

Telehealth and Diabetes Care Management

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Poll Question

What is your primary professional role?

- Clinician
- Non-clinician Investigator
- Healthcare administration
- Information technology support
- Other

Poll Question

What is your interest in telehealth?

- I'm using telehealth technologies in the care of patients.
- I'm not familiar with the topic and would like to learn more.
- I had nothing better to do today, so I decided to sign-up for this conference.

Telehealth

- *(Telemedicine)*

The use of information and communication technology to provide clinical care, patient education, provider education, and hospital administration in circumstances where distance separates those receiving services and those providing services.

Care management

- *(Care coordination or case management)*
Facilitating delivery of the right care, in the right place at the right time.
In most cases, the home is the preferred place of care

Interactive behavior change technology

- The use of hardware and software to promote and sustain behavior change (e.g. PDAs, websites, automated telephone calls)
- Assists patients and clinicians in monitoring patient's health status, supports patients' efforts to make changes, and enhances communication between patients and clinicians

Is Telehealth technology important?

- Generally accepted based on validation studies or anecdotal reports
- Few studies to assess cost-effectiveness
- FDA ranked home telehealth in top 5 of 36 new medical technologies in terms of impact on healthcare over the next 10 years

Telehealth applications

- **Patient-to-provider – basic information**
 - Ask basic questions, offer prompts, limited data
 - **Patient-to-provider – complex information**
 - Internet-based portals
-
- **Clinical peer-to-peer – basic information**
 - Tele-radiology, dermatology, ophthalmology
 - **Clinical Peer-to-peer – complex information**
 - Remote consultation

Patient-to-Provider Telehealth



Health Buddy



Viterion 100



Home PC

Can education and
care management be
delivered remotely?

Computer Use and Internet Access

- Survey of Ambulatory Care patients -VABHS
894 respondents, age 62
 - 53% with computer access
 - 63% interested in receiving health information via the Internet

Internet-based applications

- ***Weight management using e-counseling***
 - *Greater weight loss with website access and e-counseling*
- ***Interactive asthma education website***
 - *Access to a website was associated with:*
 - *Increased asthma knowledge, reduced symptom days, fewer ER visits, lower steroid doses*

Tate DF et al. JAMA 2003; 289: 1833-1836

Krishna S et al. Pediatrics 2003; 111: 503-510.

Telephone-based management

- **Telephone calls with RN follow-up**
 - *Biweekly automated telephone calls; most benefit when A1c >8% (net effect- 0.5 -1.1%)*
- **Mobile phone and SMS messaging**
 - *Patients send glucose results via phone, receive message from nurse*
 - *Decrease in A1c by 1.1% over 12 weeks*

Piette JD et al. Diabetes Care. 2001;24:202-208

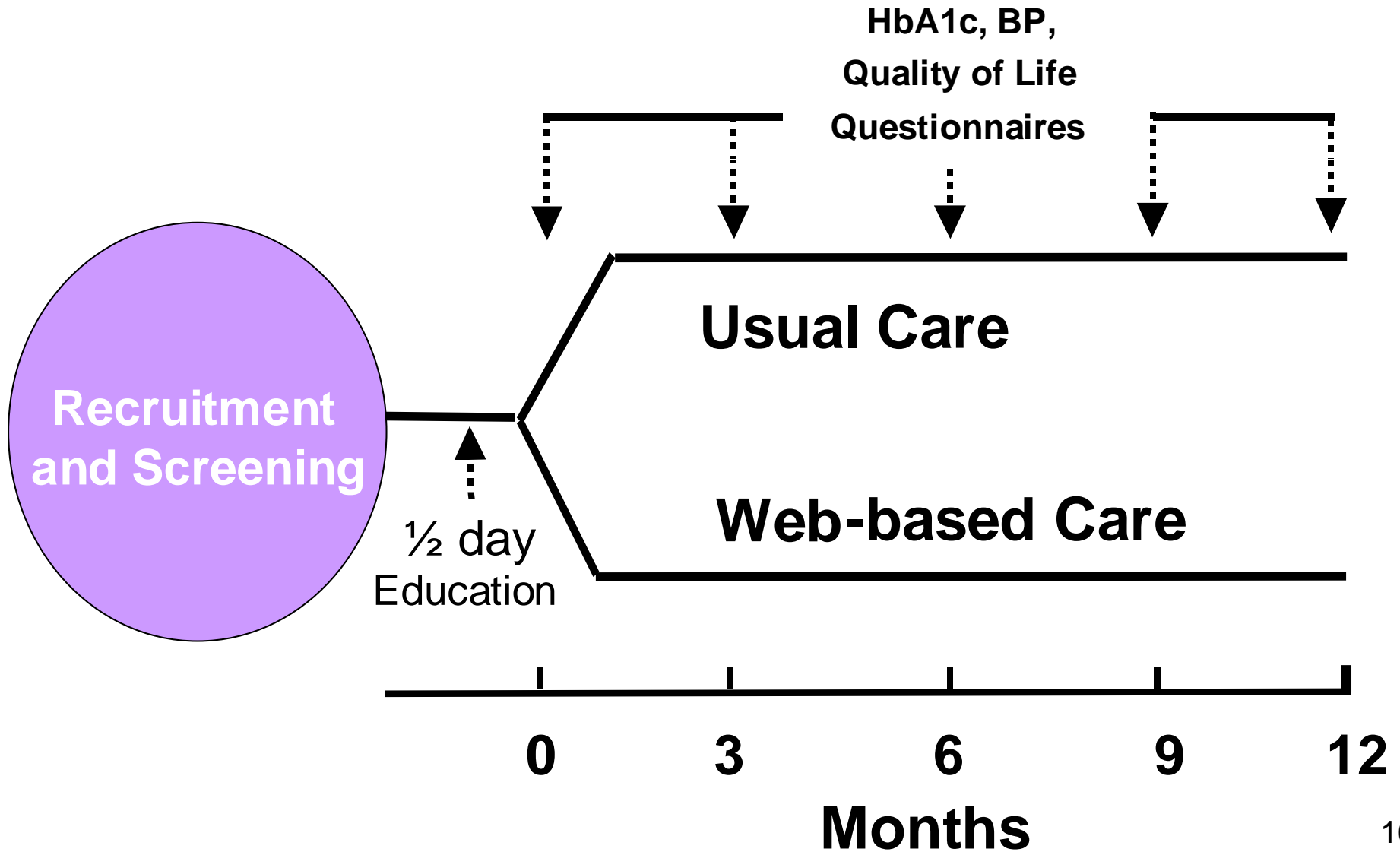
Kim HS. Int J Nurs Stud. 2007; 44:687-692

Care management - *caution*

- ***Nurse care management***
 - *246 patients, A1c 9.3%*
 - *Nurse care management using algorithms; follow-up over 18 months*
 - *No difference in A1c, BP, lipids*
 - *Intervention resulted in greater satisfaction with diabetes care*

