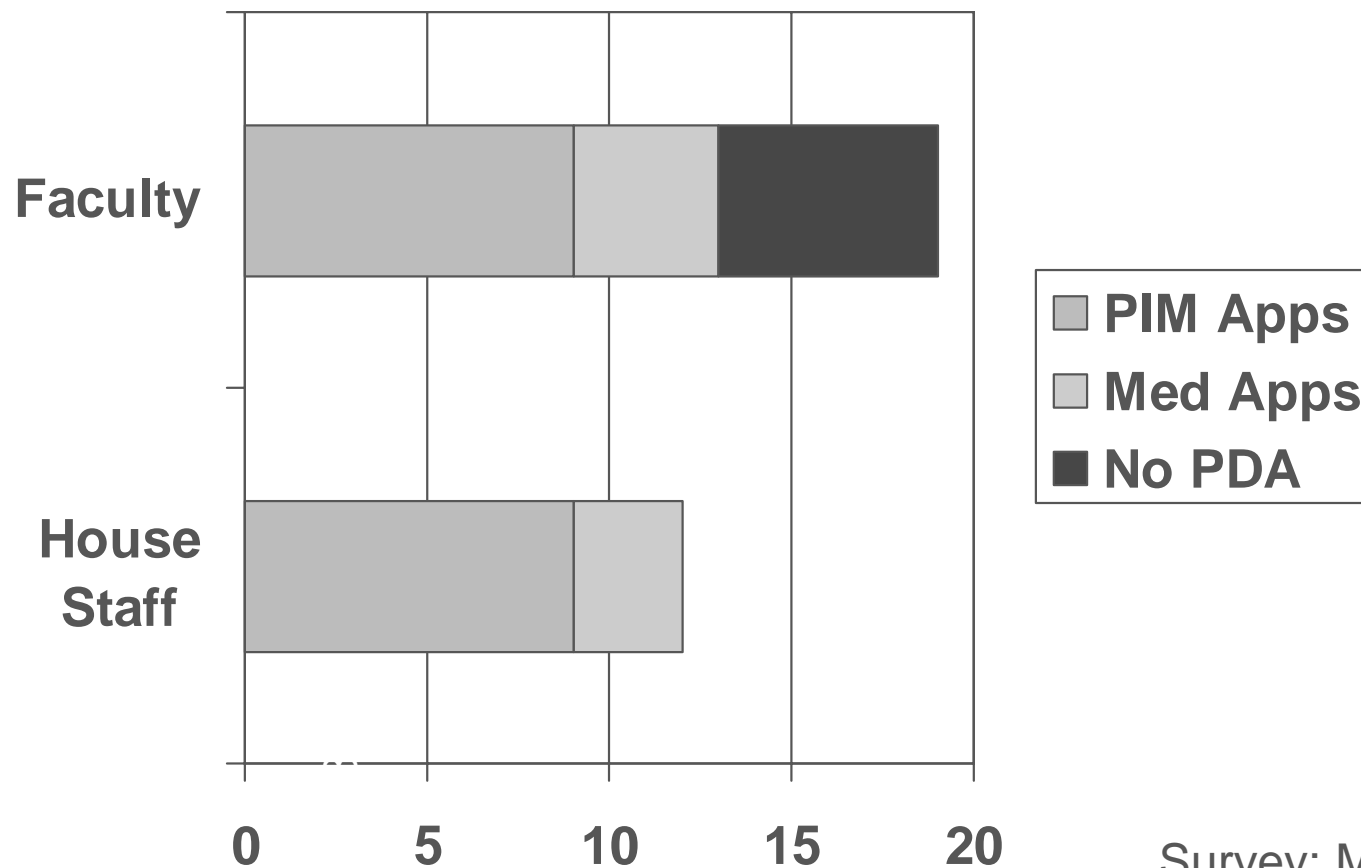
Current Handheld Usage



Survey: May 2003,
Drexel Med – IHI
R. Maulitz, MD



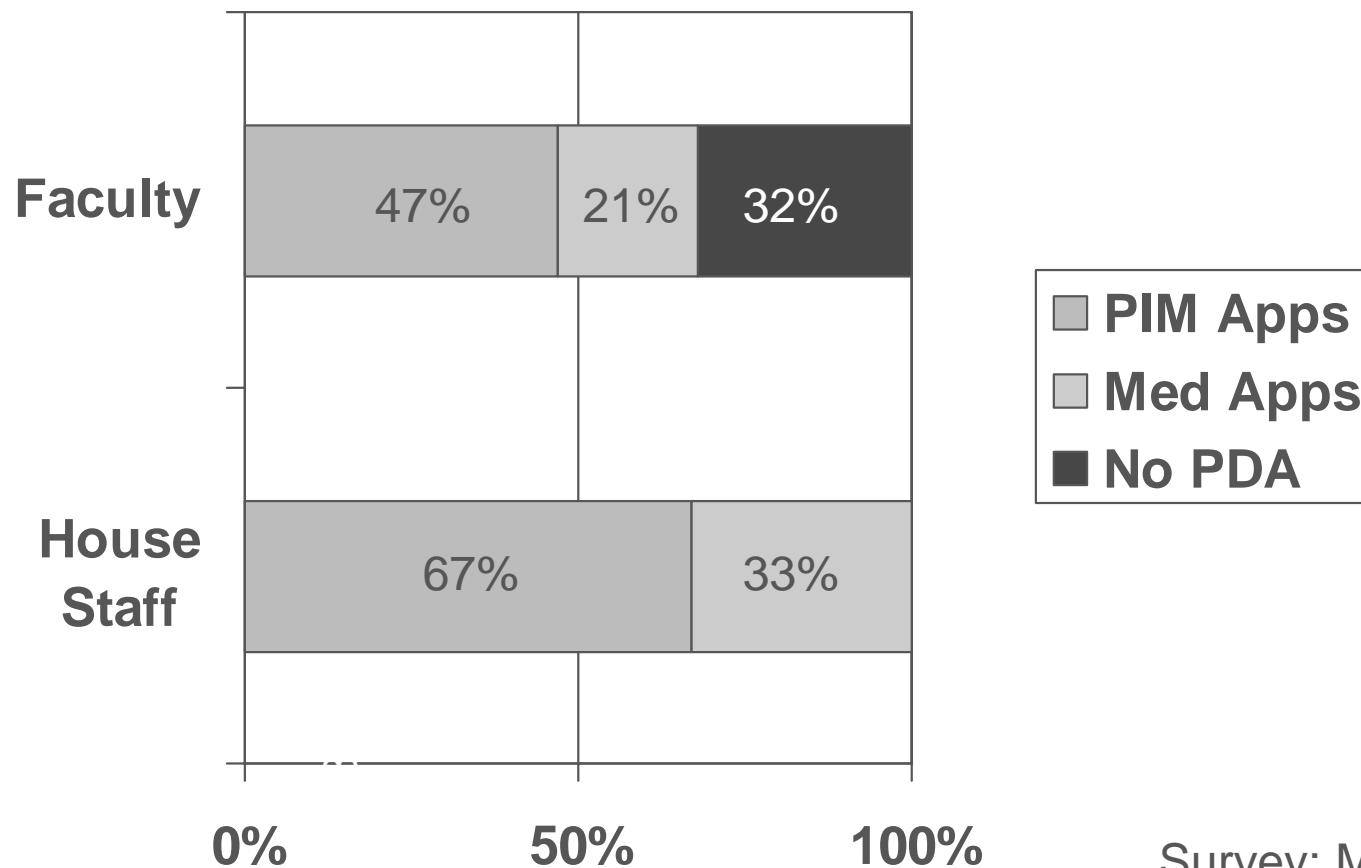
Current Handheld Usage



Survey: May 2003,
Drexel Med – IHI
R. Maulitz, MD



Current Handheld Usage



Survey: May 2003,
Drexel Med – IHI
R. Maulitz, MD



Used for what?

- Already saw: 1° use is non-medical
- Medical
 - Rudimentary look-up
 - Overwhelmingly: simple drug look-up
 - ePocrates
 - Sanford
 - Calculators
 - Or: step up from data to knowledge

● ● ● | Medical content (cont'd)

- Step up: EBM Tools (more on this later)
 - Very few entries anything approaching robustness
 - We drilled down on this a few months ago

healthcareinformatics

Article

HANDHELD

Bedside Consults

New handheld programs make practicing evidence-based medicine a reality.

by Eric Vogel, Jennifer Erskine and Russell Maulitz

March 2003 - *Healthcare Informatics*

But we found little to be excited about

- Lots of reasons
 - Disconnected “tower of Babel”
 - Markets “immature”
 - “Tough stuff”
- All comes down to special pleading
- You have to “belly up” and start to develop





Belly up to the bar

- Our experience: worked with two companies
 - Knowledge management company
 - Electronic prescribing company
- One folded, had its IP picked up on the cheap
- The other pulled out of the enterprise, and went back to basics (junior's homework on the Web)



Why?

- The usual (non-technical) suspects
 - Burn rate
 - Inability to close fast enough
- But some other semi-technical issues they may not have recognized
 - Inattention to end-user needs
 - E-prescribing required access to printer next door and overnight “modem farm”

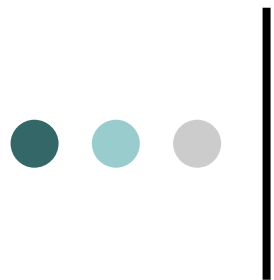


So we decided to turn elsewhere

- Different players, different tools
- Roll our own
- Content houses
- (Getting ahead of the story)

... first ask...

- Why will providers and hospitals slowly show they're interested, despite all, in investing in these tools?



