Desktop Medicine:
for the Center for eHealth Information Adoption and Exchange

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Desktop Medicine

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JAMA. 2010;304(18):2061-2062 (doi:10.1001/jama.2010.1624)

http://jama.ama-assn.org/cgi/content/full/304/18/2061

Desktop Medicine

Jason Karlawish, MD

CONCEPTS OF DISEASE ARE ESSENTIAL FOR DEFINING medicine. By the 20th century, the dominant concept was pathology in an individual, the foundation for the bedside model of medicine. Bedside medicine organizes the patient-physician relationship around the chief concern, which guides the focus of the history taking and physical examination; medical training that em-

trate this. A physician gathers a patient's 12 clinical risk factors, enters data about those risk factors into an online model, and receives the patient's 10-year probability of a fracture, and then determines whether to recommend treatment.[4]

Desktop medicine has begun to transform how physicians diagnose bedside diseases. Risk measurements compete with signs and symptoms and encompass progressively milder stages of disease. For example, Alzheimer disease is transforming from a diagnosis based on dis-

Discovery of desktop disease

Longitudinal, epidemiological data shows a factor is associated with risk of negative health event

Randomized controlled trial shows an intervention on the factor reduces the likelihood of the event

Factor is redefined as a disease

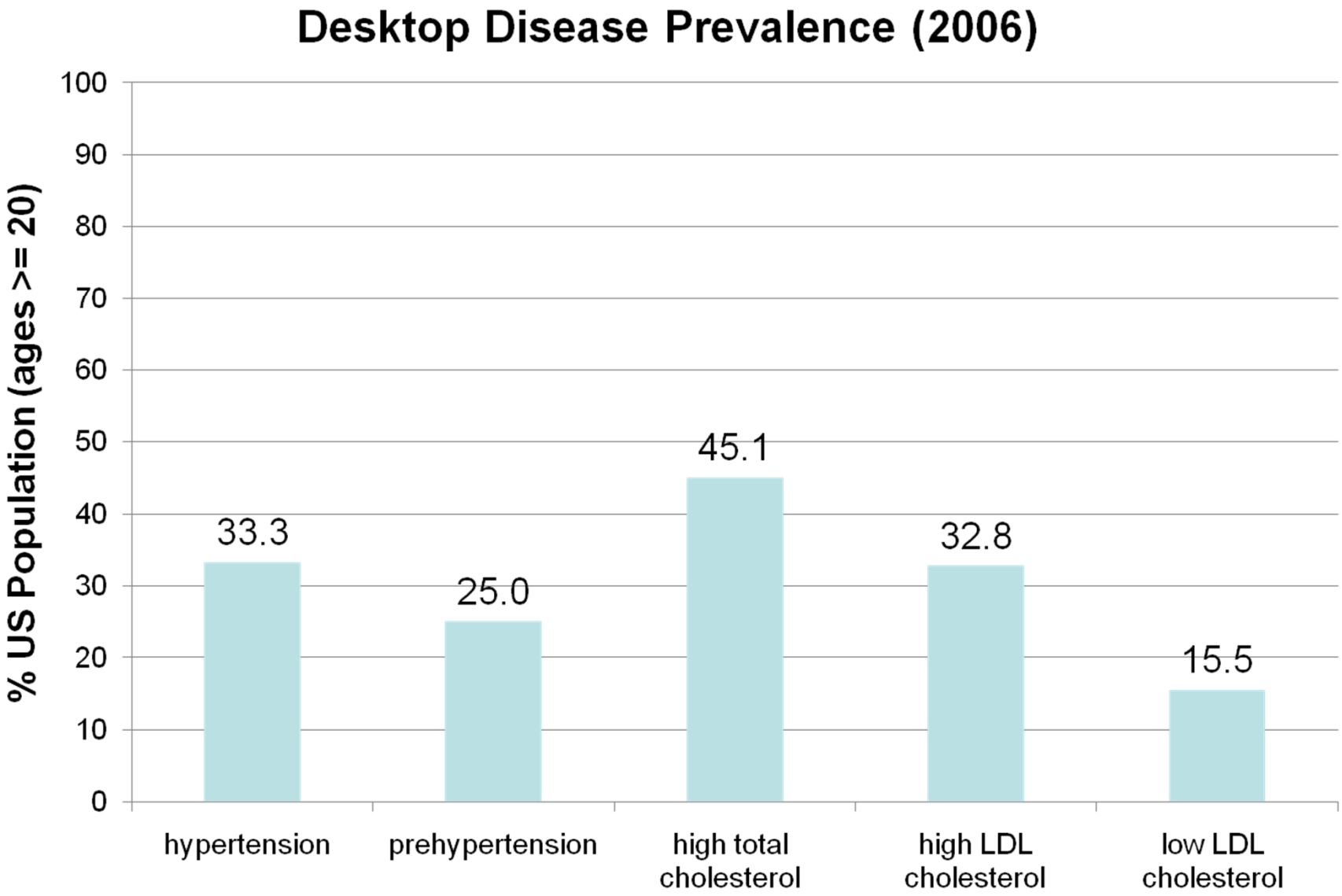
Framingham Heart Study shows association between systolic hypertension and cardiovascular disease in the elderly

SHEP trial shows chlorthalidone to reduce incidence of stroke and other cardio/coronary events

Systolic Hypertension in the Elderly is tranformed from an inevitable part of aging to a treatable disease

Desktop diseases

Disease	Diagnostic tool (DT)	Discrete clinical event (DCE)	Intervention to validate link between DT and DCE
Dyslipemia	NCEPIII	stroke, MI	statin drug
HTN	BP	stroke, MI	thiazide, beta-blocker
Osteoporosis	FRAX	bone facture	bisphosphonate
Diabetes	HgA1C	Dx of DM	insulin, thiaglitazone



Lloyd-Jones D, Adams R, Carnethon M, et al. Heart disease and stroke statistics--2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2009;119:e21-181.