Web-based diabetes education and care management

Web-based care management



Methods

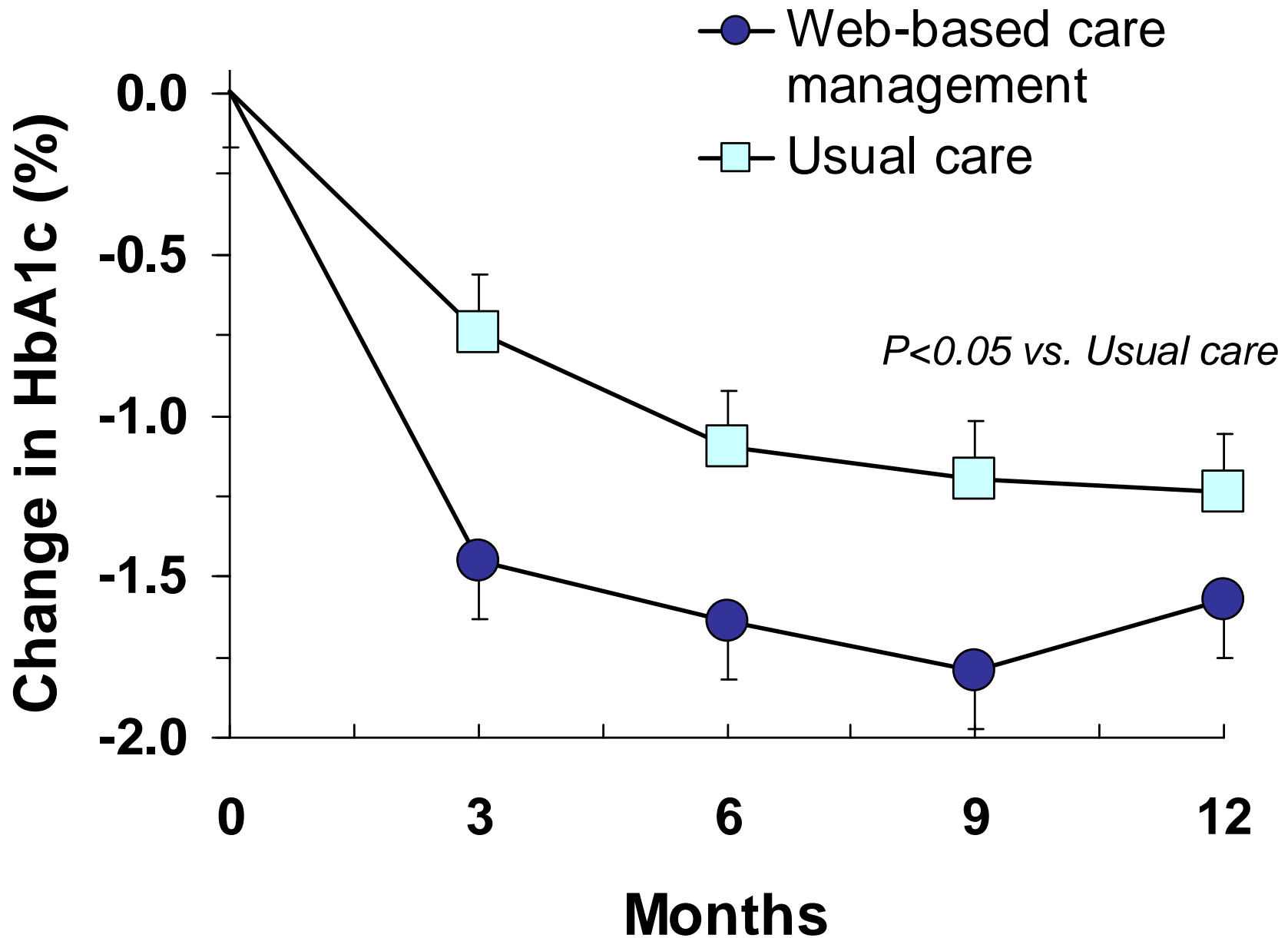
- ***Web-based care management***
 - Provided with notebook computer, glucose and BP monitors and dial-up access to MyCareTeam™ website
 - Upload glucose and BP data
 - Interact with care manager via internal messaging system on website
 - Care manager uses algorithms to improve glucose and BP control
- ***Usual care-*** on-going care by their PCP

Clinical Characteristics

Baseline Characteristics ($n = 104$)

- HbA1c 10%
- Age (years) 64
- BMI (kg/m²) 33
- Sex (% male) 99
- Duration of diabetes (yrs) 12
- Prior Internet access (%) 29

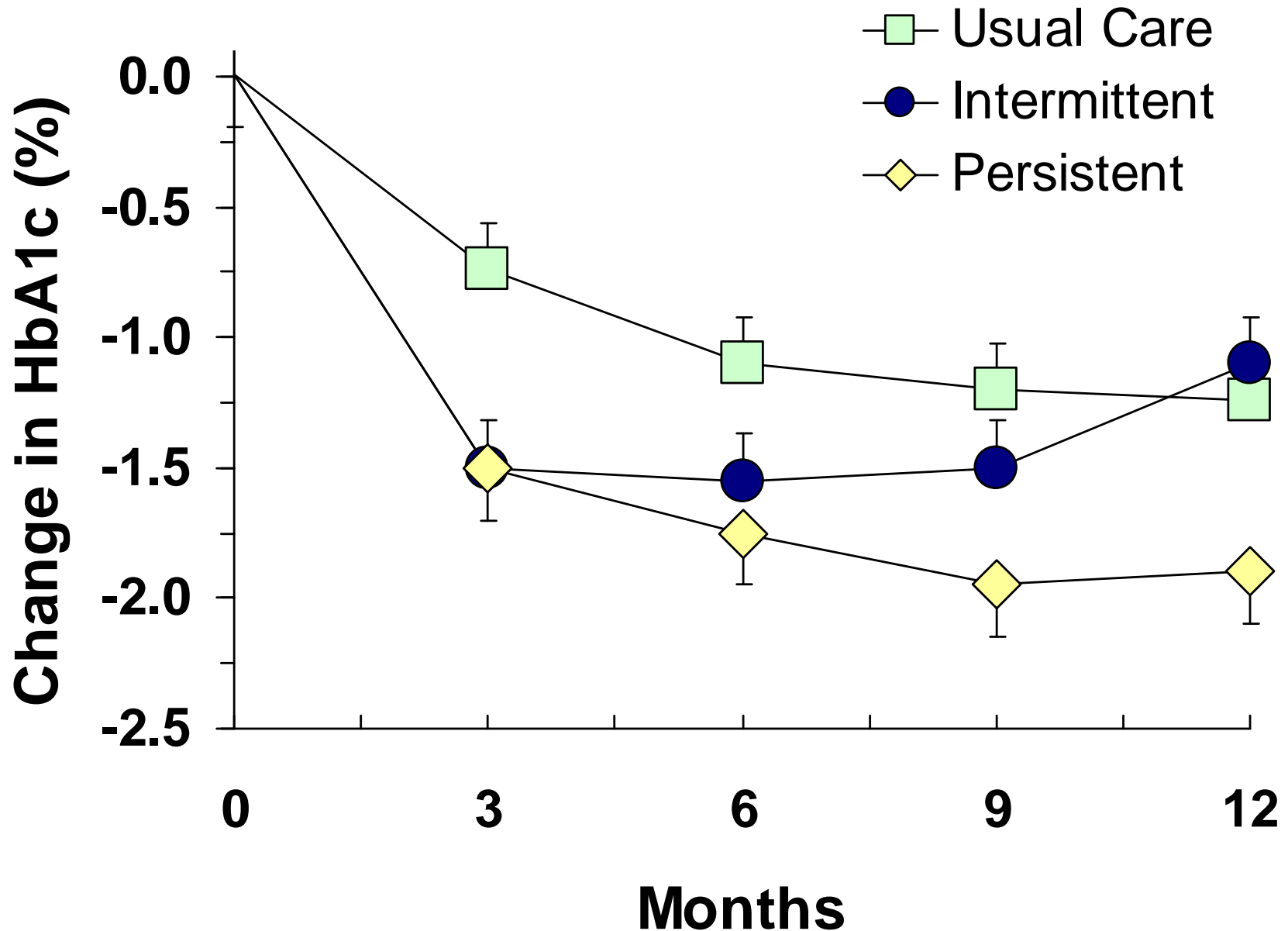
HbA1c over 12 months



Persistence with web-site logins

- *Persistent users (n = 30)*
 - At least one website login every 3 months
- *Intermittent users (n = 22)*
 - >3 months during the study with no registered logins

