Telemedicine in Prevention and Chronic Disease Management

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Background

- Untreated CVD Risk Factors
- ↑ Utilization Due to Obesity and Aging
- Medical Cost Rapidly Increasing
- More Efficient Medical Delivery Will Not Solve the Problem
- Need a Shift from Acute Care Model to a Prevention Model
- Information Technology Needs to be Part of the Answer

Background

- Heart Failure - NIH

- CVD Risk Reduction - PA

- Gestational Diabetes - NIH

- COPD - PA

- Gastroparesis - NIH

- Obesity – PA

- HTN - AHRQ

Background

Shopping - 1989 vs. 2009

1989	2009
Oder Catalog	Shop On-line
Review Catalog, Discuss item with Sales Person	See details and read reviews
Sales Person obtains mailing and billing information, places order	Enter mailing and billing information, place order
Sometime later item arrives	Receive noticed that item has been ordered and shipped
	Notified about status of shipment
	Know when item will arrive

Background

Starting a new Prescription – 1989 vs. 2009

1989	2009
Call patient	Call Patient
If no answer. Leave detailed message on answering machine	If no answer, leave vague message to call office (HIPAA).
	Try again to connect with Patient
Call Pharmacist with new prescription	Call Pharmacist with new prescription
	Enter transactions in medical record

What is Telemedicine?

- Telemedicine's role is to strengthen the patient-provider relationship by using Today's technology (cell phone, computers, internet, artificial intelligence, measuring devices), thereby improving chronic disease management and prevention in a cost effective manner. ➔ PHR ➔ Nurse Management

Prevention & Chronic Disease Management

- Nothing Like a Nurse!!

- Costs, Costs, Costs!

Design Philosophy

- <u>Costs</u>

  Hardware

  Asynchronous Communication

- <u>Strengthen Patient-Provider Relationship</u>

  Self-Monitoring

  Education

  Communication / Feedback with PCP

- <u>Access</u>

  Easy / Flexibility / Cost

Cost

Hardware ➡ Device directly Connected to Internet

| Authors	Device	# Pts	Duration	Age	Asyn	Who Δ meds	BP Outcome
Artinian 2007	Yes	387	1 Yr	60	No	Doctor	↓ 13.0/6.3 mmHg
Logan 2007	Yes	33	4 mo	48.1	Automatic	Doctor	↓ 10.0/4.0 mmHg
Bobrie 2007	Yes	111	8 wks	59	No	Patient	↓ 9.0/6.0 mmHg
Green 2008	No	778	1 year	59.1	Yes	Pharmacist	↓ 13.2/4.6 mmHg
Rogers 2001	Yes	121	8 wks	61.5	No	Doctor	↓ 4.9/2.0 mmHg
Santamore	No	465	1 Yr	60.7	No	Doctor	↓ 18.1/7.1 mmHg

BP Telemedicine Studies

BP Accuracy Study Design CVD Risk Reduction Study

- Hypothesis – Telemedicine Subjects will accurately transmit their BP values

- 465 Pts with moderate risk of CVD.

- Randomized to Standard Care or Telemedicine, given <u>BP meters with memory</u>