Real, here-and-now, pressing needs

- Ready access to knowledge tools at point of care
- Emphasis on privacy and security
- Emphasis on trapping of error ever since IOM Report, Duke transplant disaster, various others

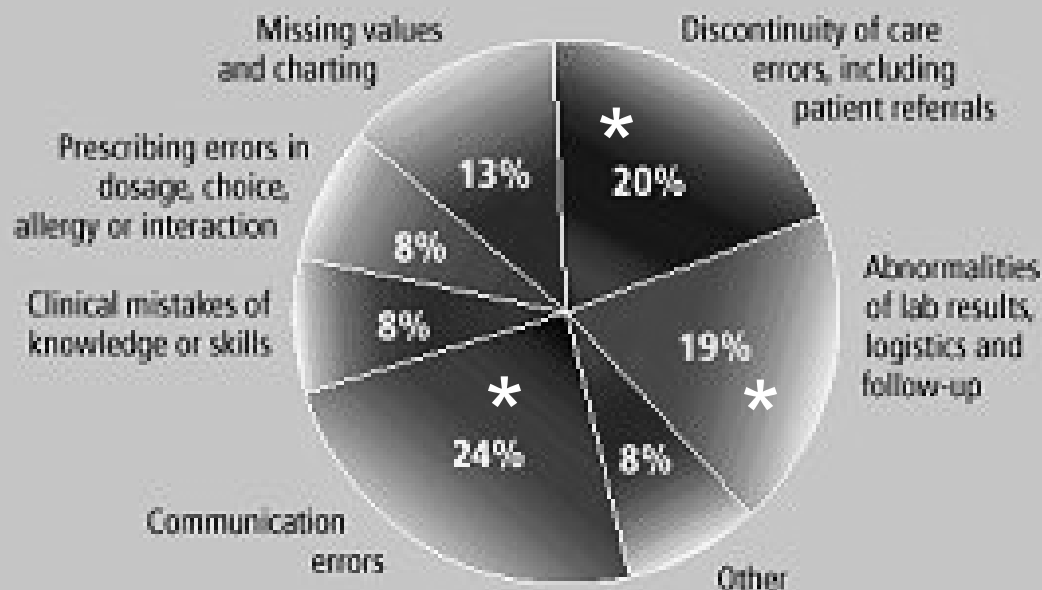


Error in outpatient setting

*** ≈ about $\frac{2}{3}$ of all errors, and all three are not Rx or knowledge, but relate to communication and continuity of care**

A breakdown of outpatient errors

Where do community-based generalists make errors? To answer that question, Ashok V. Daftary, FACP, presented data from the California Academy of Family Practice analyzing errors made over a year by a group of 50 family physicians. While the information doesn't specifically describe internists, Dr. Daftary said it was the best look at ambulatory practice he had seen. Here's a breakdown of the errors:



Source: "Diagnosing and Treating Medical Errors in Family Practice," California Academy of Family Physicians Monograph, 2002.



The “Content Mismatch”

- Most content still provides
 - Static information on
 - Pharmacotherapy
 - Treatment guidelines, or at best
 - Basic decision support, alerts
- Most MDs opt out and call consultant who can supply missing connectivity
- Or worse (viz.: CPOE at Cedars-Sinai)
- Most content houses haven't a clue how to bridge this gap

- ● ● | Why: it's a SW and app-planning glitch



...and it's completely expected and natural

2nd or 3rd time we've been
here



Current “New Gutenberg”

- Upside: new metaphors for interfacing with information
- Downside: “Pseudo-integration”





But need true interaction between disparate genres of applications and content

- Execution
- Design



Execution





Execution





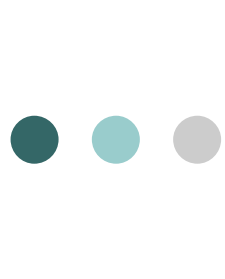
Design





Design





New design principles for new form factors

- Use the new metaphors
- Look for new ways to integrate
- Keep in mind a few key factors
 - *STANDARDS !!!*
 - Exploit connectivity
 - Evidence Based Medicine (EBM)



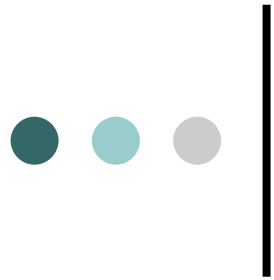
EBM Handheld Primer

- EBM and portable information resources
- Overview of Handheld Hardware, Operating Systems
- Standard Reference Software for Handhelds
 - Calculators
 - Drug References
 - Print References on the handheld
 - “Value-Added References”
 - MEDLINE Searching



Overview, continued

- Portable EBM Database: InfoRetriever
- The Future
 - Upcoming Products
 - New Approaches
- Questions and Answers



The Problem

- “Doctors face a serious problem keeping up to date. They do not know about important advances, feel overwhelmed by new scientific information, are not good at finding new information, and do not know how to evaluate it when it is found.”

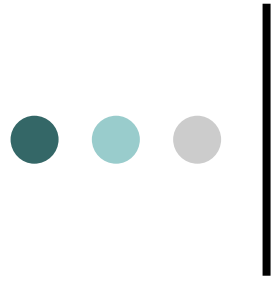
--Richard Smith, *BMJ* 1996



Why aren't MDs up to date?

- Information explosion
- Lack of training (locating, analyzing information)
- Time constraints

Questions just go unanswered



The Solution (?)

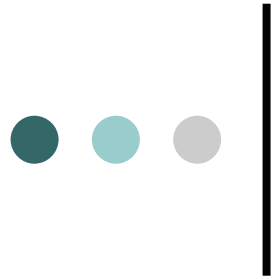
- Evidence-Based Medicine (EBM):
 - “The conscientious, explicit, and judicious use of current best medical evidence (from systematic research) in making clinical decisions about the care of individual patients”

-Sackett et al, 1997



Practicing EBM (Traditional)

- Clinical questions from patient care
- Finding the best, most up-to-date information, usually on MEDLINE
- Critically assessing the information for validity and importance for patients
- Applying information to individual patients
- Integrating of patient preferences, clinical expertise with best evidence from research

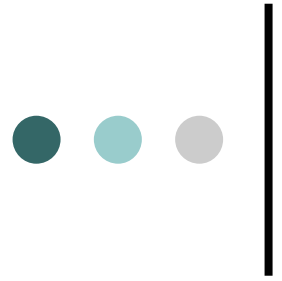


How “Useful” is this?

- “Usefulness” equation for Medical Information Sources:

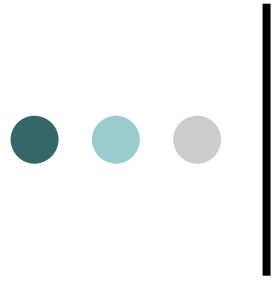
$$\text{Usefulness} = \frac{\text{Validity} \times \text{Relevance}}{\text{Work}}$$

(Shaughnessy AF, Slawson DC, Bennett JH, *J Fam Pract.* 1994)



Handheld Hardware

- Palm Operating System/Units
- Pocket PC Operating System/Units



Palm OS Units

- Vast majority of handheld computers
- More medical software available
- Lighter and thinner, better battery life
- Generally less expensive (B&W vs. Color)
- Less internal memory, but some expandable in various formats



Pocket PC OS Units

- A minority of handhelds
- Larger, bulkier units, shorter battery life
- Mostly color units - More expensive
- Large internal memory (64 MB standard)
- More expandable
- Familiar Microsoft programs
- Some EBM info resources only on PPC



Handheld Tools for EBM

- Calculators
- Drug Guides
- Print References on the Handheld
- Value-added References
- MEDLINE Searching



Evaluation Considerations

- Validity Peer-reviewed, referenced
Well-designed studies, up to date
- Relevance Information pertinent to question
Patient population similar to
yours
- Work Indexed, searchable, well-
formatted
- Cost / ROI Installation, updates, and support
Price of software, required readers
Demo availability



EBM Calculators

- Free products: EBM Calculator, EBM Tables, and MedRules
- For-purchase: MD EBM, Palm Stat, and Med Calc (requires MathPad)
- Calculations such as Bayesian Analysis, positive predictive value, negative predictive value, NNH, NNT, relative risk, relative risk reduction, sensitivity, and specificity

EPOCRATES

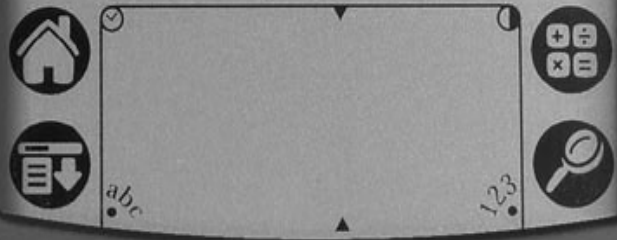
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EBM Calculator

EBM

Evidence Based Medicine

- Diagnostic Test
- Prospective Study
- Case Control Study
- RCT
- Convert ORs to NNTs



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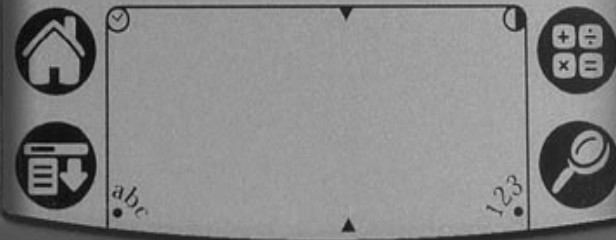
Convert ORs to NNT

Odds Ratio (OR) 0.82.....

Patient's expected
event rate (PEER) .071.....

Clear Table Calculate Main i

NNT: 83.000.....





Drug Guides

- ePocrates Rx 4.0 and ePocrates ID
- mobileMICROMEDEX
- LexiDrugs (interfaces with 5 minute CC)
- Physician's Drug Handbook
- E-prescribing: Allscripts, iScribe



Scenario One

You are seeing a 23 year old white female with a history of mild asthma, for which she takes albuterol as needed. She reports the symptoms get worse when she jogs or swims. She asks if there is something “stronger” she can take to prevent symptoms during exercise.