HbA1c based on persistence

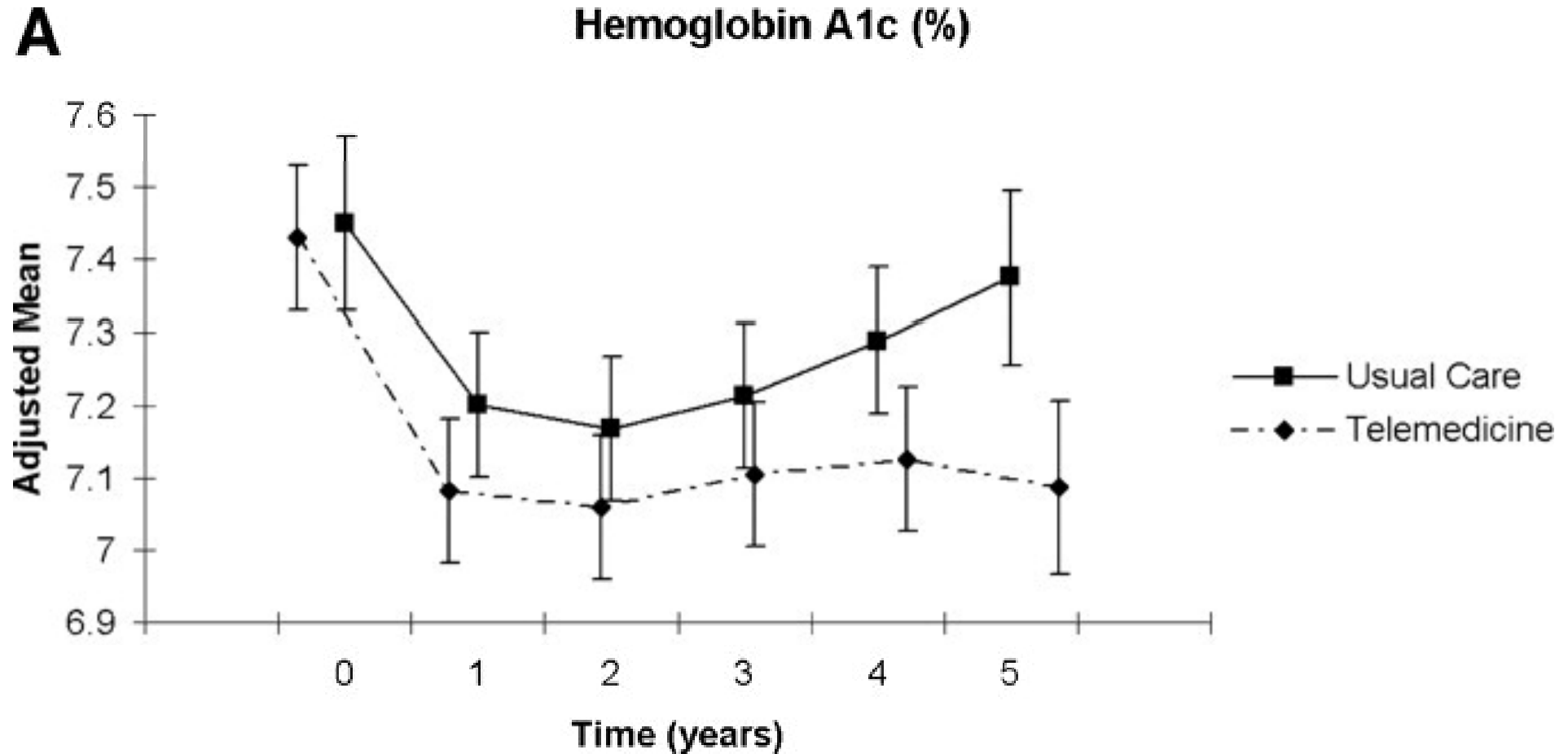


IDEATel – Methods

Informatics for Diabetes Education and Telemedicine

- ***Telemedicine intervention***
 - *Telemedicine in-home unit with nurse case management*
- ***Randomized trial***
 - *Intervention vs. usual care*
- ***Medicare beneficiaries (n = 1665)***
 - *Diabetes, >55 years, medically under-served areas in NY (upstate and NYC)*

IDEATel – Change in A1c

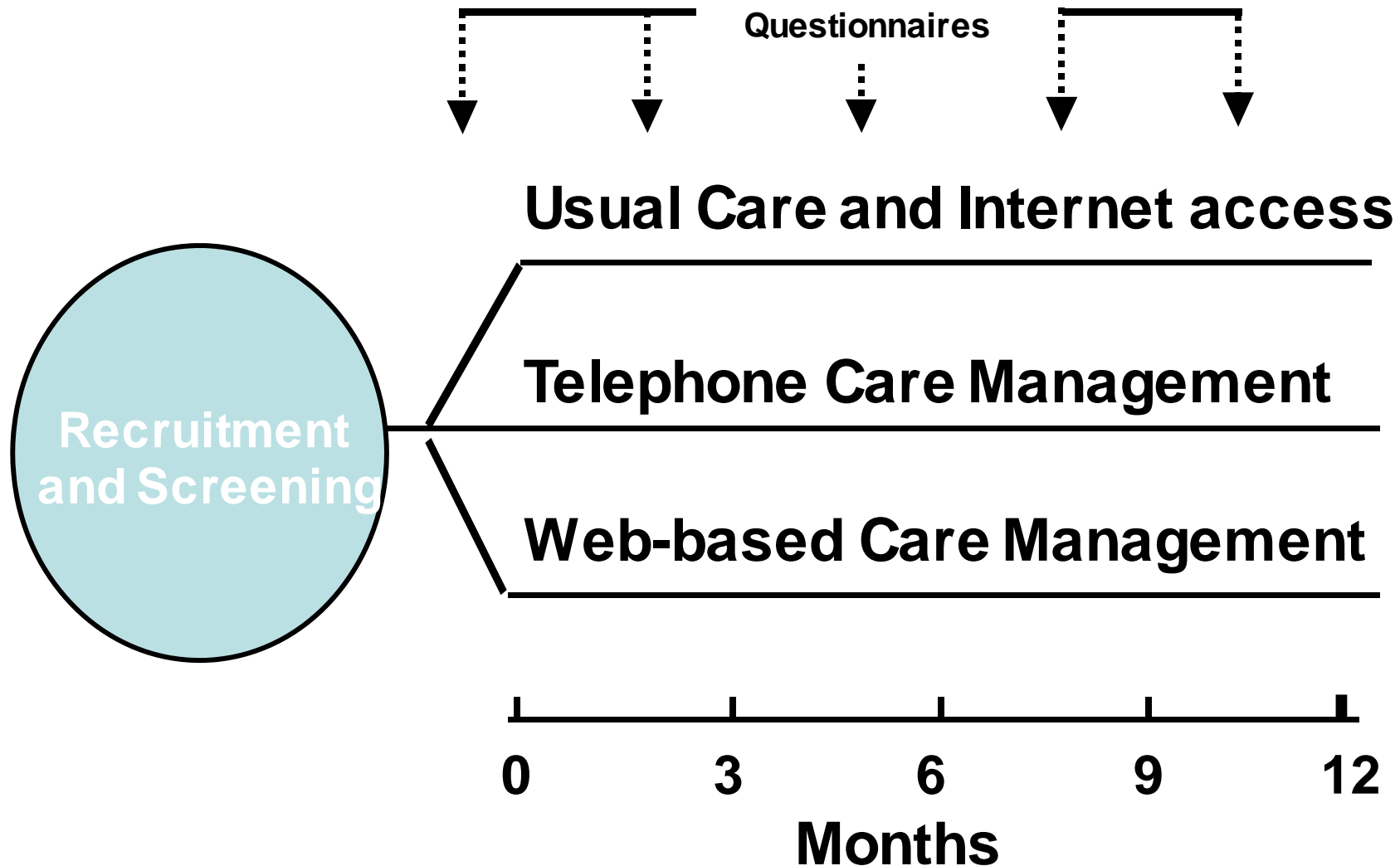


IDEATel – Caveats

- ***Modest clinical effects***
 - *Small but significant changes – A1c (0.29%), SBP (4.3 mm Hg), lipids (3.8 mg/dl)*
- ***No mortality benefit***
 - *Likely under-powered*
- ***Increased costs***
 - *\$8,000 per person per year for intervention*
 - *Total Medicare costs 71% higher in intervention group*

Care management vs. Internet access?