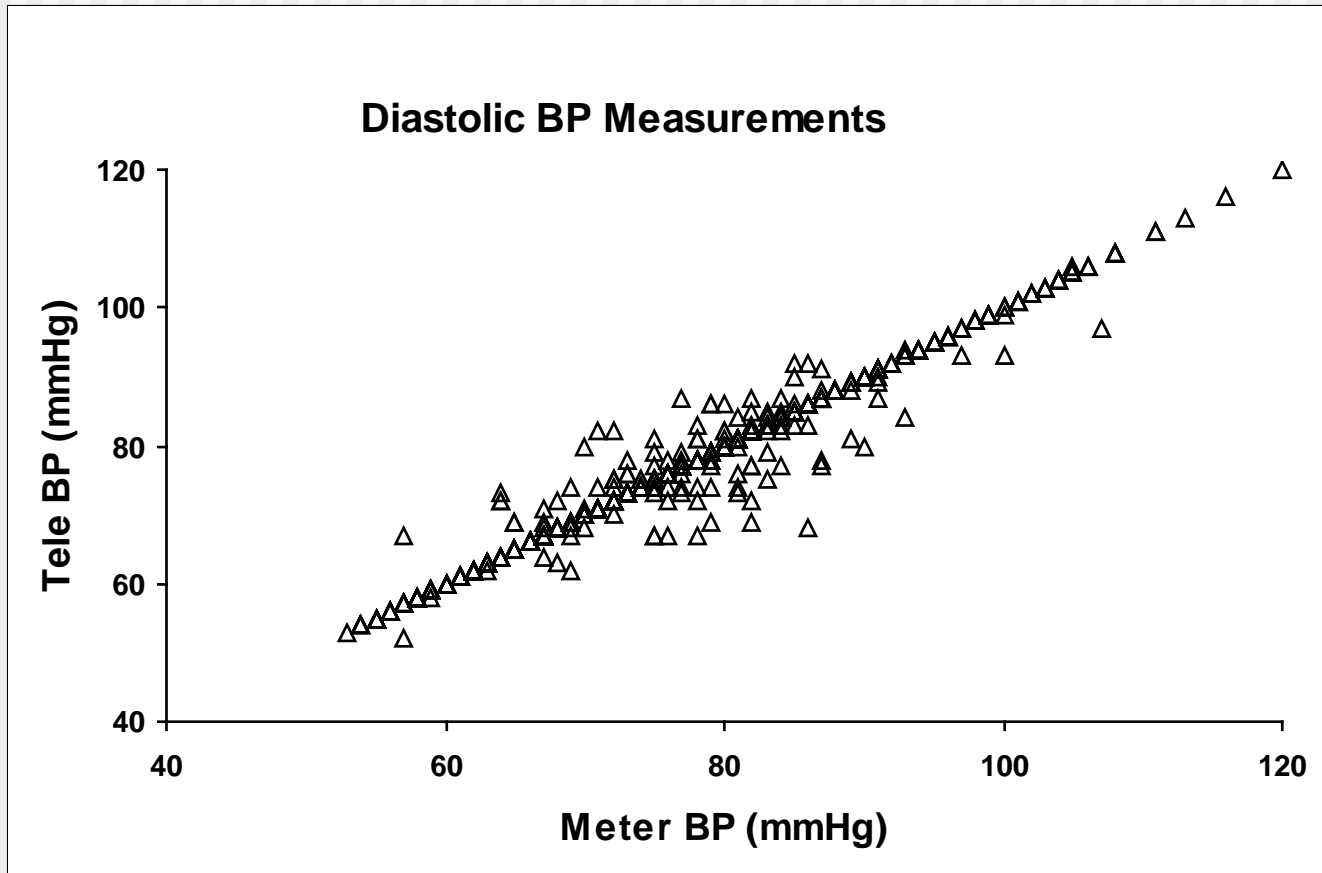- Followed for 1 year

- Primary Outcome – BP values;