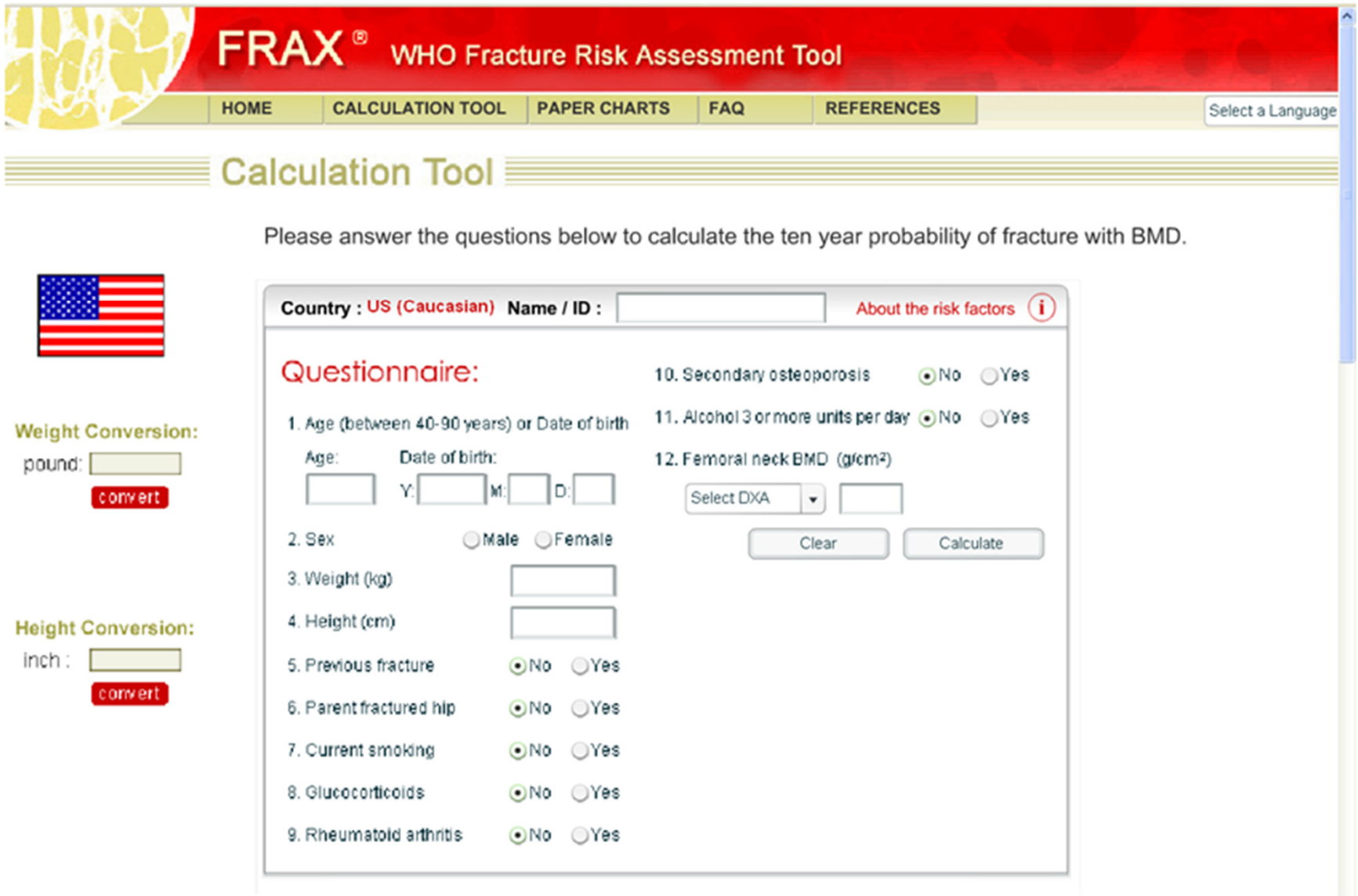
Leading Causes of Death, 2006

1. Heart disease (26%)
2. Cancer
3. Cerebrovascular diseases (5.7%)
4. Chronic lower respiratory diseases
5. Accidents
6. Diabetes mellitus (3%)
7. Alzheimer's disease
8. Influenza and pneumonia
9. Kidney disease
10. Septicemia
11. Intentional self-harm
12. Chronic liver disease and cirrhosis
13. Essential hypertension and hypertensive renal disease (1%)
14. Parkinson's disease
15. Assault

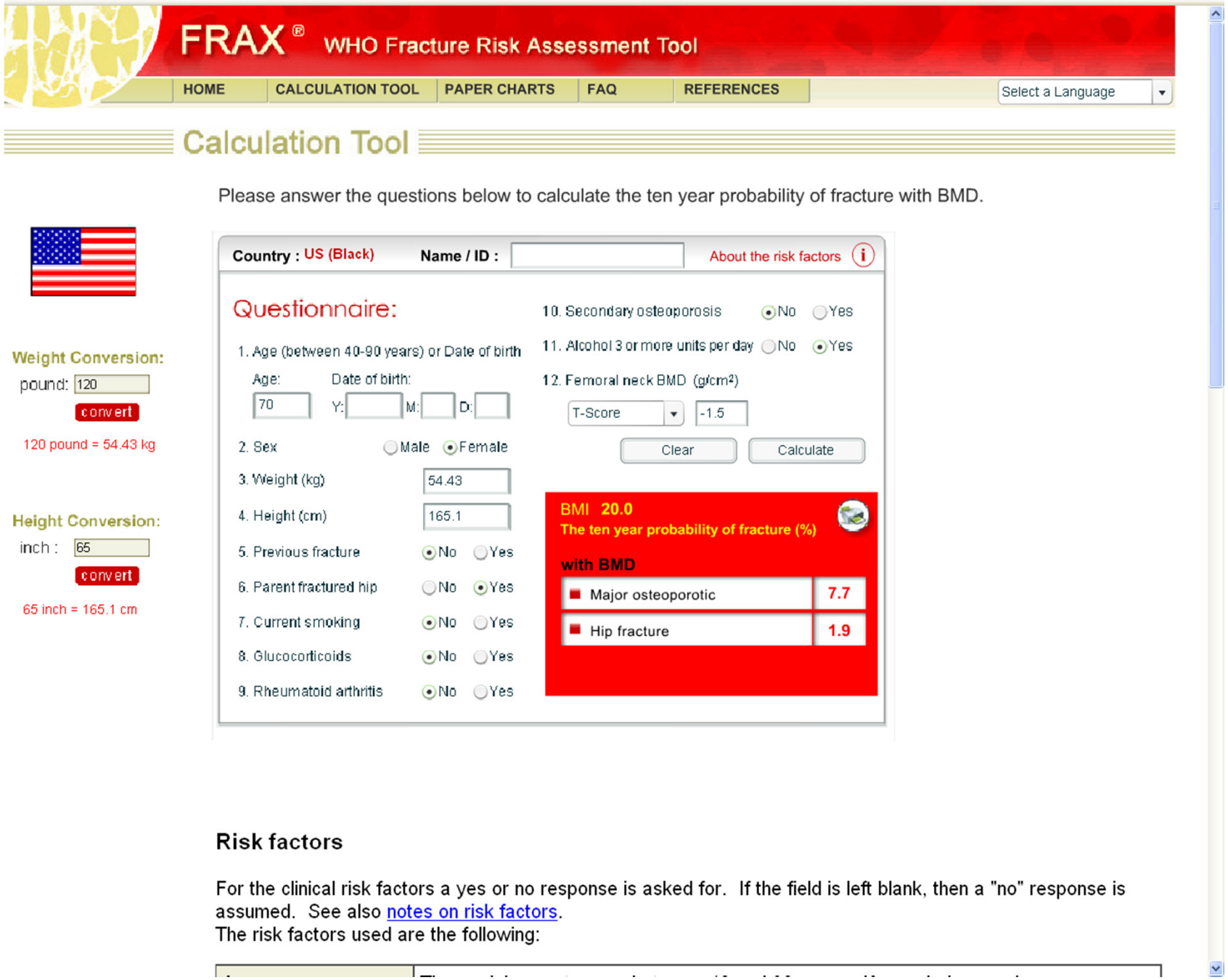
Red = desktop diseases

Heron M, Hoyert DL, Murphy SL, Xu J, Kochanek KD, Tejada-Vera B. Deaths: final data for 2006. National vital statistics reports : from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System 2009;57:1-134