Clinical Question

- In adults with exercise-induced asthma, are other therapies such as salmeterol, leukotriene antagonists or cromolyn sodium effective in preventing or decreasing asthma symptoms?

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Drugs

▼ All

▼ HealthPartners

Septra DS	Y
Septra IV	N
Serax	N
Serentil	N
Serevent	Y
Serevent Diskus	PA
Serophene	Y
Seroquel	Y
Serostim	PA
sertraline	-

Look Up:

By Class



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Serevent

salmeterol inhaled
(21 mcg/spray MDI)

asthma, exercise-induced

[2 puffs INH x1]

Info: give 30-60 min before exercise

COPD

[2 puffs INH q12h]

Max: 2 puffs INH q12h; Info: not for
acute treatment

▲ Adult Dosing

Back

Home



abc

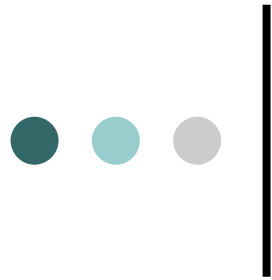
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Journal TOC / Abstract Services

- Most are free-of-charge
- Providers include:
 - Handheldmed.com & AvantGo
 - BMJ Publishing Group (on CogniQ platform)
 - Ovid@Hand (on CogniQ platform)
 - JournalToGo
 - Redi-Reference Clinical Update Newsletter



Journal TOC/Abstracts

- American Family Physician
- American Journal of Epidemiology
- Annals of Internal Medicine
- BMJ British Medical Association
- Chest
- Circulation
- Gastroenterology
- JAMA
- Journal of Clinical Oncology
- Journal of the American College of Cardiology
- The Lancet
- The New England Journal of Medicine

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- ▶ The New England Journal of
Medicine

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NEW ENGLAN...

N ENGL J MED (VOLUME 345;
ISSUE 6; 2001 AUG 9)

ARTICLES

- ☐ Resumption of driving
after life-threatening
ventricular tachyarrhythmia
Akiyama T; Powell JL; Mitchell LB;
Ehlert FA; Baessler C



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TOC / Abstract Usefulness

- Validity
 - Current
 - Not enough info information
- Relevance
 - Unlikely to apply to the clinical question
- Work
 - Not indexed
 - No search function



Print References on the Handheld

- The Merck Manual of Diagnosis and Therapy
- Harrison's Companion Handbook
- The Washington Manual
- The Ferry Guide
- Five Minute Clinical Consult
- Clinical Medicine Consult
- and many others



Scenario Two

A 68 year old patient of yours is being admitted to the hospital for unstable angina. You give orders to start IV heparin, but the nurse tells you that she is unable to get IV access despite multiple attempts.



Clinical Question

- In patients with unstable angina, is low molecular weight heparin (enoxaparin) as effective as unfractionated heparin in preventing acute MI or recurrent angina?

Index



A	B	C	Angina decubitus
D	E	F	Angina pectoris
G	H	I	Angina, Ludwig's
J	K	L	Angiocardiography
M	N	O	Angiodysplasia
P	Q	R	Angioedema
S	T	U	Angiofibroma
V	W	X	Angiography
Y	Z		Angiokeratoma corporis diff

Find: angina





Angina pectoris

Angina pectoris

crescendo

vs. dyspnea

vs. gastrointestinal disorders

nocturnal

unstable

variant



Angina pectoris



ANGINA PECTORIS

A clinical syndrome due to myocardial ischemia characterized by precordial discomfort or pressure, typically precipitated by exertion and relieved by rest or sublingual nitroglycerin.

Etiology

The cause is usually critical coronary artery obstruction due to atherosclerosis. Spasm (idiopathic or due to cocaine) or, rarely, a coronary embolism may



emergency to be treated in a cardiac care unit (CCU). Both heparin and aspirin reduce the incidence of subsequent MI. To reduce intracoronary clotting, aspirin 325 mg po and IV heparin should be instituted immediately. If aspirin cannot be tolerated or is contraindicated, ticlopidine 250 mg bid or clopidogrel 75 mg/day is a possible alternative. Ticlopidine requires monitoring of WBC at regular intervals because of the risk of neutropenia.

Cardiac work should be reduced by slowing heart rate and



The image shows the bottom portion of the EZReader application window. It includes a toolbar with icons for document management (list, folder, back, forward, index, search, print, and a double back arrow) and a status bar. The status bar contains a search field with the text "Angina Pectoris" and a menu bar with the items "File", "Edit", "Tools", and "Help".

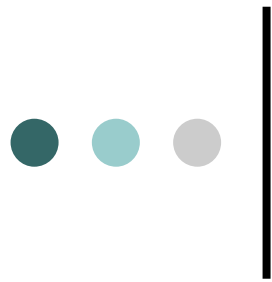
Angina Pectoris

File Edit Tools Help



Print Reference Usefulness

- Validity
 - Often not current
 - Not referenced to the evidence
- Relevance
 - Good for summary information
 - Lacking some content
- Work
 - Indexed, usually searchable
 - Often require lots of scrolling



mobileMICROMEDEX

- Drug Points (drug information data)
- AltMedDex Points (alternative medicine data)
- ToxPoints (toxicology data) and
- Clinical Points (acute care data)
- Also, Mobile Drug Reax (drug interaction tool)
- Palm or Pocket PC
- Subscription or \$79 individually, demo version

EPOCRATES

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mobileMICROMEDEX Home

Acute Care Info
Alt Med Info
Drug Info
Drug Interaction Tool
Toxicology Info

Preferences

Data Manager



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ABDOMINAL AORTIC ANEURYSM
ABDOMINAL WALL HERNIA
ABRUPTIO PLACENTAE
ACROMIOCLAVICULAR SEPARATION
ACUTE CORONARY SYNDROME
ACUTE RENAL FAILURE
ACUTE RESPIRATORY DISTRESS SY...
ADNEXAL TORSION
ADRENAL CRISIS
AIDS
AIR EMBOLISM



Look Up: _____

▼ Acute Care Info



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ACUTE CORONARY SYNDROME



- GLYCOPROTEIN IIB/IIIA ANTAGONIST:
Tirofiban(Aggrastat(R))
0.4mcg/kg/min IV X30MIN, then 0.1 mcg/kg/min X 12-108H.
- HEPARIN: With t-PA: 60U/kg (max 4000U) IV bolus, then 12U/kg/h (max 1000U/h).
- LMWH: Enoxaparin 1mg/kg SQ Q12H X2d PLUS ASA
- NITROGLYCERIN: 0.4mg SL Q5MIN

Go to: Treatment



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ASTHMA



- give as single agent)
- STEROIDS: PREDNISONE or METHYLPREDNISONE: ED/Inpt: 120-180mg/d PO/IV divided TID/QID (peds 1mg/kg PO/IV Q6H; max 60mg/d) x48h
- AIRWAY MANAGEMENT: 100% O₂; intubation, mechanical ventilation as needed
- OTHER: Fluids, ketamine, heliox, leukotriene modifiers

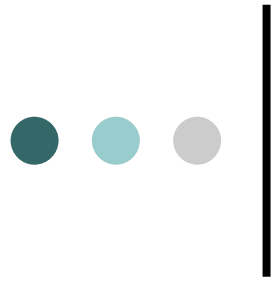
Go to: Treatment



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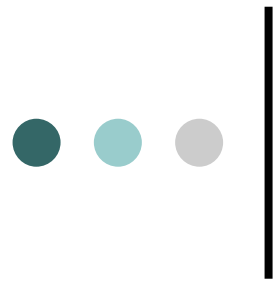
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mobileMICROMEDEX Usefulness

- Validity
 - Written, reviewed by editorial staff
 - Updated quarterly
- Relevance
 - “Acute Care Info,” some major gaps
 - Not a lot of detail about Dx or Rx
- Work
 - Easy to navigate, well-formatted
 - Topics arranged alphabetically
 - Index / search suboptimal



The Bellevue Guide

- BMJ Publishing Group
- Topically arranged, links to evidence
- Palm platform, \$29.95, demo available
- Uses iSilo (\$17.50) reader
- Mobipocket (free) reader for release soon

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BVG Demo 1 ▾

📖 🏠 A ↩ 1 ▾

BMJ Books

The Bellevue Guide to
Outpatient
Medicine

An evidence-based guide to



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BVG Demo 1 ▾

📖 🏠 A ↩ 51 ▾

5-Asthma and chronic
obstructive pulmonary
disease
Jahangir J. Rahman

- Asthma
- Occupational asthma 15
- Chronic obstructive
pulmonary disease
(COPD)



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BVG Demo 1 ▾   A  83 ▾

- For patients with predominantly nocturnal symptoms, use PM theophylline, a long acting beta₂ agonist, or a steroid inhaler.
- For exercise induced asthma, use a beta₂ agonist prior to exercise. Cromolyn sodium is the second choice.
- For patients without a



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BVG Demo 1 ▾   A  72 ▾

2 puffs qid Cough, dry mouth, nausea, blurred vision. Use caution in patients with glaucoma and urinary retention
Ipratropium/albuterol (Combivent) 2 puffs qid
Mast cell stabilizer inhalers
Cromolyn sodium (Intal) 2 puffs qid or before exercise
Cough, dry mouth ORAL
MEDICATIONS Steroids
Prednisone (Deltasone)



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BVG Demo 1 ▾   A' ← 77 ▾

ced modest improvements in airflow in asthmatic patients, with minimal side effects.¹³

- Montelukast, a leukotriene receptor antagonist, has shown modest protection against exercise induced bronchoconstriction.¹⁴
- LT modifiers have not been compared to other



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BVG Demo 1 ▾   A' ← 148 ▾

¹⁴Leff JA, Busse WW, Perlman D et al. Montelukast, a leukotriene-receptor antagonist, for the treatment of mild asthma and exercise-induced bronchoconstriction. *N Engl J Med* 1998;339:147--52. Montelukast reduced the exercise-induced decrease



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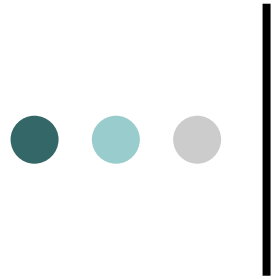
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The Bellevue Guide Usefulness

- Validity
 - Edited by 2 MDs
 - ? Updates
- Relevance
 - Both acute and outpatient
 - Still some gaps in content
- Work
 - Hard to navigate
 - Subtopics are large



Clinical Evidence

- Published by BMJ Publishing Group
- CogniQ platform for Palm
- AvantGo platform for Palm, PocketPC
- Download selected portions of Clinical Evidence
- CogniQ platform offers TOC / abstracts
- CogniQ platform also offers full-text delivery
- Handheld trial version free for now

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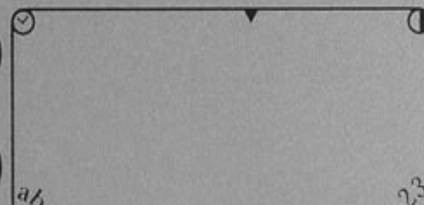
▸ [Clinical Evidence](#)

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Clinical Evid...