Care management vs. Internet access



Methods

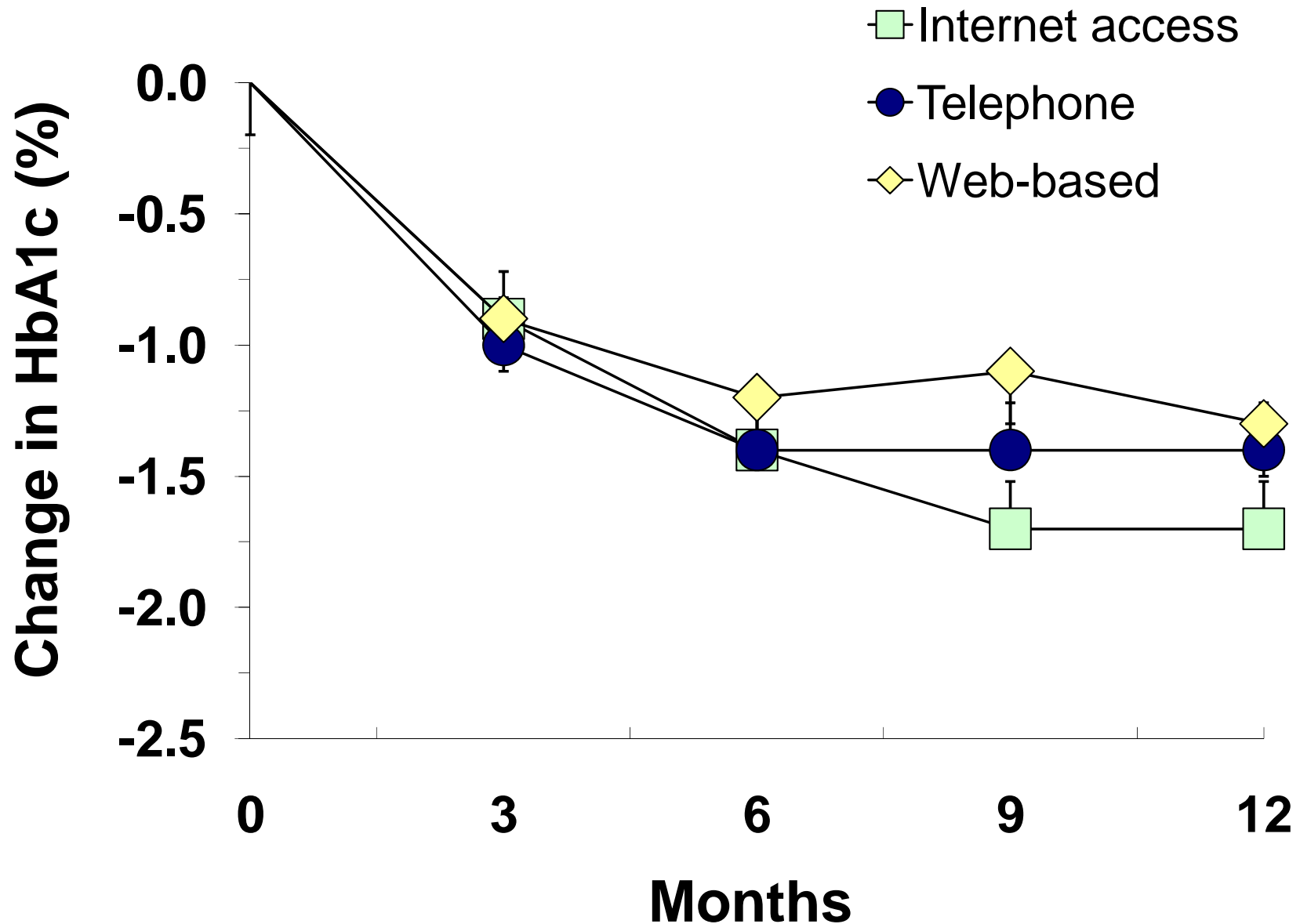
- ***Web-based care management***
 - Notebook computer, glucose and BP monitors, access to website, care manager
- ***Telephone-based care management***
 - Glucose and BP monitors, routine access to care manager via phone and office visits
- ***Internet access***
 - Notebook computer and Internet access; home-page set to web-based diabetes care resources

Clinical Characteristics

Baseline Characteristics ($n = 104$)

- HbA1c 9.9%
- Age (years) 60
- Sex (% male) 95
- Duration of diabetes > 5 y 78%
- Some college education 60%

HbA1c over 12 months



Clock-drawing test

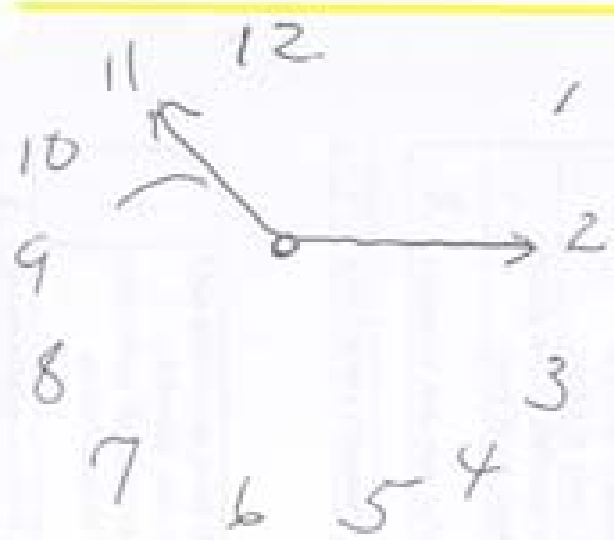
- In the paper provided draw a clock face, with numbers, in the blue box
- Show the hands of the clock pointing to 10 minutes after 11 o'clock

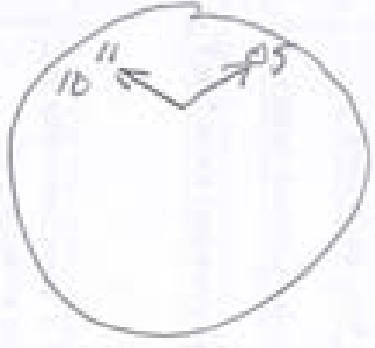


Handwriting practice area with a red border. The page contains faint, illegible text and a grid pattern, likely from a worksheet.

Handwriting practice area with a yellow border. The page contains faint, illegible text and a grid pattern, likely from a worksheet.

Handwriting practice area with a green border. The page contains faint, illegible text and a grid pattern, likely from a worksheet.







[Faint, illegible handwriting in the top-left quadrant, possibly a list or notes.]