Medical Economics
SMARTER BUSINESS » BETTER PATIENT CARE
WWW.MEMAG.C
December 5, 2008
The Rating Game
PATIENTS & INSURERS ARE RATING THE QUALITY OF YOUR CARE. DO YOU KNOW WHAT THEY'RE SAYING? p.18
Plus: DON'T LET A BAD RATING RUIN YOU p.27
Coding changes for 2009 p.30
An upswing in downcoding? p.9
AN ADVANSTAR PUBLICATION
ModernMedicine.com

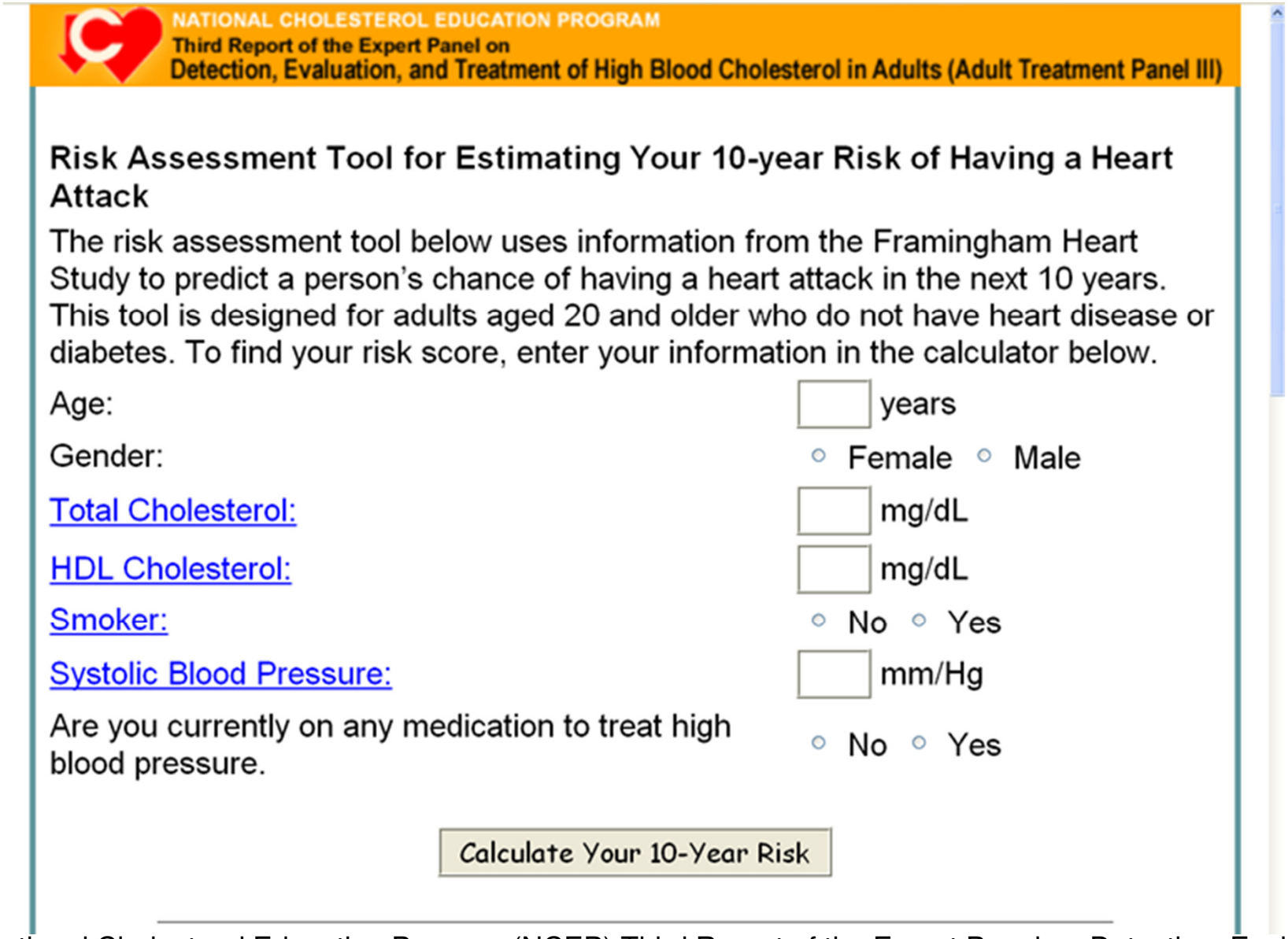


World Health Organization. FRAX: WHO fracture risk assessment tool. World Health Organization Collaborating Centre for Metabolic Bone Diseases, University of Sheffield, UK, 2008. (Accessed January 19, 2010, at http://www.shef.ac.uk/FRAX/index.htm.)