▪ [About Clinical Evidence](#)

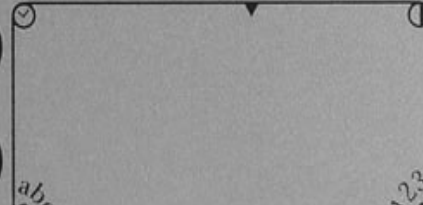
▪ [Feedback](#)

Sections (Edit)

▪ [Cardiovascular disorders](#) ▾

▪ [Respiratory disorders](#) ▾

From BMJ Publishing Group



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Clinical Evid...

Topics

- Asthma ↴
- Chronic obstructive pulmonary disease ↴
- Community acquired pneumonia ↴
- Lung cancer ↴
- Spontaneous pneumothorax ↴
- Upper respiratory tract infection ↴

Issue 6 - December 2001



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Clinical Evid...

agonists.

- One systematic review and one additional RCT have found that, in people with asthma poorly controlled with inhaled corticosteroids, adding long acting, inhaled β_2 agonists improves symptoms and lung function. We found no evidence that regular use of long acting β_2 agonists causes deterioration in asthma control.
- Three RCTs have found that leukotriene antagonists added to short acting β_2 agonists alone



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ePOCRATES

m500

Clinical Evid...

OPTION - Low molecular weight heparins

One systematic review has found that aspirin plus LMWH is more effective than aspirin alone in the first 30 days after an episode of unstable angina. One systematic review found no significant difference in benefits between LMWH and unfractionated heparin. One systematic review comparing short term treatment with LMWH versus unfractionated heparin found



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ePOCRATES

m500

Clinical Evid...

review found no significant difference in benefits between LMWH and unfractionated heparin. One systematic review comparing short term treatment with LMWH versus unfractionated heparin found no significant difference in the frequency of major bleeding, and found that long term LMWH is associated with a significant increase in the risk of major bleeding compared with placebo.

[Full Text](#)

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Clinical Evidence Usefulness

- Validity
 - Summarized reviews of studies
 - High quality, peer-reviewed
 - Updated monthly
- Relevance
 - Med, Surg, Nursing, Alternative
 - Have to download relevant sections
 - Some major gaps but growing
- Work
 - Arranged by organ system, topic
 - No visible search function



MEDLINE Clinical Queries

- PubMed searching project sponsored by OHPCC, NLM and the Department of Biomedical Informatics USUHS, Uses clinical filters developed by Haynes 1994
- Unbound Medicine offer MEDLINE searching thorough the CogniQ platform

EPOCRATES

m500

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PDA

ADD | REMOVE

My Channels

► PDA_PubMed_Clinical_Query

AVANTGO WIRELESS | ACCOUNT INFO



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PDA

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abc

123



EPOCRATES

m500

PDA PubMed ...

Category: ☒ therapy ☐ diagnosis

☐ etiology ☐ prognosis

Emphasis: ☒ sensitivity ☐
specificity

**Enter subject search (do not
repeat any of the words
above):**

Serevent and exercise and asthma

Search

Reset



abc

123



ePOCRATES

m500

Entrez-Pub...

☐ 7: Edelman JM, Turpin JA, Bronsky EA, Grossman J, Kemp JP, Ghannam AF, DeLucca PT, Gormley GJ, Pearlman DS. Related Articles
Oral montelukast compared with inhaled salmeterol to prevent exercise-induced bronchoconstriction. A randomized, double-blind trial. Exercise Study Group.
Ann Intern Med. 2000 Jan 18;132(2):97-104.
PMID: 10644288 [PubMed - indexed]



abc



123



ePOCRATES

m500

Entrez-Pub...

☐ 6: Cohen M, Maritz F, Gensini GF, Danchin N, Timerman A, Huber K, Gurfinkel EP, White H, Fox KA, Vittori L, Le-Louer V, Bigonzi F. Related Articles

The TETAMI trial: the safety and efficacy of subcutaneous enoxaparin versus intravenous unfractionated heparin and of tirofiban versus placebo in the treatment of acute myocardial infarction for patients not thrombolized: methods and design.



abc



123





MEDLINE Usefulness

- Validity
 - Current
 - Abstract is not the article
 - No evaluation of study quality
- Relevance
 - Filtering increases it
 - Some platforms with no detail
- Work
 - Very labor intensive



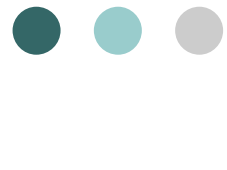
InfoRetriever

- Most “mature” EBM product for PDAs
- Only available for PocketPC
- Developed by Mark Ebell at MSU and colleagues
- Expensive (\$249 for one year package subscription:
InfoRetriever for Pocket PC,
Internet access, daily e-mail)



InfoRetriever, cont'd

- Database for Pocket PC includes
 - brief synopses of relevant, valid articles in the literature (from Evidence Based Practice)
 - Abstracts of systematic reviews from the Cochrane Database of Systematic Reviews
 - Basic prescribing information for 1200 drugs



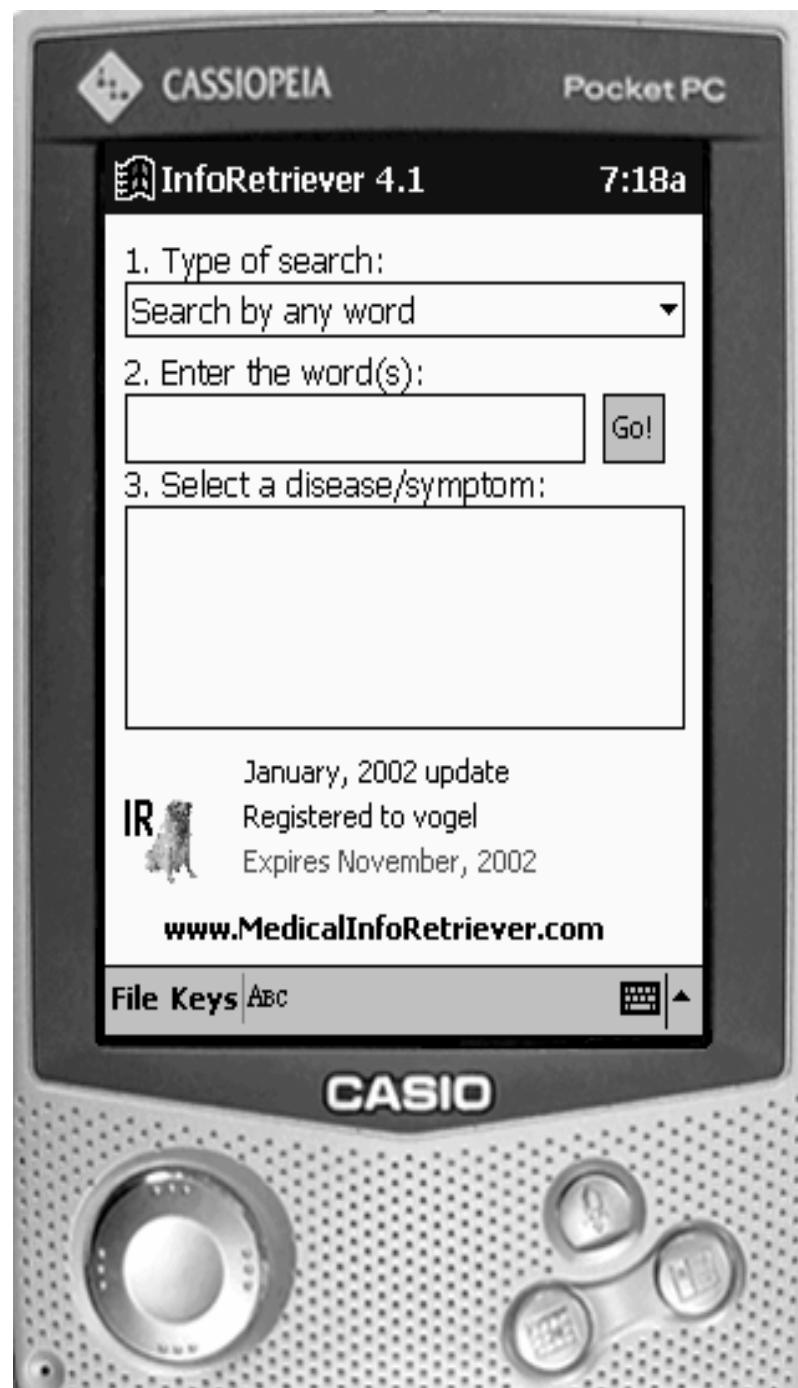
InfoRetriever, cont'd

- Also Includes:
 - Clinical prediction rule calculators (such as the Pneumonia Severity Index), other calculators
 - Calculator for diagnostic tests and history and physical examination maneuvers
 - summaries of selected evidence-based practice guidelines
 - Griffith's 5 Minute Clinical Consult



Clinical Question

- In adults with exercise-induced asthma, are other therapies such as salmeterol, leukotriene antagonists or cromolyn sodium effective in preventing or decreasing asthma symptoms?