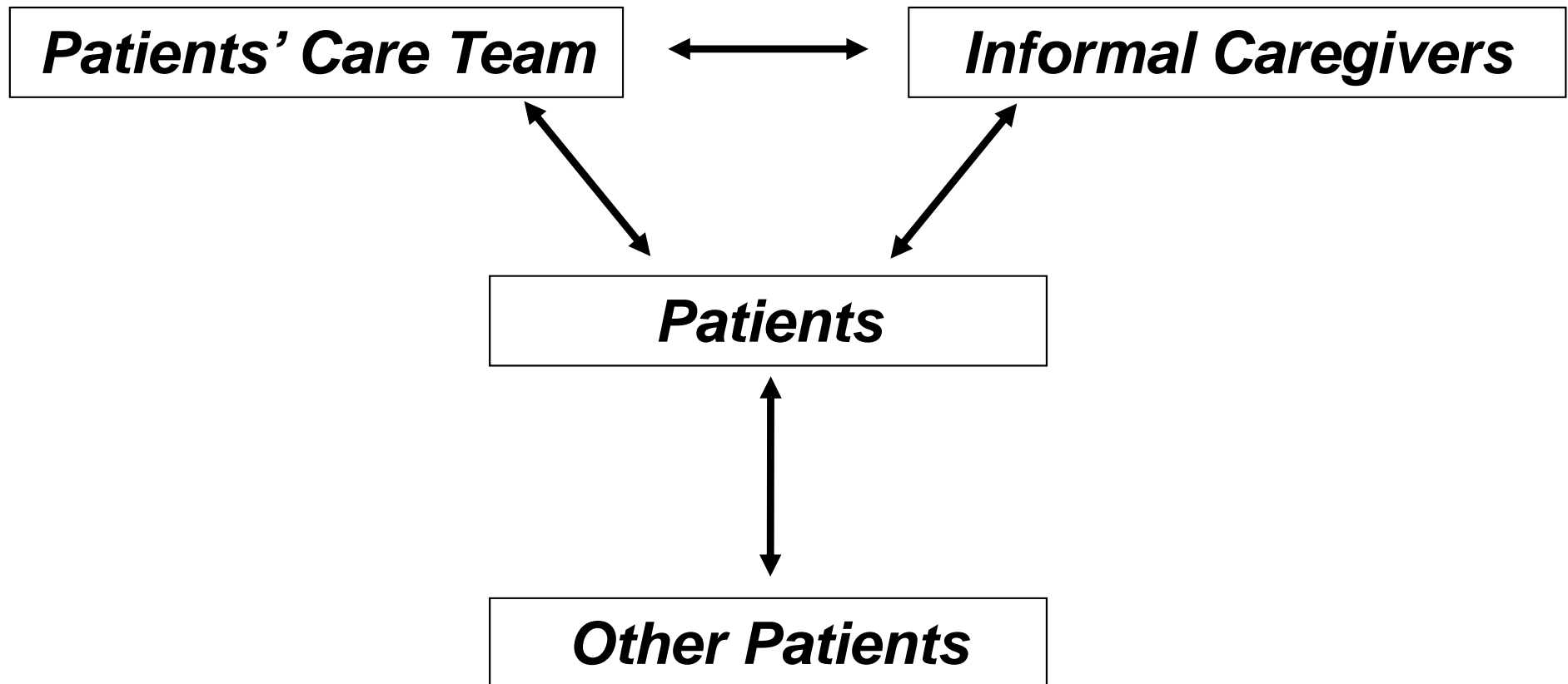
[Faint, illegible handwriting in the top-right quadrant, possibly a list or notes.]

[Faint, illegible handwriting in the bottom-left quadrant, possibly a list or notes.]

[Faint, illegible handwriting in the bottom-right quadrant, possibly a list or notes.]

Interactive Behavior Change Technology

Communication links that could be targeted by IBCT



Interactive behavior change technology

- Look before you leap
- One size does not fit all
- Beware of “cool” applications
- IBCT should support human contact
- Diabetes self-management is rarely patients' primary life concern
- Not all patients need IBCT
- Innovations require multidisciplinary collaborations

Future Directions

- What component(s) are responsible for improved glucose control?
- Which patient characteristics identify those who will benefit from e-health applications?
- Fitting technology with patients
- Identifying cost-effective strategies
- How to sustain persistence

Summary

Telehealth-based diabetes management

- Clinical benefits demonstrated – but...
 - Key components are unclear
 - One size does not fit all
 - Patient persistence is likely required
 - Questionable cost-effectiveness

When you come to a fork in the
road, take it.

Lawrence “Yogi” Berra

Tele-retinal Imaging

Who? What? Where? When? Why?

History of Teleretinal Imaging in VISN-1

- FY1998 – VA – Department of Defense – Joslin Diabetes Center collaboration established
- FY1999 – Teleretinal imaging begun at VA Boston and in VISN-20
- FY2000 – Image acquisition at Togus VAMC
- FY2001 – VHA convenes expert panel to review criteria
- FY2006 – VHA establishes national teleretinal imaging program
National Training Center at VA Boston
- FY2007 – Image acquisition at multiple sites; image interpretation at VA Boston
- FY2008 >200,000 patients accessed

Tele-retinal Imaging

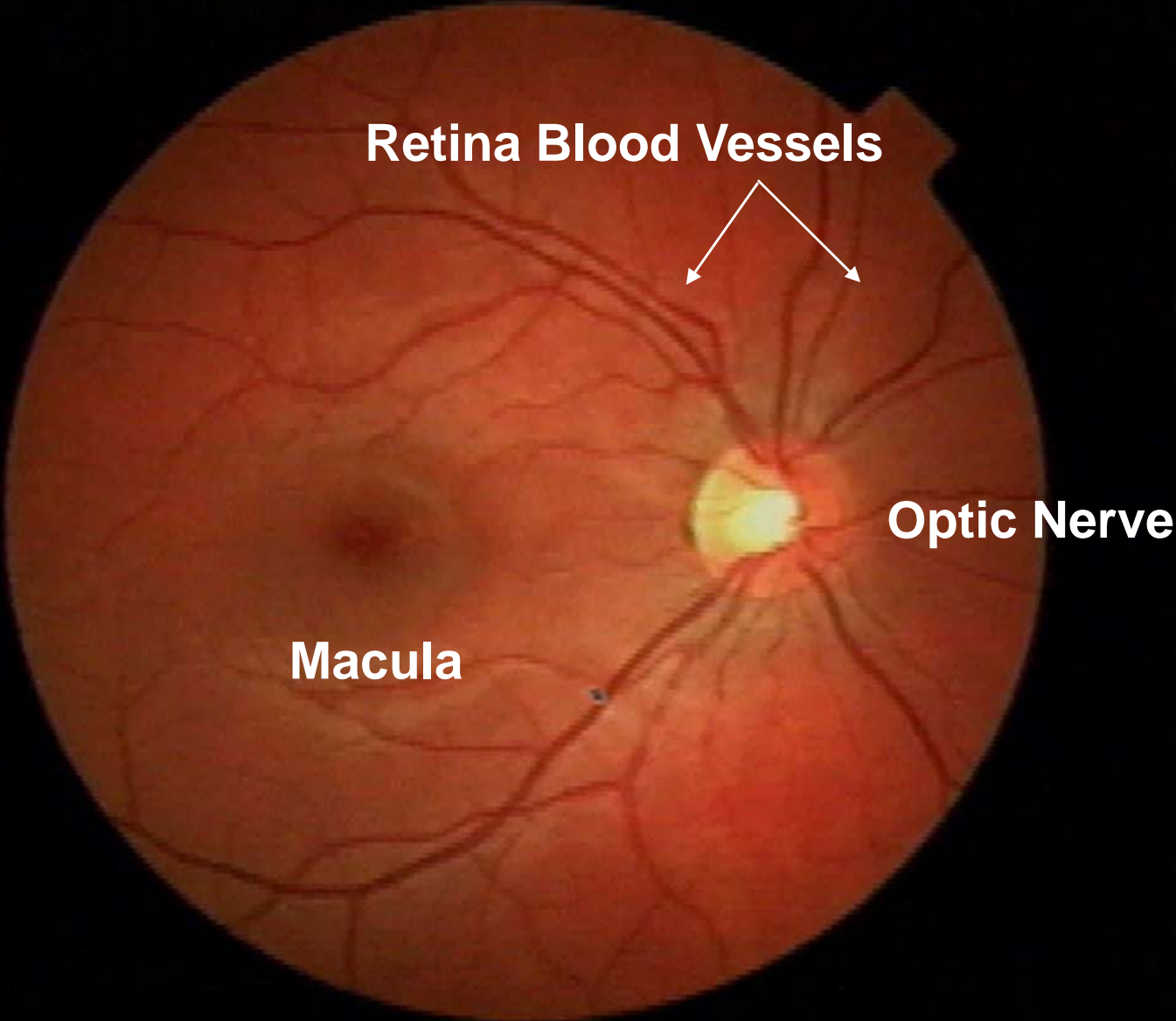
- Who?
 - Patients with diabetes mellitus
 - No recent eye examination or scheduled for eye exams with known low-risk characteristics
 - Not for those with known, advanced DR
- What?
 - Technology-assisted evaluation for diabetic retinopathy
 - NOT a substitute for a complete eye exam