Risk factors

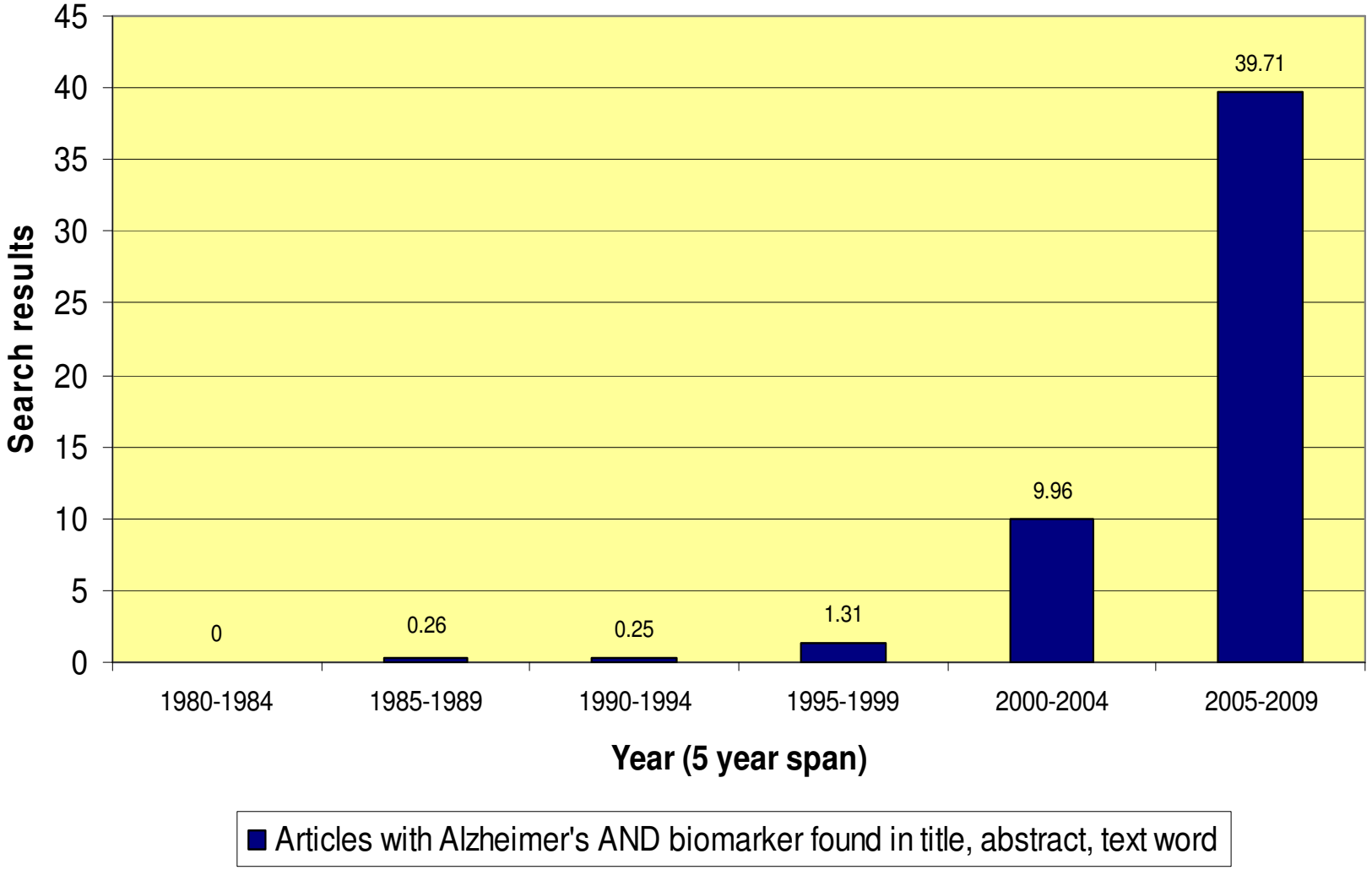
For the clinical risk factors a yes or no response is asked for. If the field is left blank, then a "no" response is assumed. See also notes on risk factors.
The risk factors used are the following:



National Cholesterol Education Program (NCEP) Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Risk Assessment Tool for Estimating Your 10-year Risk of Having a Heart Attack. The National Heart, Lung, and Blood Institute (NHLBI). (Accessed June 8, 2010, at http://hp2010.nhlbihin.net/atpiii/calculator.asp?usertype=pub.)


12TH
1024
HANK-
DIABETES
COMPLICATIONS
ARE COMING
TO GET YOU.
Know your risk. Know your A1C.
diabetesA1C.org
American Diabetes Association
Ad Council
JDRF

MEDLINE citations for [biomarker AND Alzheimer's], per 100,000 articles



Consequences of desktop diseases

- Drugs are critical for the *discovery* of disease
- “Disease” is the result of a multi-variate risk calculation.
  - Biomarker = disease fades (e.g. FRAX, NCEP)
- Label of “disease” as a category makes little sense
- Categories of prevention make little sense
- Prevalence of persons in need of treatment (i.e. disease) is very unstable.

Concept of Disease

Bedside Model	Desktop Model
Disease as pathology in an individual; typically identified by symptoms and signs *examples*: Alzheimers disease, congestive heart failure, ulcerative colitis, influenza pneumonia	Disease as a risk of future impairment in an individual *examples*: diabetes, dyslipemia, hypertension, osteoporosis. Also, early stages of bedside diseases such as ACC/AHA Stage A heart failure which describes “high risk for heart failure”

Approach to Diagnosis

Bedside Model	Desktop Model
History and Physical (the “H and P”), typically initiated by patient’s chief complaint. Results guide clinical-pathological correlation	Running the numbers. Results guide clinical-actuarial correlation which uses one or more factors to calculate a patient’s personalized risk assessment *example*: WHO FRAX criteria to calculate 10 year risk of fracture (www.sheffield.ac.uk/FRAX)
Distinguishes among primary, secondary, and tertiary prevention	Does not distinguish among primary, secondary and tertiary prevention

Clinical Inertia

recognition of the problem, but failure to act

Disease	**Intervention target (specific goal varies by patient population)**	**% of treated patients at treatment target**
Hypertension	Systolic blood pressure Diastolic blood pressure	45%
Hypercholesterolemia	LDL cholesterol	14%- 38%
Diabetes	hemoglobin A1c	33%

while the difficulties in managing asymptomatic problems are understandable… they do not mitigate the need to improve care for disorders such as hypertension, dyslipidemia, and diabetes

Phillips LS, Branch WT, Jr. , Cook CB, et al. Clinical Inertia. Ann Intern Med 2001;2001:825-34.

Running the numbers first?

Pro

Phillips & Twombly: *deal with blood pressure and glucose before asking about other problems*

it is our responsibility to help patients appreciate the importance of such disorders as hypertension and diabetes

Running the numbers first?

Con

Boyd & Leff: [running the numbers first] *does not adequately acknowledge a patient-centered perspective of chronic illness care*

Vijan, Hayward, Ubel: [the paradigm is] *at odds with fundamental principles of primary care interactions…* [physicians would be] *imposing their own priorities onto patients*

Criticism of traditional approach

Evidence-based paralysis: The failure to act in the absence of specific trial-based information

RCTomyopia: The belief that randomized and controlled trials are the only justification for clinical action

Ziemer DC, Phillips LS. The dogma of "tight control": Beyond the limits of evidence - Reply. Arch Intern Med 2006;166:1672.

New paradigm

Responsible physicians and patients should make decisions based on the best available evidence—including cell and animal studies, observational studies, and controlled trials, if available—and the strengths and weaknesses of the findings with each approach should be given due consideration

Ziemer DC, Phillips LS. The dogma of "tight control": Beyond the limits of evidence - Reply.
Arch Intern Med 2006;166:1672.

Case Study: NCEP guidelines

Cholesterol lowering treatment recommended for women at high risk of cardiac events despite lack of specific clinical trial evidence

The approach…is to review the entire body of scientific evidence…,including animal, pathologic, genetic, and epidemiological studies and clinical trials.

The alternative approach…would mean that many women would have a potentially preventable heart attack before they are accorded the benefits of therapy.