1. Type of search:

Search by any word	▼
Search by any word	▲
Search 5 Minute Clinical Consult	
Search by keyword	
Search diagnosis only	≡
Drug info (by class)	
Drug info (by name)	
Clinical rules and calculators	
Practice Guidelines	▼

January, 2002 update



Registered to vogel

Expires November, 2002

www.MedicalInfoRetriever.com



InfoRetriever 4.1

7:45a

1. Type of search:

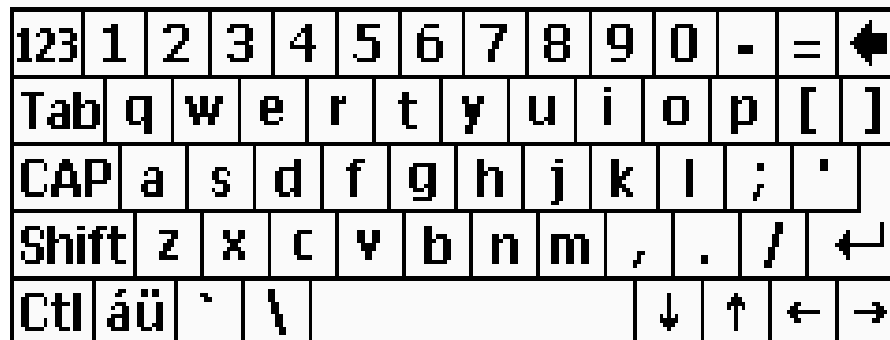
Search by any word ▼

2. Enter the word(s):

exercise-induced asthma

Go!

3. Select a disease or symptom:

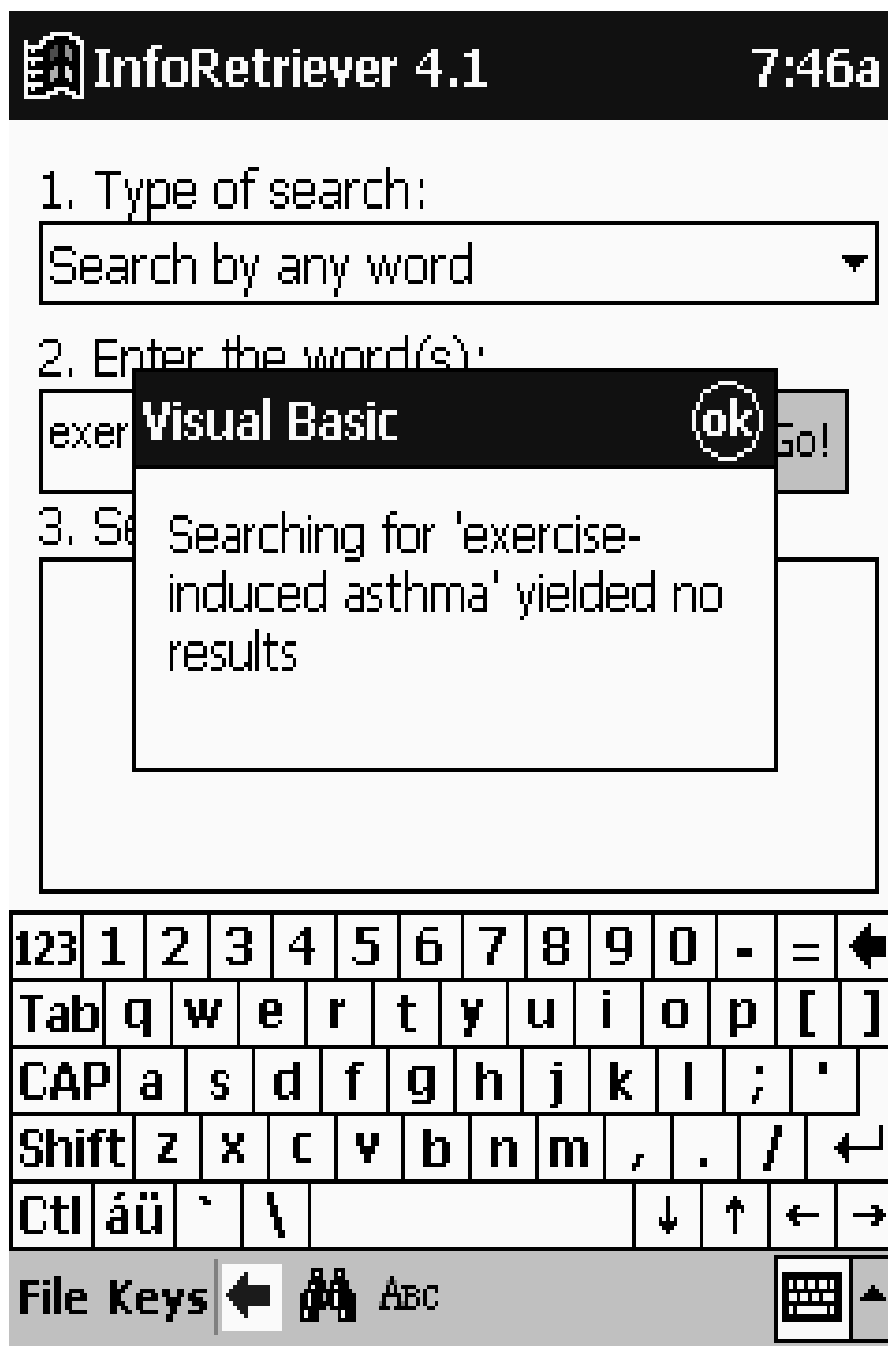


File Keys



ABC







InfoRetriever 4.1

7:49a

1. Type of search:

Search by any word

2. Enter the word(s):

asthma

Go!

3. Select a disease or symptom:

Asthma

January, 2002 update



Registered to vogel

Expires November, 2002

www.MedicalInfoRetriever.com

File Keys



ABC





InfoRetriever 4.1

7:50a

1. Type of search:

Search by any word

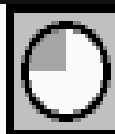
2. Enter the word(s):

asthma

Go!

3. Select a disease or symptom:

Asthma



January, 2002 update



Registered to vogel

Expires November, 2002

www.MedicalInfoRetriever.com


File Keys




ABC










 **InfoRetriever 4.1** 7:55a

InfoRetriever Search Results:














- 5 Minute Clinical Consult
 -  Asthma
 - + Etiology and causation
 - + Screening and prevention
 - + Diagnosis
 - + Prognosis
 - + Therapy and management
 - + Education
 - + Administration




File Keys   ABC  







 **InfoRetriever 4.1** 7:59a

InfoRetriever Search Results:

-  5 Minute Clinical Consult
 -  Asthma
-  Etiology and causation
-  Screening and prevention
-  Diagnosis
 -  Asthma-children->unfavourable outcome
 -  Pulmonary function testing interpretation
 -  Ethnic differences in patients' descriptions
 -  Peak expiratory flow not adequate for
-  Prognosis
-  Therapy and management
-  Education
-  Administration

File Keys   ABC  



InfoRetriever 4.1

8:01a

Symptom: Asthma (Children)

Disease: unfavourable outcome

Select a test (sorted by LR+):

1.9 - Post-treatment pulse ox \leq 91%

More info

LOE (1a-5): 1b

Pretest:

Sensitivity:

Specificity:

40	\wedge
	\vee

42	\wedge
	\vee

78	\wedge
	\vee

LR+: 1.9

LR-: 0.744

Likelihood of disease if the test is...