Acquisition station

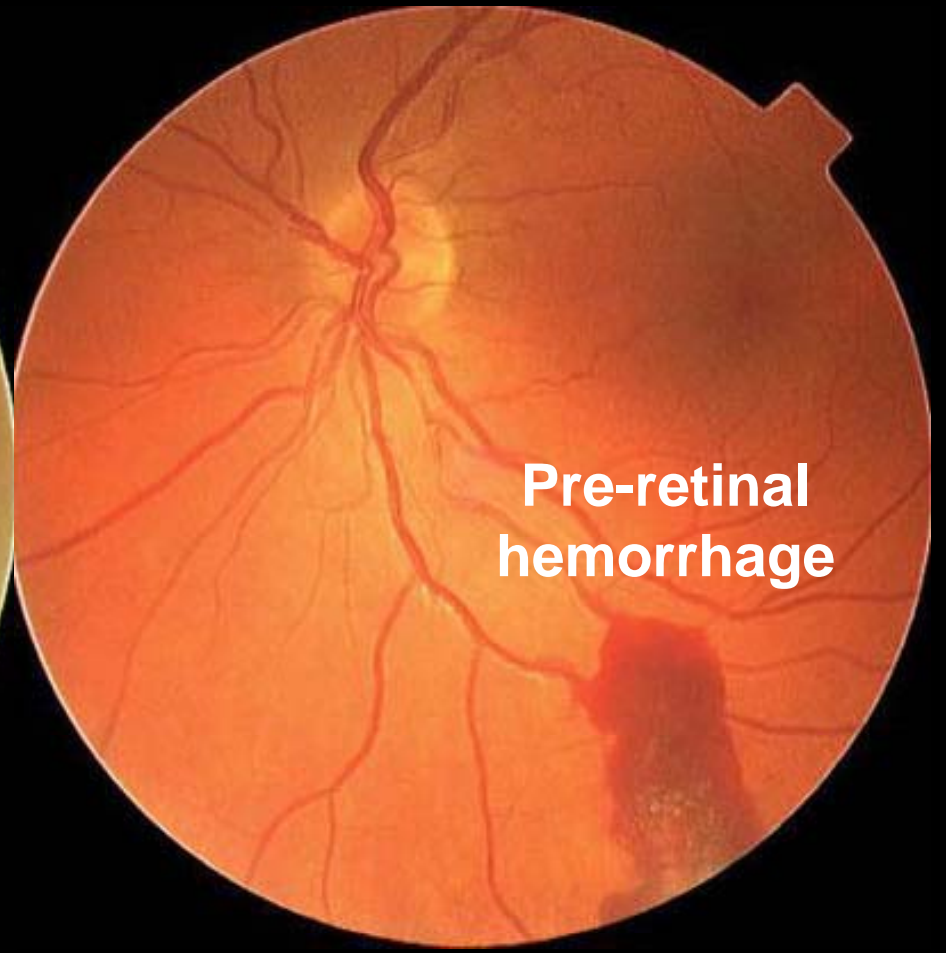
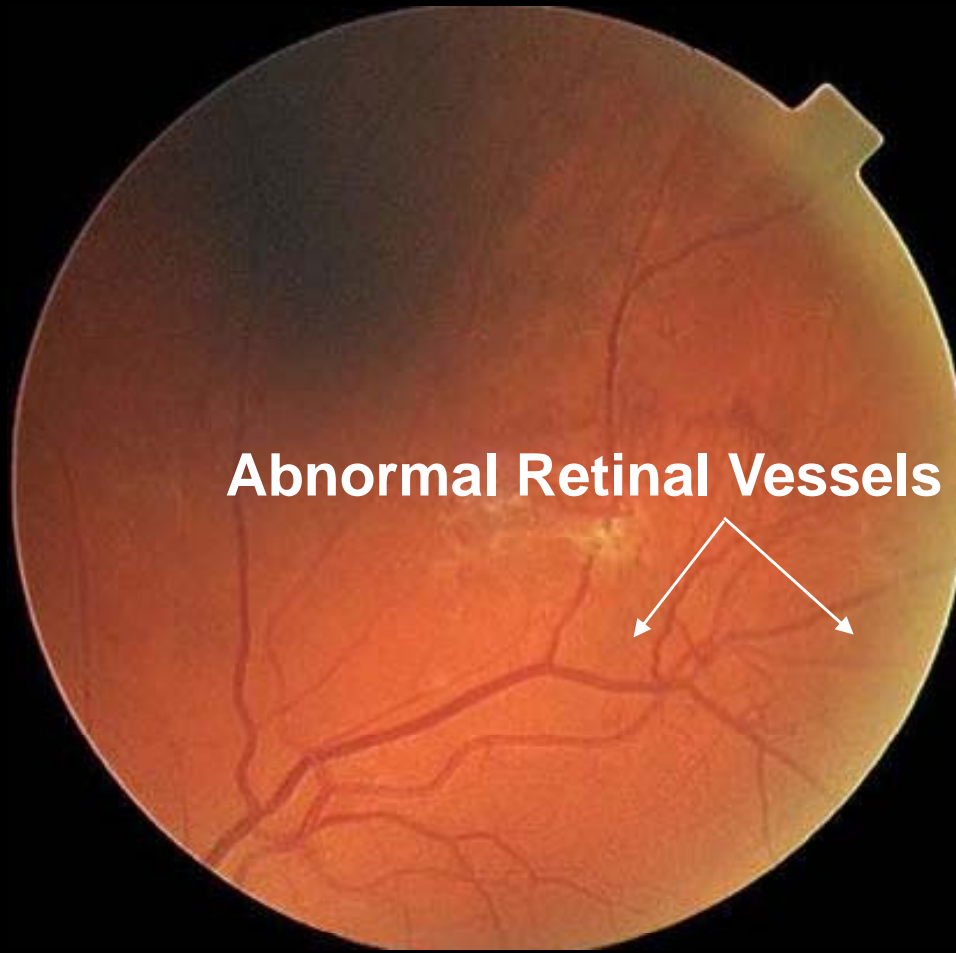
- Retinal camera
- Computer workstation
- No pupil dilation
- High-resolution digital stereo, color images
- Data transmission using standard network links



Normal Retina



Diabetic Retinopathy



Non-diabetes eye findings

Glaucoma



Age-related macular degeneration



Tele-retinal Imaging

- When?
 - “Capture” patients when they present for primary care, subspecialty care, other visits
- Where?
 - NOT in the Ophthalmology or Optometry clinics