Petition to the National Institutes of Health seeking an independent review panel to re-evaluate the National Cholesterol Education Program Guidelines - Reply. 2004. (Accessed March 2, 2010, at http://www.nhlbi.nih.gov/guidelines/cholesterol/response.htm.)

Approach to Treatment

Bedside Model	Desktop Model
Clinical judgment with a preeminence for the results of randomized and controlled trials to select the best treatments for the pathology and to relieve the patient's symptoms	Clinical-actuarial correlation that integrates the patient's measured risk with the results of biological and cohort studies and clinical trial data to determine the value of reducing that patient's risk

Consequences of desktop practice

- Pre-eminence of the “chief complaint” to organize the medical encounter diminished
- The H&P is replaced by, stands beside “running the numbers”
- Pre-eminence of the randomized-controlled trial as the mechanism to determine therapy diminished
  - diagnosis and treatment are an actuarial exercise

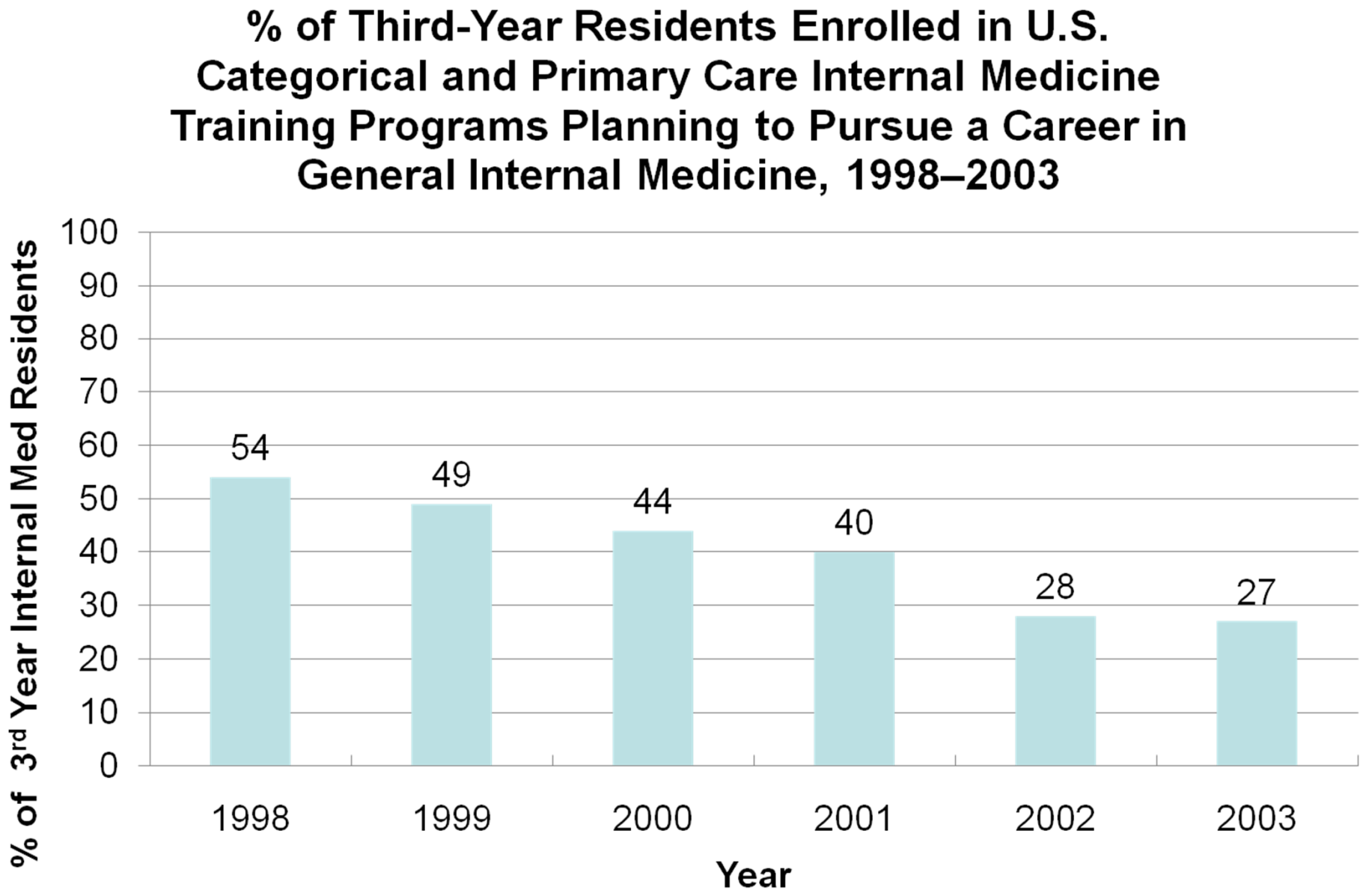
Medical Residents' understanding of biostatistics and results in the medical literature

Table 3. Percentages of Correct Answers for the Knowledge-Based Questions

Question No.[a]	Objective	Correct (95% CI), %
1a	Identify continuous variable	43.7 (37.8-49.5)
1b	Identify ordinal variable	41.5 (35.7-47.3)
1c	Identify nominal variable	32.9 (27.3-38.4)
2	Recognize a case-control study	39.4 (33.6-45.1)
3	Recognize purpose of double-blind studies	87.4 (83.5-91.3)
4a	Identify ANOVA	47.3 (41.4-53.2)
4b	Identify χ^2 analysis	25.6 (20.5-30.8)
4c	Identify *t* test	58.1 (52.3-63.9)
5	Recognize definition of bias	46.6 (40.7-52.4)
6	Interpret the meaning of *P* value >.05	58.8 (53.0-64.6)
7	Identify Cox proportional hazard regression	13.0 (9.0-17.0)
8	Interpret standard deviation	50.2 (42.3-56.1)
9	Interpret 95% CI and statistical significance	11.9 (8.0-15.7)
10	Recognize power, sample size, and significance-level relationship	30.3 (24.9-35.7)
11	Determine which test has more specificity	56.7 (50.8-62.5)
12	Interpret an unadjusted odds ratio	39.0 (33.3-44.7)
13	Interpret odds ratio in multivariate regression analysis	37.4 (31.9-43.3)
14	Interpret relative risk	81.6 (77.0-86.2)
15	Determine strength of evidence for risk factors	17.0 (12.6-21.4)
16	Interpret Kaplan-Meier analysis results	10.5 (6.9-14.1)

Abbreviations: ANOVA, analysis of variance; CI, confidence interval.
[a] See Appendix.

Windish DM, Huot SJ, Green ML. Medicine Residents' Understanding of the Biostatistics and Results in the Medical Literature JAMA 2007;298:1010-1022.