   Meter vs. Telemedicine
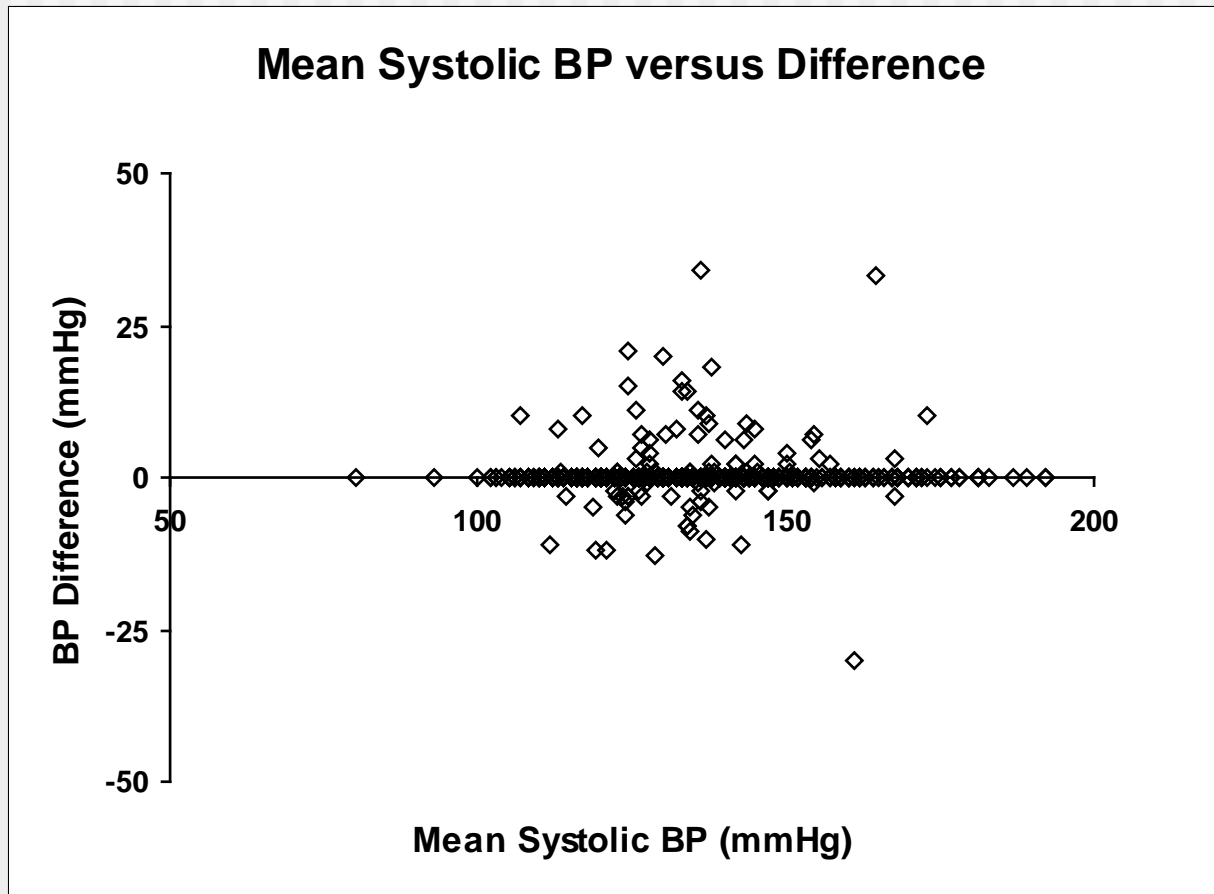
BP Accuracy Study