A Clinical Pathway for Tele-retinal Imaging

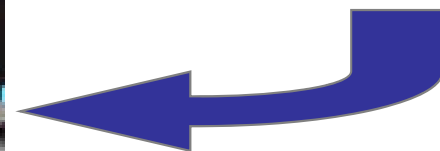
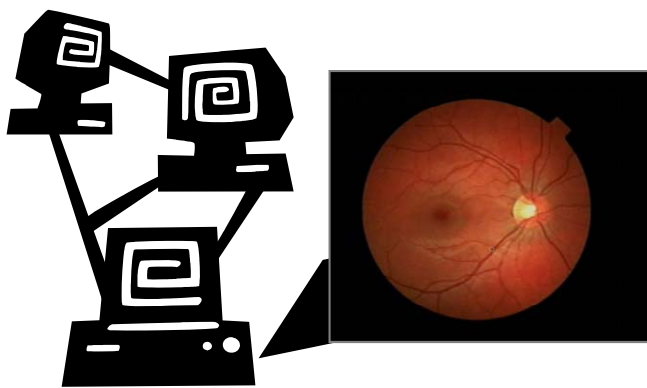
Patient Identified
With Clinic
Appointment



Review medical
and eye care history



Candidate for tele-
retinal imaging

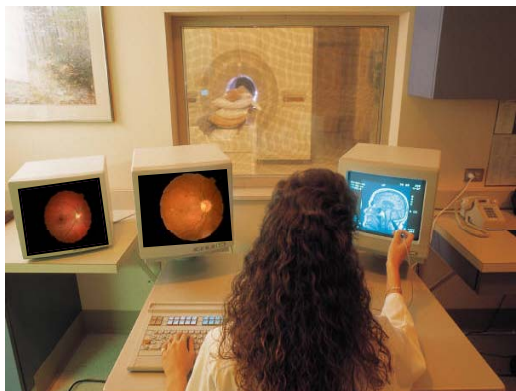
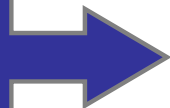


Acquire images

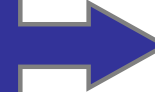
Transmit images to
Reading Center



Review
images



Report
in CPRS



Technician
Triage/Appoint
patients based
on findings

Tele-retinal Imaging

- Why?
 - Frequency of annual eye exams are less than optimal
 - Eye clinic appointments require separate visit
 - Most patients have no retinopathy
 - Ability to triage patients

Tele-retinal imaging studies

Agreement with clinical exam

268 patients examined by TRI and retina specialist

- Exact agreement 72%
- Within one DR level 89%
- Appropriate referral 92%

- Other referable eye findings 25%
- Patients with no DR or mild DR 67%

Other Ocular Conditions

1219 patients examined by TRI

- Urgent ocular conditions 1%
 - Retinal vein occlusion, vitreous hemorrhage
- Urgent medical conditions 4%
 - Retinal emboli, hypertensive retinopathy
- Additional ocular diagnoses 61%
 - Cataract, glaucoma suspect, choroidal nevus, macular degeneration

Tele-retinal imaging and glaucoma

Case-control study of patients examined by TRI

- 175 diagnosed as “glaucoma suspect”
- 175 without glaucomatous findings
 - Matched for age, sex and race
- Results from comprehensive eye exam
 - 103/175 (59%) “cases” met glaucoma criteria
 - 7/175 (4%)”controls” met glaucoma criteria
 - Intra-ocular pressure was identical between groups

Adherence with eye care

Patients with diabetes randomly assigned to have tele-retinal imaging or not (n = 447)

- **Tele-retinal imaging** ($n = 223$)
 - Follow-up based on results of images
- **Control group** ($n = 224$)
 - Follow-up based on guidelines (e.g. annual eye exam)
- **End points**
 - Eye exam within 12 months, level of agreement between imaging and follow-up exam

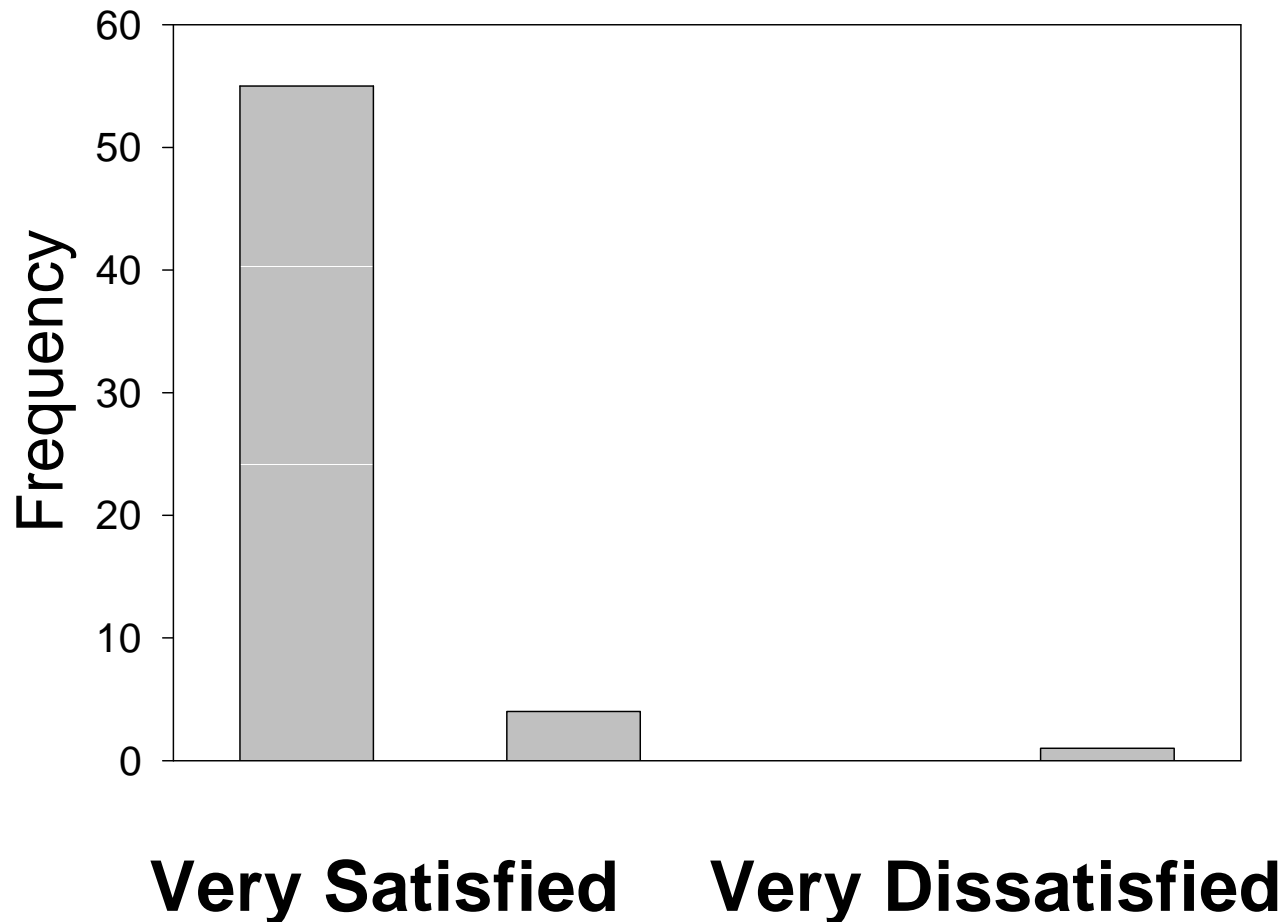
Eye care follow-up

	<i>Follow-up Visit</i>	<i>No follow-up Visit</i>
TRI group <i>(Documented eye care within 12 months)</i>	194 (87%)*	29
Control group <i>(No eye care in 12 months)</i>	172 (77%)	52