Garibaldi RA, Popkave C, Bylsma W. Career plans for trainees in internal medicine residency programs. Acad Med 2005;80:507-12

Desktop medicine and medical education

- A gap exists between reality of desktop diseases and how physicians are selected & trained

- Medical education should increase focus on desktop sciences (epidemiology, decision sciences, biomarker-focused lab. sciences)
  - attract students who are likely to be interested in desktop medicine
  - ensure that new physicians are adequately trained to care for desktop diseases

Core Sciences for premed and medical education

Bedside Model	Desktop Model
• Anatomy • Biology • Biochemisty • Histology • Organic chemistry • Pathology • Physiology	• Laboratory sciences oriented toward biomarker discovery (e.g. genomics) • Economics • Epidemiology • Information sciences • Psychology • Statistics

Talking about Desktop Diseases

- Bedside diseases are categorical
  "I have osteoporosis."

- Desktop diseases are dimensional
  "*I have a 1.9% chance of major osteoporotic fracture"*

- Implications for patient communication and decision-making

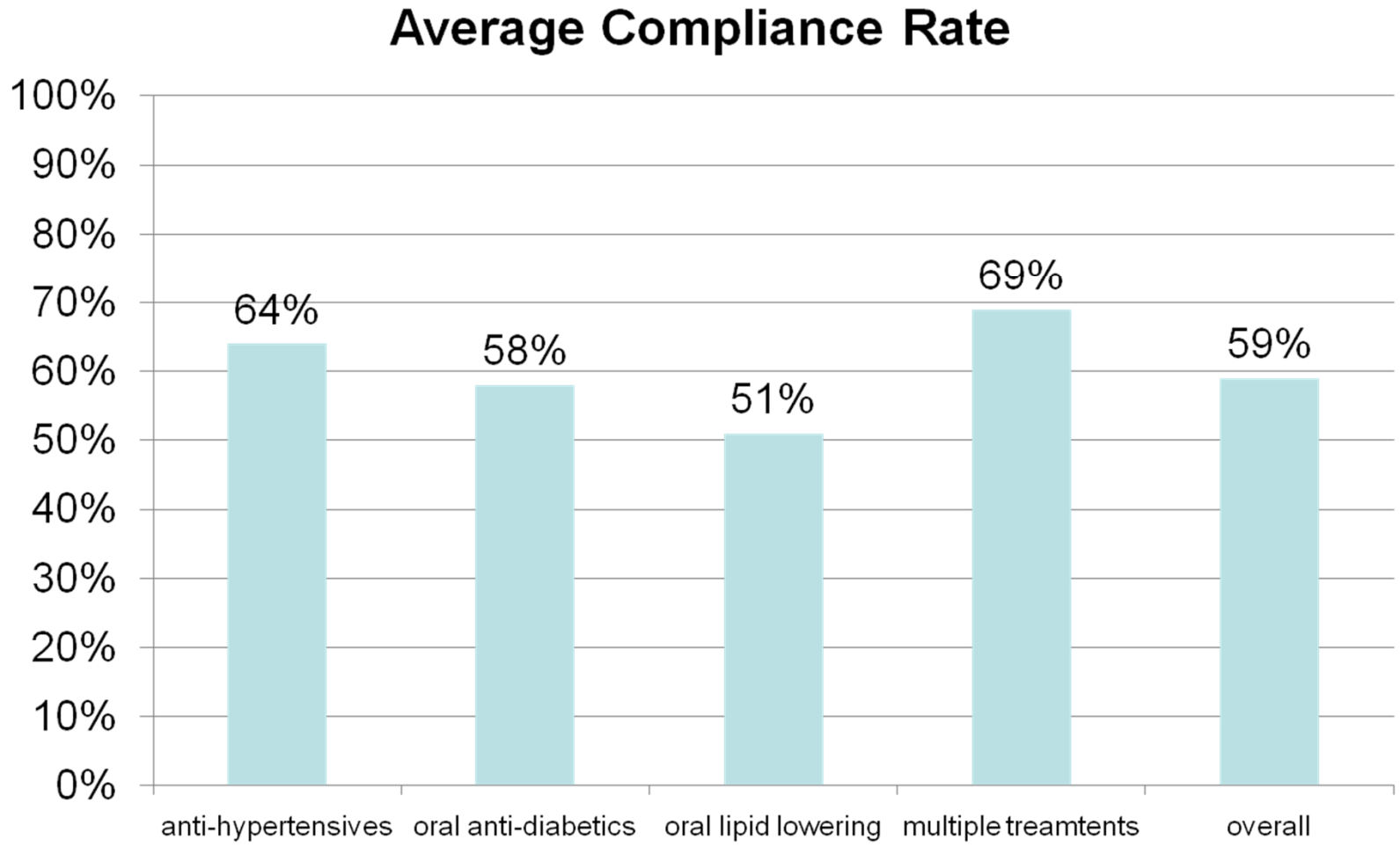
Feeling risk: getting the gist

"'*I know what you told me, but this is what I think*:' Perceived risk of Alzheimer disease among individuals who accurately recall their genetics-based risk estimate."

- Among 158 participants who accurately recalled their AD risk assessment 6 weeks after risk disclosure…
  - 75 (47.5%) said AD risk was more than 5% points *different* from their *calculated AD risk estimate*.