Systolic BP Measurements

Tele BP (mmHg) vs. Meter BP (mmHg)
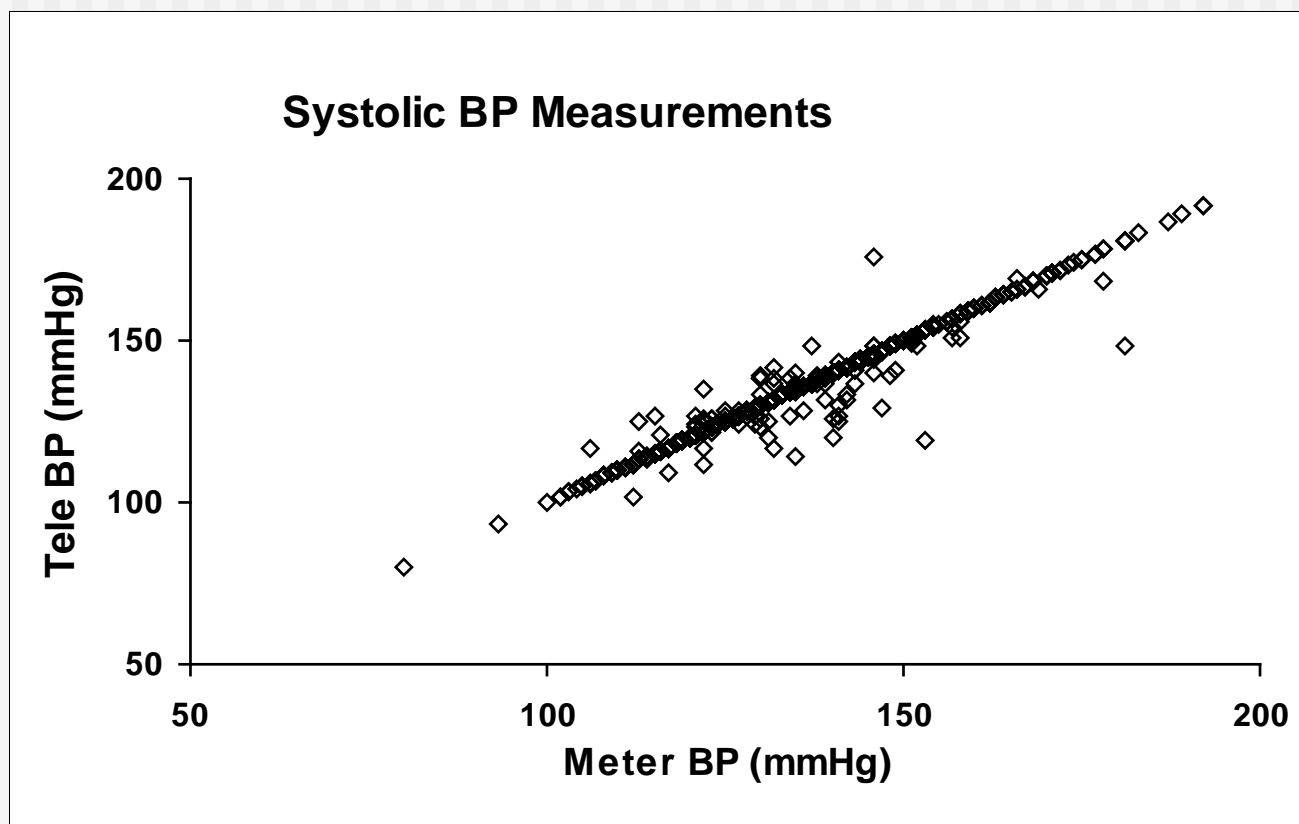
Tele BP 133.4±11.1 vs. Meter BP 136.4±11.9 mmHg