Pos: 56.00% Neg: 33.10%


File Keys



ABC






 **InfoRetriever 4.1** 8:07a

-

5 Minute Clinical Consult

+

 Asthma

+

Etiology and causation

+

Screening and prevention

+


Diagnosis


+


Prognosis


-


Therapy and management


 NNT: Respiratory conditions


 Asthma: chronic management guide


 Asthma: acute exacerbation guide


 Acupuncture for chronic asthma

 Combined inhaled anticholinergics a

 Holding chambers versus nebulisers

 Family therapy for asthma in childre

 Maternal antigen avoidance during

 Corticosteroids for preventing rela

◀


III


▶

File

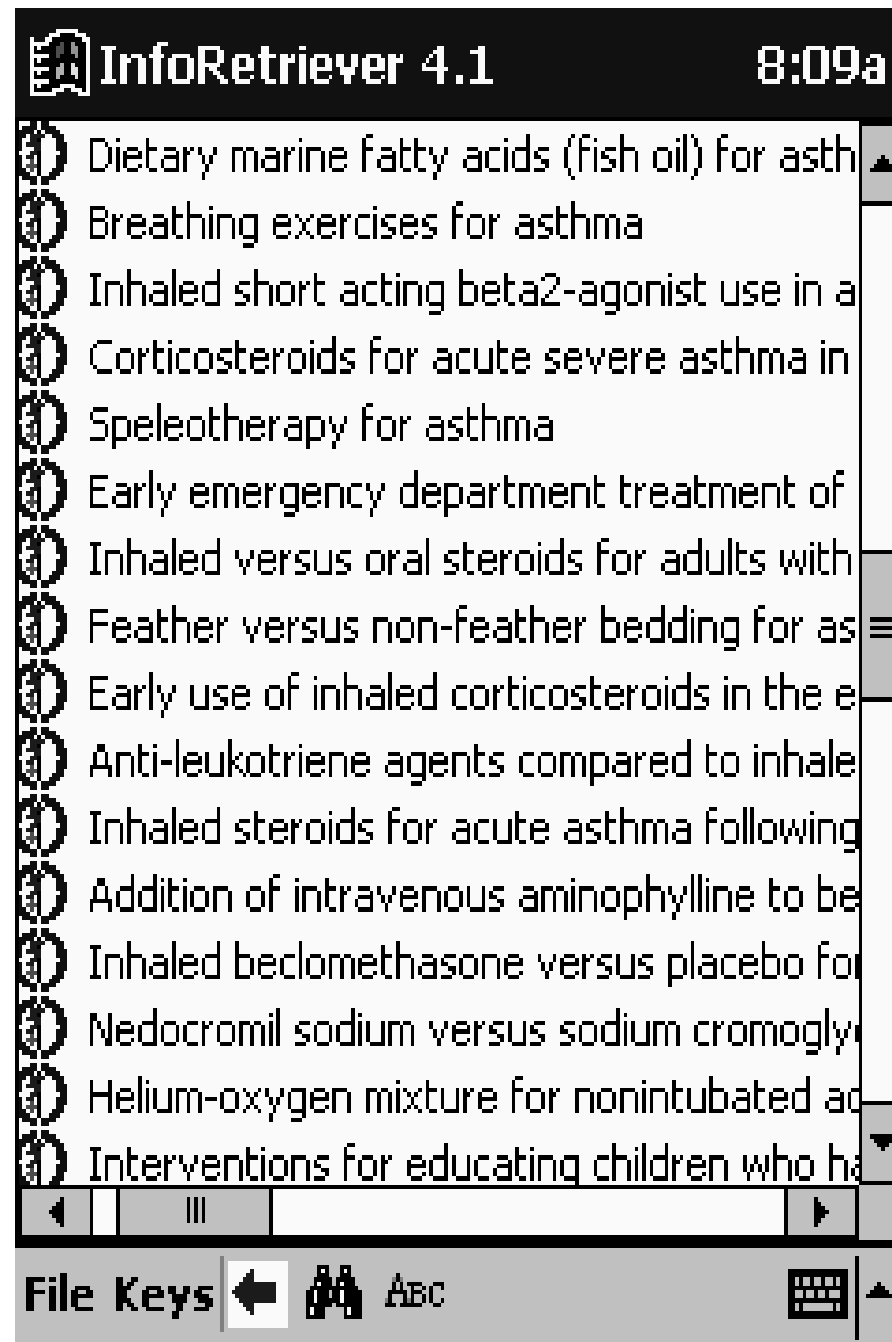
Keys

◀


 ABC







▶





 **InfoRetriever 4.1** 9:28a

Cochrane Database abstract
Nedocromil sodium versus sodium cromoglycate
for preventing exercise-induced bronchoconstriction in asthmatics
Objective
The objective of this review was to compare the effects on post-exercise lung function between prophylactic doses of nedocromil sodium (NSG) and sodium cromoglycate (SCG) in persons diagnosed with exercise-induced bronchoconstriction.
Sources
Randomized controlled trials were identified from the Cochrane Airways Review Group Asthma Register which
Copyright © 2000 by Cochrane

File Keys   **ABC**  



InfoRetriever 4.1

9:29a

0.77, 60.73), or sore throat (OR = 3.46; 95% CI: 0.32, 37.48). For these pooled comparisons, no statistically significant heterogeneity was identified. Subgroup analyses based on age, dosage of medications and timing of exercise post-inhalation were consistent with the overall pooled analyses.

Conclusions

No significant differences were evident between the effect of NCS and SCG during the immediate post-exercise period in adults and children with EIB with regards to pulmonary function - specifically maximum percent decrease in FEV1, complete protection, clinical protection, or side effects.


File Keys





















ABC









 **InfoRetriever 4.1** 9:32a

-  Inhaled plus oral steroids to prevent asthma
-  Inpatient teaching improves asthma
-  Ipratropium for adults with asthma
-  Ipratropium for acute asthma
-  Ipratropium for acute asthma in children
-  Ipratropium plus albuterol improves asthma
-  Ipratropium produces small effect in adults
-  Leukotriene antagonists for chronic asthma
-  Low and high dose albuterol equivalent in
-  Low-dose inhaled corticosteroids prevent
-  Magnesium sulfate is effective in severe a
-  MDIs are more effective with a spacer
-  Meta-analysis: Ipratropium produces a sm
-  Montelukast for mild and exercise-induced
-  Montelukast use decreases need for inhale
-  Montelukast vs. beclomethasone for asthr

 III 

File Keys   ABC  



Evidence-Based Practice

Montelukast for mild and exercise-induced asthma

Clinical question: Is montelukast (Singulair) safe and effective for the treatment of mild, exercise-induced asthma?

Study design: Randomized controlled trial (double-blinded) (LOE = 1b)

Setting: Outpatient (specialty)

Synopsis

A total of 110 non-smoking patients aged 15 to 45 years with mild, exercise-induced asthma who were only using beta-agonists were randomized to montelukast 10 mg po qhs or matching placebo. Use of





patients to report a 'global assessment of asthma control'. The latter was a scale from 0 (asthma very much better) to 6 (asthma very much worse); 3 represented no change in their asthma control. After 12 weeks, patients taking montelukast reported greater improvement than those taking placebo (73.1% better, 21.2% unchanged, 5.8% worse, compared with 44.4% better, 46.3% unchanged, and 9.3% worse, $p = 0.009$ by the Mantel-Haenszel chi-square statistic). In addition, fewer patients taking montelukast required rescue therapy with a beta-agonist after exercise at 12 weeks (14.3% vs 36.0%, $p < 0.05$). All of the less important disease-oriented endpoints





important disease-oriented endpoints were also improved during the treatment period. Adverse effects were not more common in the treatment group, and no rebound asthma was observed after the drug was discontinued.

Bottom-line

Montelukast offers an effective, if expensive, supplement to the use of beta-agonists in mild, exercise-induced asthma. (ME)

Leff JA, Busse WW, Pearlman D, et al. Montelukast, a leukotriene-receptor antagonist, for the treatment of mild asthma and exercise-induced bronchoconstriction. N Engl J Med 1998; 339: 147-52.





InfoRetriever Usefulness

- Validity
 - High validity of sources
 - Updated regularly
- Relevance
 - Large Database
 - Good variety of info
 - “Hit or Miss”
 - Improved with 5MCC
- Work
 - Multiple search options, but search function suboptimal (no textword-like function)



Evidence Trek: the Next Generation

- Hardware enhancements
- Software enhancements
- Breeching of specific barriers
- Applications rolling out in 2003 *et seq.*
- Impact of wireless connectivity



Hardware Enhancements: Likely Results

- Four major developments 2002-2003
 - Improved “screen real estate” on all platforms \Rightarrow \uparrow ease of use
 - Boost in memory \Rightarrow \uparrow data capacity
 - Convergence of device types \Rightarrow \uparrow user acceptability (less juggling)
 - Wireless add-ins \Rightarrow \uparrow
 - ability to access very new data
 - at much higher speeds



Software Enhancements

- Mostly application-specific, less dramatic than hardware developments
- Need to redesign the way knowledge is structured
 - “chunk it down”
 - make it more “smart-searchable” so that query is answered with more
 - sensitivity (more likely to get answer)
 - specificity (answer more pertinent)



Barriers Fall

Early Barrier	2003 & beyond
Handheld a “toy”	More of KB resident
User-hostile interface	Shallow learning curve, more graphical interface
Immature market	Handheld + Health-specific apps
US lags in connectivity	Convergent devices
Old fashioned KBs (like textbooks)	Granular, searchable databases (early version e.g. InfoRetriever)



How to Think About It





How to Think About It



Server based
Information

Bandwidth

Just-in-
Time
Refreshed
Information



Near-, Medium- & Long-Term

- Near-Term: spend most time on this
 - UpToDate
 - (Physicians' Information and Education Resource)
- Medium-Term
 - YourOnCall and partners
 - ? Other
- Long-Term: for the visionaries



New Near-Term Resources

- UpToDate (UTD)
 - Wellesley, Mass. private enterprise, SGIM partner known well to membership
 - Since 1989, “from physicians for physicians”
 - Until recently, CD-based, now Web format
- PIER (Physicians’ Information & Education Resource)
 - Philadelphia, project of ACP-ASIM
 - Not for profit but partnering with vendors
 - Web-based from outset



UpToDate: Content & Format

- Medical information from over 270 journals, summarized by UTD authors
- Text, graphics, MEDLINE abstracts, drug database
- Pocket PC platform
- Microdrive → Wireless
- Currently in beta testing, available probably summer 2002
- Cost ?????? CME credit ???????