* $P < 0.01$

Level of Satisfaction

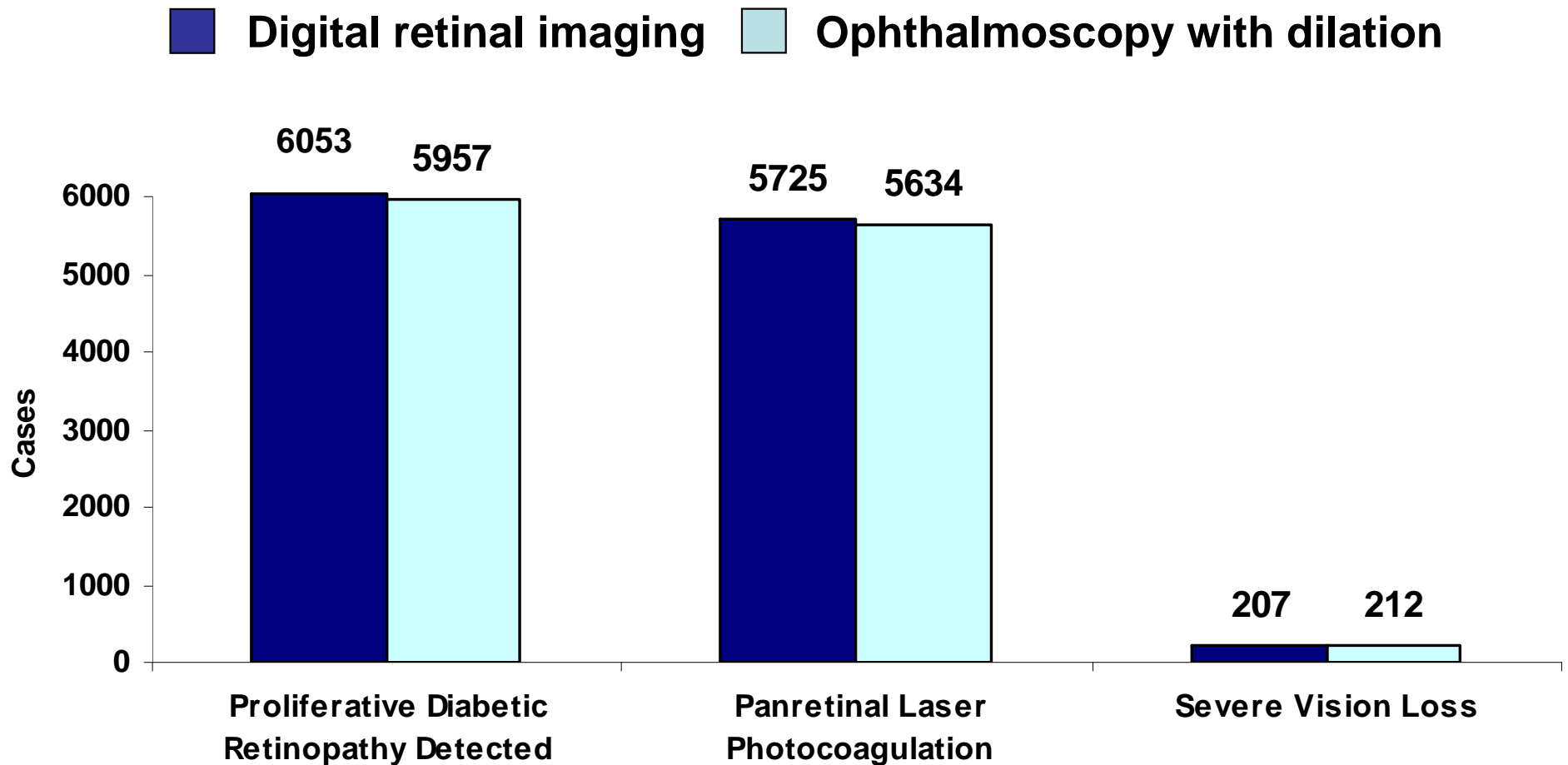
How satisfied were you overall with this video examination?



A billion here and a billion there,
and pretty soon you're talking
real money.

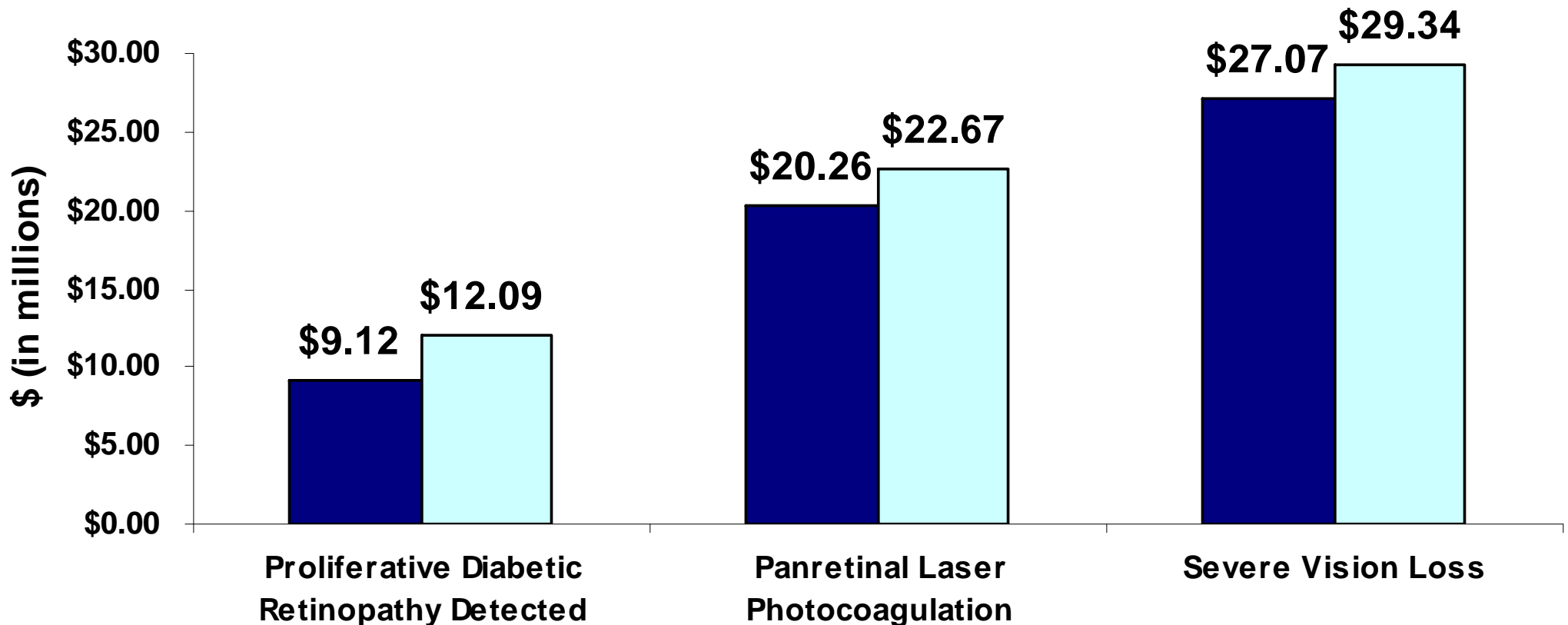
Everett Dirksen

Effectiveness of tele-retinal imaging



Total Costs of tele-retinal imaging

■ Digital retinal imaging □ Ophthalmoscopy with dilation



Future Research Directions

- Does tele-retinal imaging reliably identify ocular diseases other than DR?
-
- Can tele-retinal imaging substitute for an eye exam in low-risk patients?

Summary

Tele-retinal Imaging

- effective and cost-effective care coordination tool to improve eye care
- high level of agreement with follow-up eye exams
- often reveals other findings that warrant a referral for eye exam
- results are more than “screening” and less than “diagnostic” (i.e. evaluative)

Collaborators

Care management

- Helen Gomes
- George Alexis
- Betty A. Levine
- Graham McMahon
- Stephanie Fonda

Tele-retinal imaging

- Barry Fisch
- Sven E. Bursell
- Anthony Cavallerano
- Gerald Selvin
- Louis Pasquale
- Baharak Asefzadeh
- John Whited

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