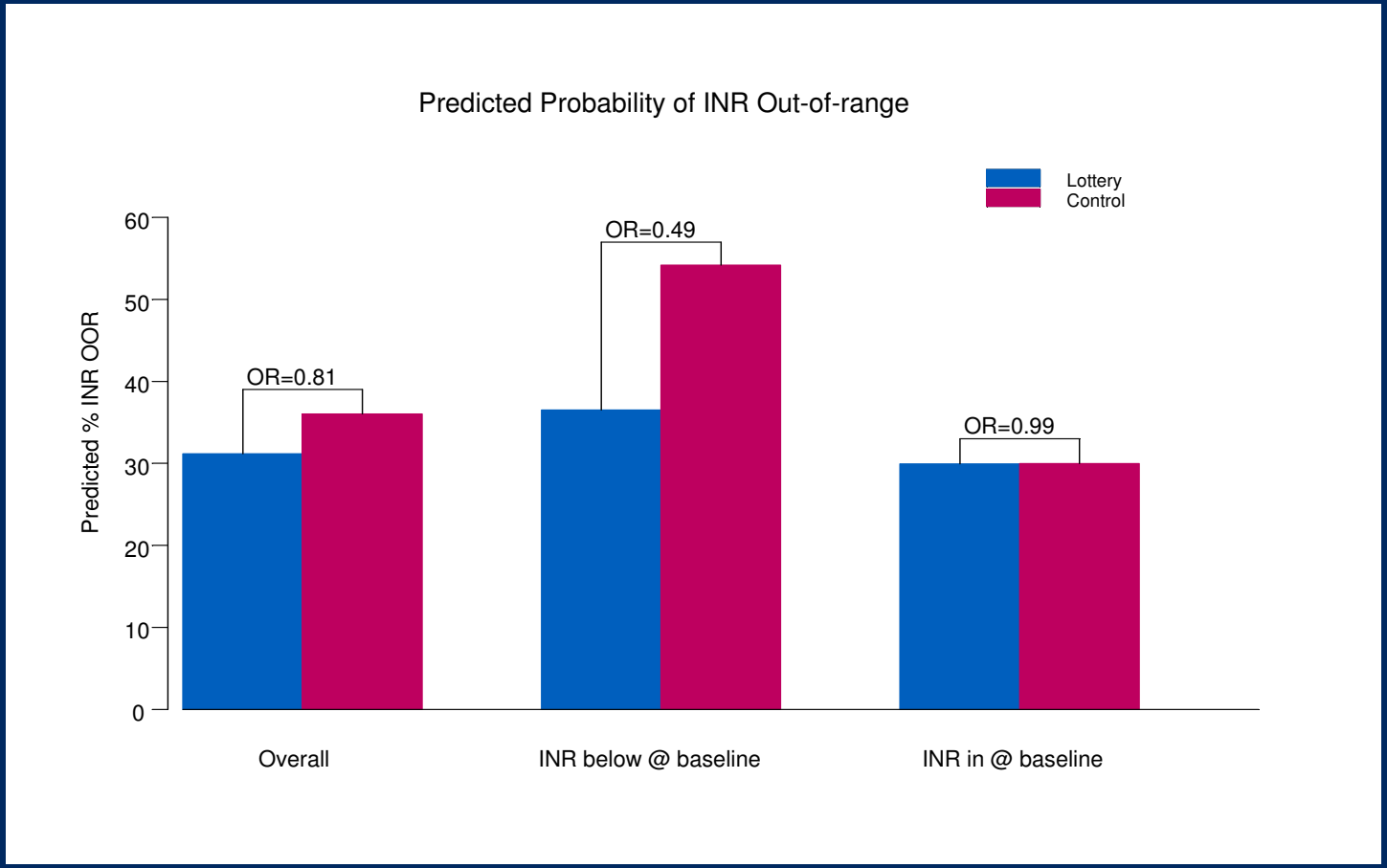
Linnenbringer et al. Genetics in Medicine. in press.

Desktop diseases & medication non-adherence



Cramer JA, Benedict A, Muszbek N, et al. The significance of compliance and persistence in the treatment of diabetes, hypertension and dyslipidaemia: a review. Int J Clin Pract 2008;62:76-87.

Significant impact on reducing time out of INR range in 2-arm RCT using daily lotteries



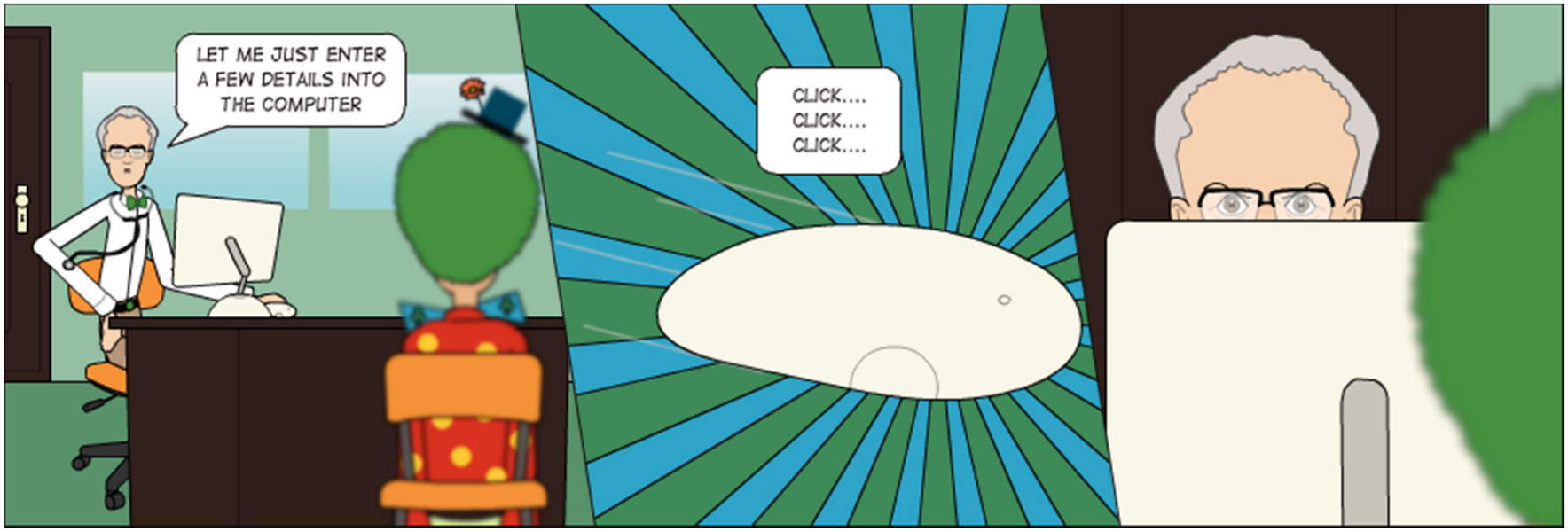
- R01 HL090929 (Kimmel/Volpp Mult PIs) will test impact of incentives vs. reminders vs. incentives and daily reminders

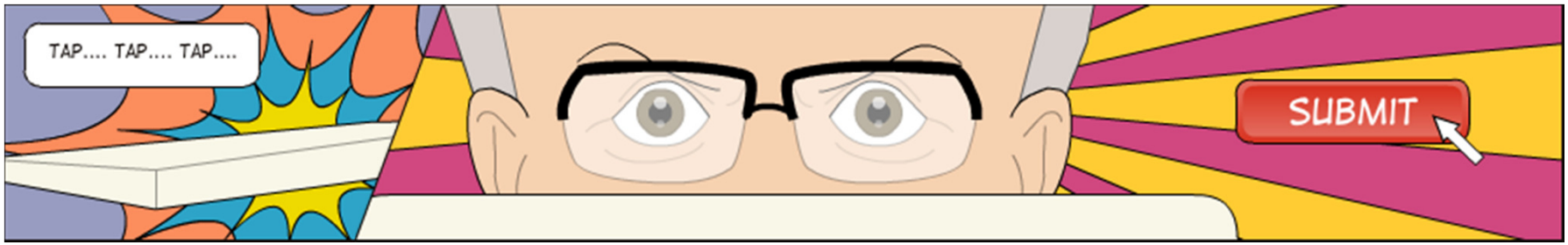
Kimmel, Loewenstein, Troxel, Doshi, Volpp, 2011 under review