UpToDate Usefulness

- Validity

- Peer reviewed
- fully referenced
- Updated every four months

- Work

- Easy to use

- Relevance

- Very thorough
- For various patient populations



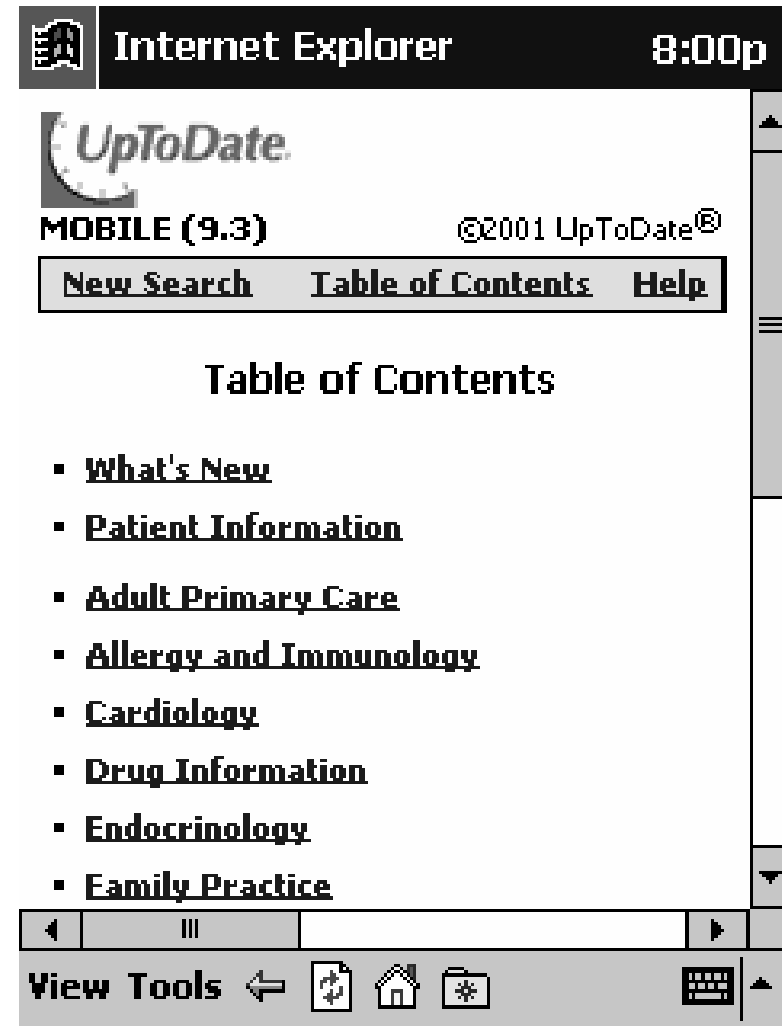
UpToDate Usefulness

- Concerns

- INDEXED???
- SEARCHABLE??

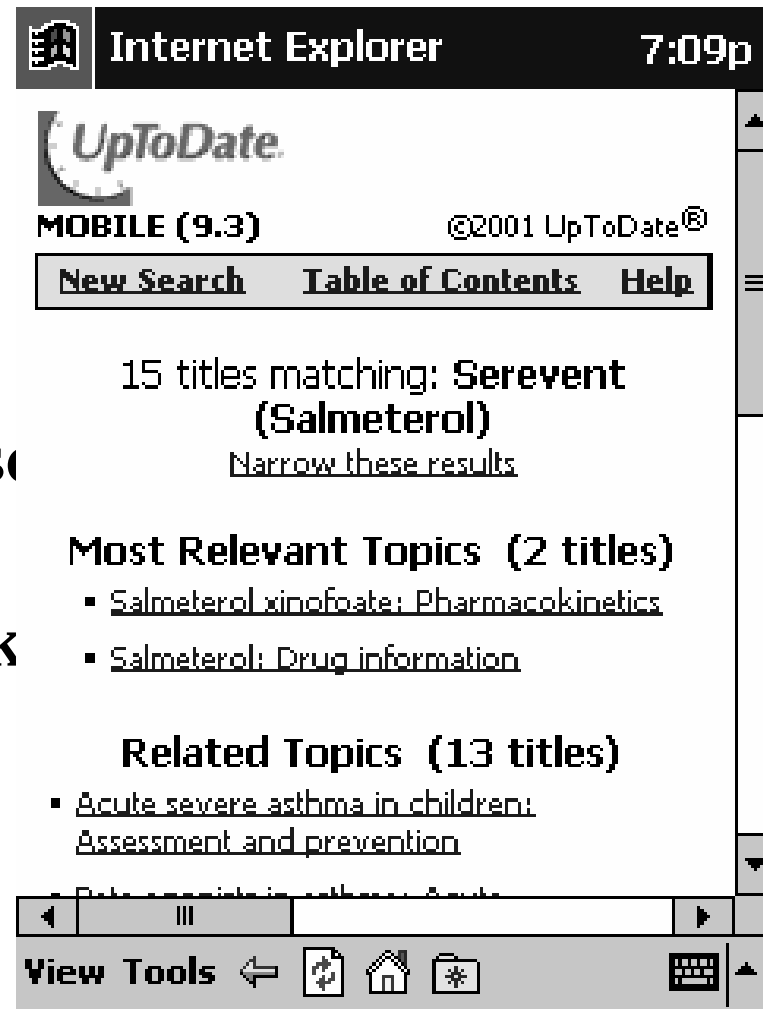
UpToDate Views

- Organization
 - Textbook-like
 - Subspecialty-oriented but also
 - Primary care-oriented
 - Includes drug database



UpToDate Search

- Intuitive Web style interface
- Start with search-box
- Allows liberal use of “back” button
- Reflects textbook on-CD heritage





Internet Explorer

8:09p

MOBILE (9.3)

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[New Search](#)

[Table of Contents](#)

[Help](#)

Beta agonists in asthma: Acute administration

- ▶ MECHANISM OF ACTION
- ▶ USE IN ACUTE EXACERBATION OF ASTHMA
 - + Importance of route of delivery
 - + Recommendations
- ▶ PROPHYLAXIS IN ALLERGEN-INDUCED ASTHMA
- ▶ USE IN EXERCISE-INDUCED ASTHMA
 - + Efficacy of different preparations
- ▶ TOXICITY
 - + Acute side effects
 - + Tolerance
- ▶ CONCLUSIONS
- ▶ REFERENCES

GRAPHICS

Navigation bar with back, forward, and search icons, and a "View Tools" button.



Internet Explorer

8:11p



MOBILE (9.3)

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[Help](#)

Beta agonists in asthma: Controversy regarding use

- ▶ MORTALITY AND BETA AGONIST USE
 - + Cardiac death and bronchodilators
- ▶ ASTHMA CONTROL WITH CHRONIC BETA AGONISTS
 - + Intermediate-acting beta agonists
 - + Longacting beta agonists
- ▶ BETA AGONISTS VERSUS INHALED STEROIDS
- ▶ BETA RECEPTOR POLYMORPHISMS
- ▶ LEVALBUTEROL
- ▶ CONCLUSIONS
- ▶ REFERENCES

GRAPHICS

Navigation bar with back, forward, and search icons, and a "View Tools" button.

Internet Explorer 8:14p

MORTALITY AND BETA AGONIST USE
—An association between mortality in asthmatic patients and chronic treatment with beta agonists was suggested by a case-control study using linked health insurance data bases in Saskatchewan, Canada [1]. Subjects were drawn from a cohort of 12,301 patients for whom asthma medications had been prescribed between 1978 and 1987. One hundred and twenty-nine case patients who had fatal or nearfatal asthmatic episodes were matched with 655 controls who had received asthma medications but had not had fatal or nearfatal events. Near fatal episodes were defined as a PCO₂ greater than 45 mmHg and/or a need for nonelective intubation, during an acute episode. Using adjusted odds ratios for statistical comparisons (with an odds ratio >2.0 being considered a significant trend), an increased risk of death or near death from

View Tools

Internet Explorer 8:15p

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[New Search](#) [Table of Contents](#) [Help](#)

Abstract for Reference 1
of 'Beta agonists in asthma: Controversy regarding chronic use'

1
TI - The use of beta-agonists and the risk of death and near death from asthma [see comments]
AU - Spitzer WO; Suissa S; Ernst P; Horwitz RI; Habbick B; Cockcroft D; Boivin JF; McNutt M; Buist AS; Rebuck AS
SO - N Engl J Med 1992 Feb 20;326(8):501-6

View Tools




PIER Format

- Conceived in “print free” environment
- More granular than most other resources
- Just introduced April 2002 at Annual Session of ACP, expanded ACP 2003
- Just out on Web (more or less)
- Pervasively evidence-rated if users base chooses to adopt with partnering products e.g. AllScripts



Pier Content


- Organization
 - Diseases
 - Screening & Prevention
 - Complementary & Alternative Medicine
 - Ethical / Legal Issues
 - Procedures
 - Drug Resource



TouchWorks
2:48p

ALLEN, CAROL J
44y F ▾

My Favorites ▾

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TouchWorks
2:49p

ALLEN, CAROL J
44y F ▾

View ▾

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Musculoskeletal				
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Respiratory				

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ALLEN, CAROL J
44y F ▼

Cardiovascular ▼

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**PIER: Essential Hypertension, Drug...▼**

Initiate drug therapy according to HTN stage and risk level. [[A](#)]

- A. Supported by at least one good randomized controlled trial (RCT).
- B. Supported by non-randomized trials, cohort studies, case-control studies, or other studies that do not meet the criteria for an RCT.
- C. Supported by expert opinion only.

• **Consider** choosing therapy that may have favorable effects on comorbid conditions, and avoid therapy that may have unfavorable

**PIER: Essential Hypertension, Drug...▼****Recommendation**

Consider a diuretic, B-blocker, or an ACE inhibitor for initial treatment of uncomplicated HTN. [[A](#)]

Specific Recommendations

• Consider drug therapy for the following patients:

- Those with stage 1 HTN (SBP 140 to 159 mm Hg or DBP 90 to 99 mm Hg) in whom lifestyle modification fails.

See table [Oral Antihypertensive Drug Treatment](#) for specific drug





PIER: Essential Hypertension, Drug...▼

◀ 99 mm Hg)

- Those in risk group C (target organ damage or diabetes mellitus) with SBP > 129 mm Hg or DBP > 84 mm Hg
- See table [Oral Antihypertensive Drug Treatment](#) for specific information on drug classes and doses.



[Rationale](#)



[Evidence](#)



[Comments](#)



PIER: Essential Hypertension, Drug...▼



Rationale

- Many randomized clinical trials have documented the benefit of antihypertensive drug therapy in reducing target organ damage from HTN.



Evidence:

- The first large prospective trial to show benefit in treating essential HTN was the VA Cooperative Study (4862069; 4914579).
- Since the 1960s, more than 20



PIER: Essential Hypertension, Drug...

Treatment

	Side Effects	Notes
3	Diuretics generally: increased glucose, cholesterol, and uric acid; hypokalemia. Photosensitivity.	Blood dyscrasias, hypercalcemia, pancreatitis, and hyponatremia are rare side effects
10	Diuretics generally: increased glucose, cholesterol and uric	Rare blood dyscrasias, hypercalcemia, pancreatitis and

DrugGd: hydrochlorothiazide ▼

Name Hydrochlorothiazide

Brand Names Aquazide®; Esidrix®; Ezide®; Hydrocot®; HydroDIURIL®; Microzide™; Oretic®

Canadian Brand Names Apo-Hydro; Apo®-Hydro; Diuchlor®; Diuchlor H; HydroDiuril; Neo-Codema; Neo-Codema®; Novo-Hydrazide; Urozide®

Generic Available Yes

Therapeutic class Diuretic, Thiazide



TouchWorks

3:13p

ALLEN, CAROL J

44y F

Essential Hypertension, New Onset

Meds ☒ Home ☐ Warn ☐ Lab ☐ Refer ☐ Illus

Home monitoring:

- ☐ Take your blood pressure once a day.
Record the numbers and bring them
with you to your appointments.

Diet:

- ☐ Restrict your sodium (salt) intake to 4
grams per day.
- ☐ Limit your use of alcohol to 1 drinks or
cans of beer a day.
- ☐ We want to put you on the DASH diet
for 2000 calories.

Activity:

- ☐ Begin or continue regular aerobic
exercise. Gradually work up to at least
3 sessions of 30 minutes of exercise a

Add View Save DUR Done Cancel



Essential Hypertension, Non-Drug...

Prevention

Screening

Diagnosis

Hospitalization

Non-drug Therapy

Drug Therapy

Patient Education

Consultation for Management

Follow-up

Rationale

Evidence

Comments



Examples in our shop

- YourOnCall (YOC)

- Starts with the problem at hand:
outpatient on-call circumstances
- Brings in only those data needed to
manage the patient
- Highly standards-compliant
 - HW
 - SW
 - Clinical vocabularies

YourOnCall


Upstream piece: tablet

Margaret O'Houlihan

[Problem List](#) || [Patient List](#)

Enter Term:

Type Term or Abbreviation, then Click Here

Problem Statement for <i>CP</i>		ICD9 Billing Code for <i>CP</i>
Natural Language	For Master Problem List	 Add to PL
CP	chest pain	

YourOnCall

Downstream piece



Web-enabled PDA

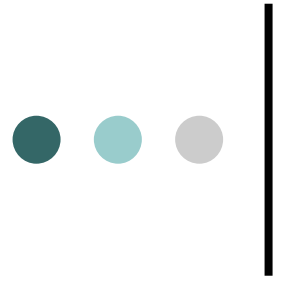
Or

Web-enabled Cellphone

(Or...

Any connected device that
fits in purse or belt)

**Shell out to relevant
content from this
patient's problems**



Clerkship Companion

- Arnold Smolen, Ph.D.



Key Question

- Does form follow function?
or
- Does function follow form?

Next Generation PDA+Browserphone

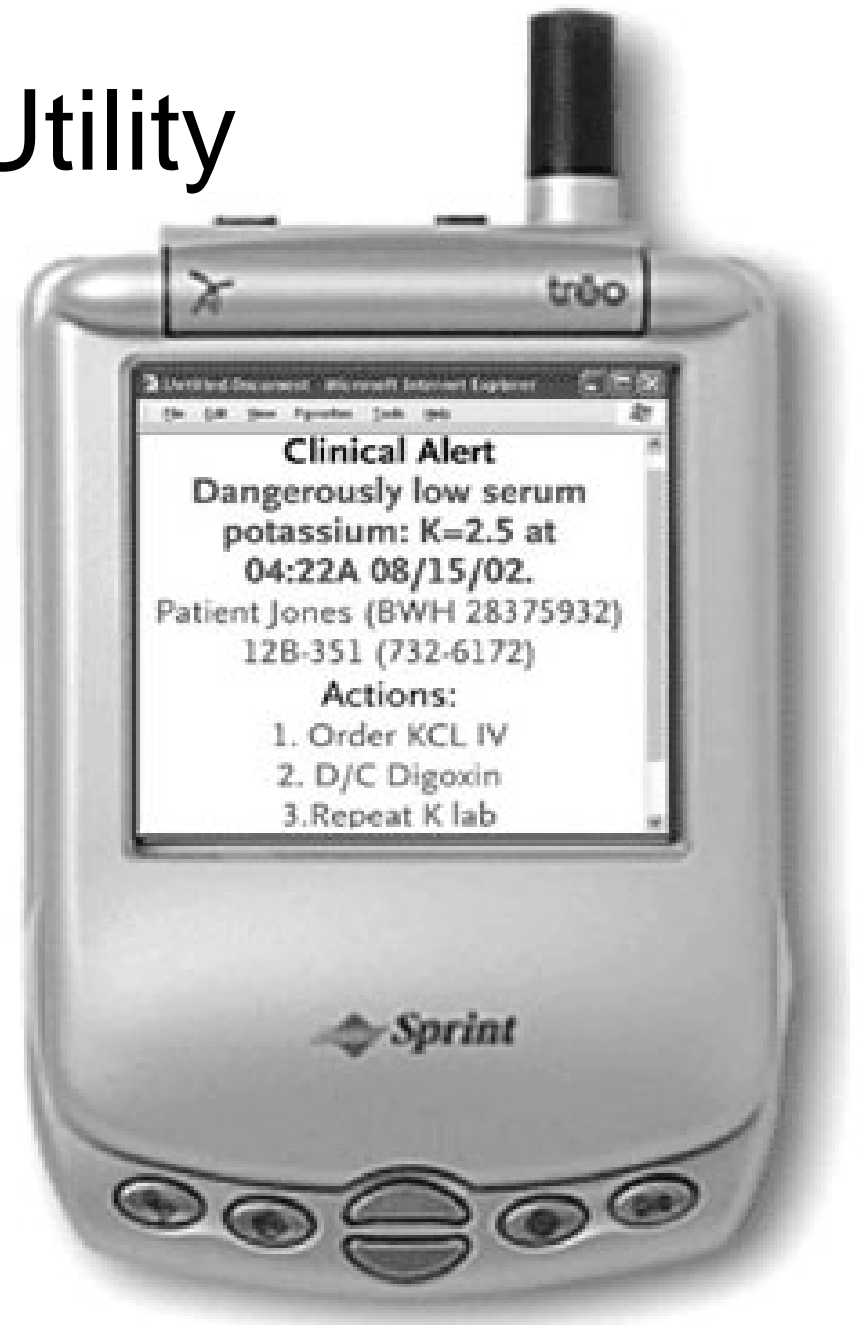
- In the PalmOS world
- Features
 - Accepts SD card
 - New browser
 - Handles JavaScript
 - Downloads
 - Camera
 - Brightness = iPaq x 4
 - Scrolling SMS
 - Decent battery



Handspring (merging with Palm) model 600 fall 2003

Examples of Utility

- From last week's *NEJM* !!!
- Think about use of
 - Push
 - Or at least instant pull
- Examples
 - Inpatient setting:
Clinical Alerts
 - Outpatient setting:
YourOnCall (under development in IHI)

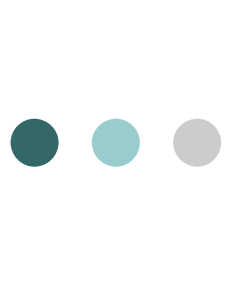


Next Generation Devices

- In other worlds
- Sharp Zaurus
 - Linux
 - Geek's dream
 - Usability issues
- Pocket PC world
 - "MiPad" White Paper was 3 years ago
 - Pleistocene in Internet years



Mipad



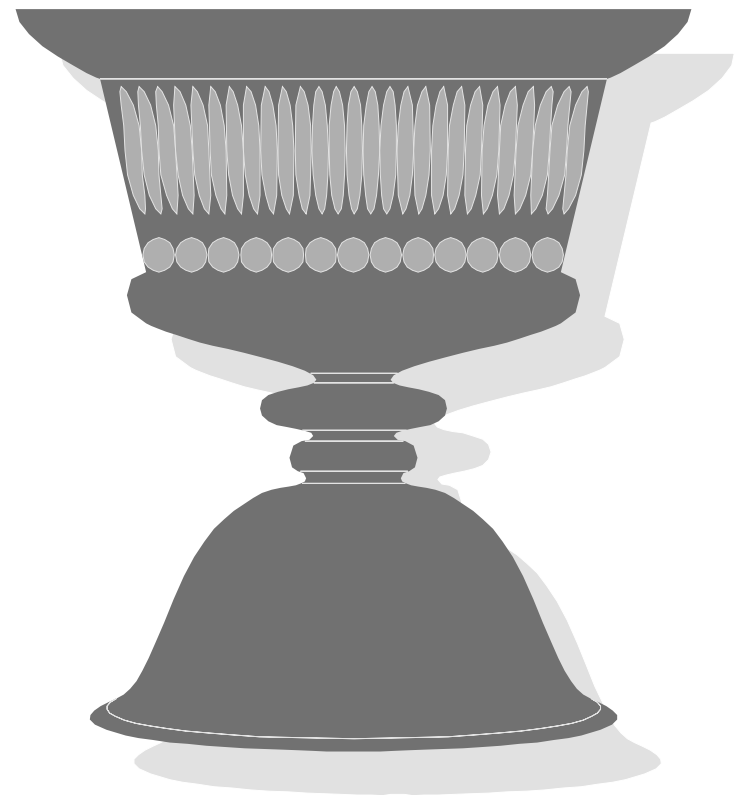
More important: next gen apps

- Clerkship Companion
- YourOnCall (YOC)



Long Term

- Go beyond “fetch for me”
- Holy grail of “think with me”
- GENERAL DISCUSSION





Questions

Email

russell.maulitz@drexel.edu

On the Web

<http://www.cis.drexel.edu/research/ihl>