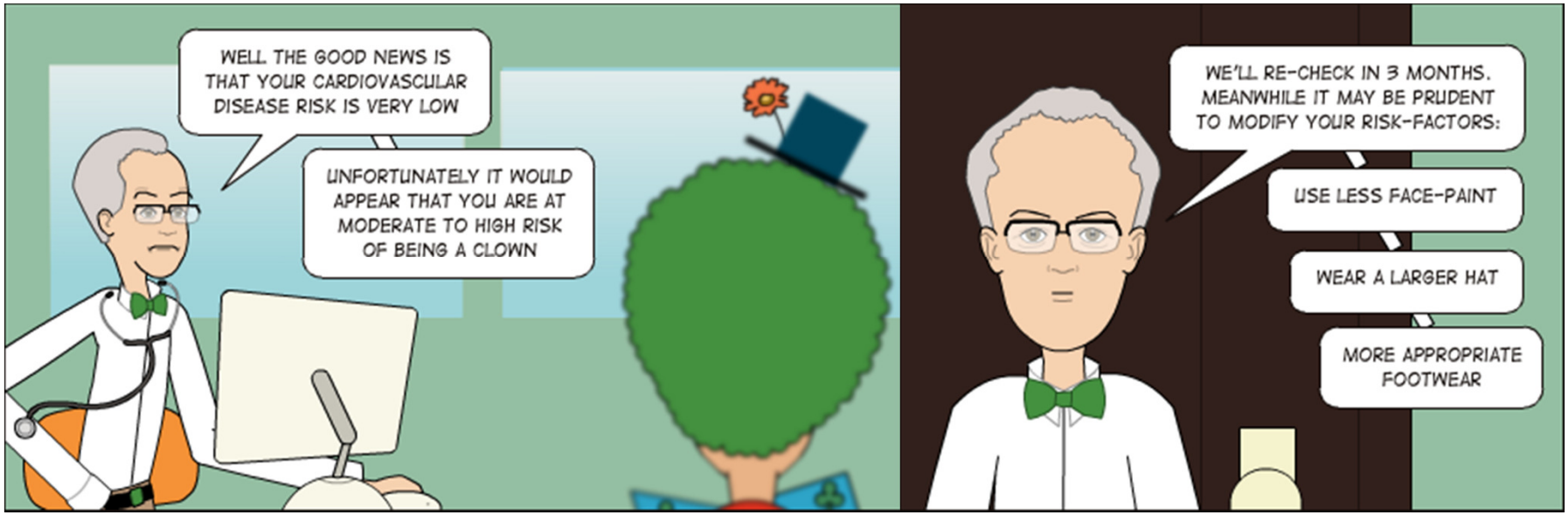
Consequences of desktop treatment

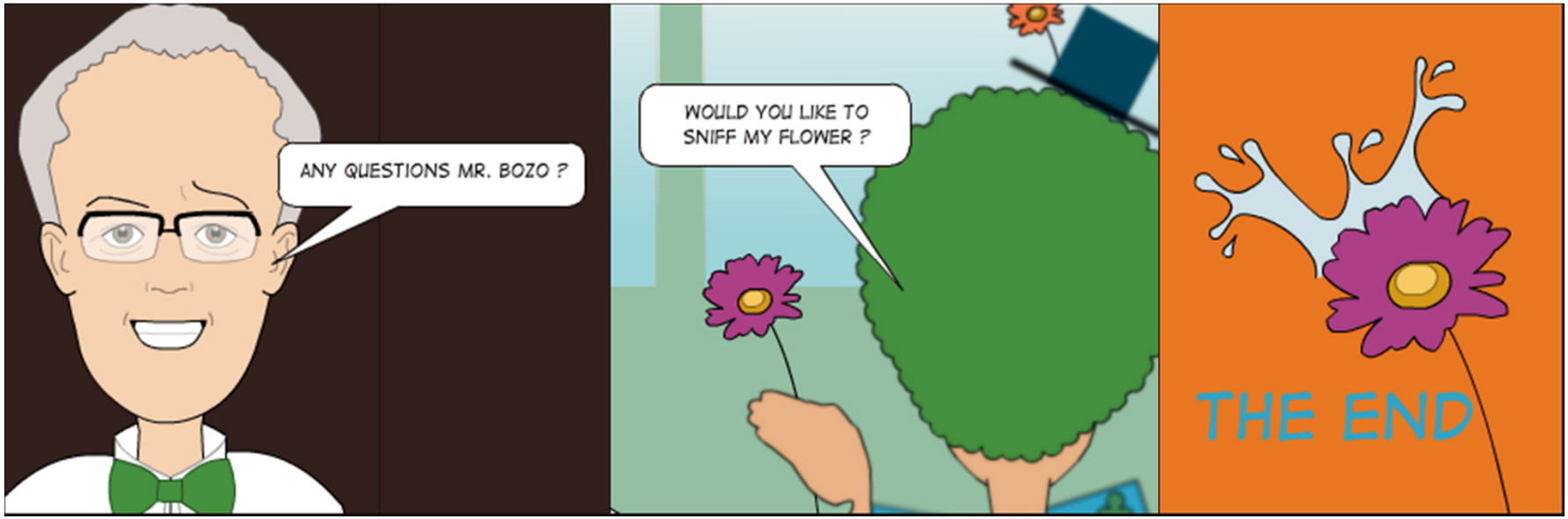
- Physicians need to learn how to make their patients “feel their” risk
- Physicians need to become comfortable with mechanisms that manipulate behavior, including seemingly non-medical approaches such as payments for adherence

http://smintoncomic.blogspot.com/2010/11/desktop-doctor.html


LET ME JUST ENTER A FEW DETAILS INTO THE COMPUTER
CLICK....
CLICK....
CLICK....


TAP.... TAP.... TAP....
SUBMIT


WELL THE GOOD NEWS IS THAT YOUR CARDIOVASCULAR DISEASE RISK IS VERY LOW
UNFORTUNATELY IT WOULD APPEAR THAT YOU ARE AT MODERATE TO HIGH RISK OF BEING A CLOWN
WE'LL RE-CHECK IN 3 MONTHS. MEANWHILE IT MAY BE PRUDENT TO MODIFY YOUR RISK-FACTORS:
USE LESS FACE-PAINT
WEAR A LARGER HAT
MORE APPROPRIATE FOOTWEAR


ANY QUESTIONS MR. BOZO ?
WOULD YOU LIKE TO SNIFF MY FLOWER ?
THE END

Closing thoughts on desktop medicine and the EMR

- The electronic medical record is as essential to desktop medicine as the hospital-based laboratory was to bedside medicine.
  - discover, diagnose, treat, and track disease
- “electronic medical record” is an incomplete term
- Electronic medical database is better – the EMDB

Closing thoughts on desktop medicine and the EMDB

- The more the EMDB is national and public, not local and private, the more it will serve scientific interests
  - the conjoining of EMDB data with $ creates a potential conflict of interest
- Drugs are for as long as their patents remain, but databases and technology are forever…

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