BP Accuracy Study

Diastolic BP Measurements

Tele BP 77.5±6.8 vs. Meter BP 79.7±7.5 mmHg

BP Accuracy Study

Mean Systolic BP versus Difference

Percent Error = -0.02±0.04%

BP Accuracy Study

Mean Diatolic BP vs. BP Difference

y-axis: BP Difference (mmHg), values 20, 10, 0, -10, -20

x-axis: Mean Diastolic BP (mmHg), values 40, 60, 80, 100, 120
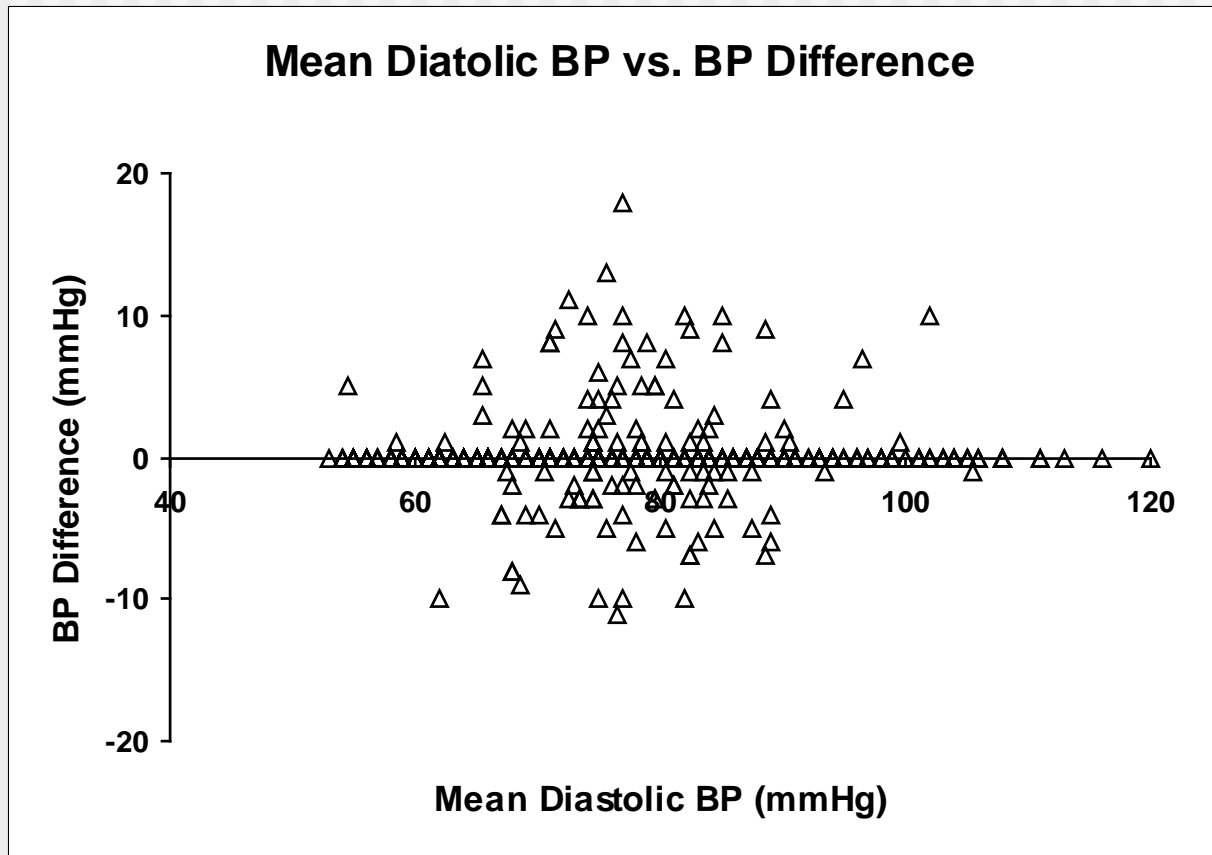
Percent Error = -0.032±0.04%

Cost
Is Hardware Needed?

- Device that directly transmits BP is more accurate than patient entering BP values

- But, only small patient errors

- Clinical studies show comparable Outcomes

- For large populations, hardware costs are excessive

Cost
Nurse's Time - Asynchronous

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Heart Failure Study Design

- Hypothesis – A Telemedicine System ↓hospitalization
- 48 Pts with Class II, III or IV HF & Hospitalization within 6 months, computer with Internet access.
- Randomized to Standard Care or Telemedicine
- Followed for 1 year
- Primary Outcome - Hospital Days

Communication
Internet Messages – Telephone Calls

	Total	#/week	Ave/pt/wk
Patient messages	1887	36	1.5
Text + data	721	14	0.6
Data only	1166	22	0.9
Provider messages	1887	36	1.5
Generic message	1250	24	1.0
Tailored message	637	12	0.5

Telephone Calls: Controls 8 calls/year/pt; Tele – 6 calls/yr/pt

1-Year Outcomes

	Control (n=24)	Telemedicine (n=24)
ED visits	12	5*
Hospitalizations	40	24*
Hospital Days	226	84*

* P < 0.025
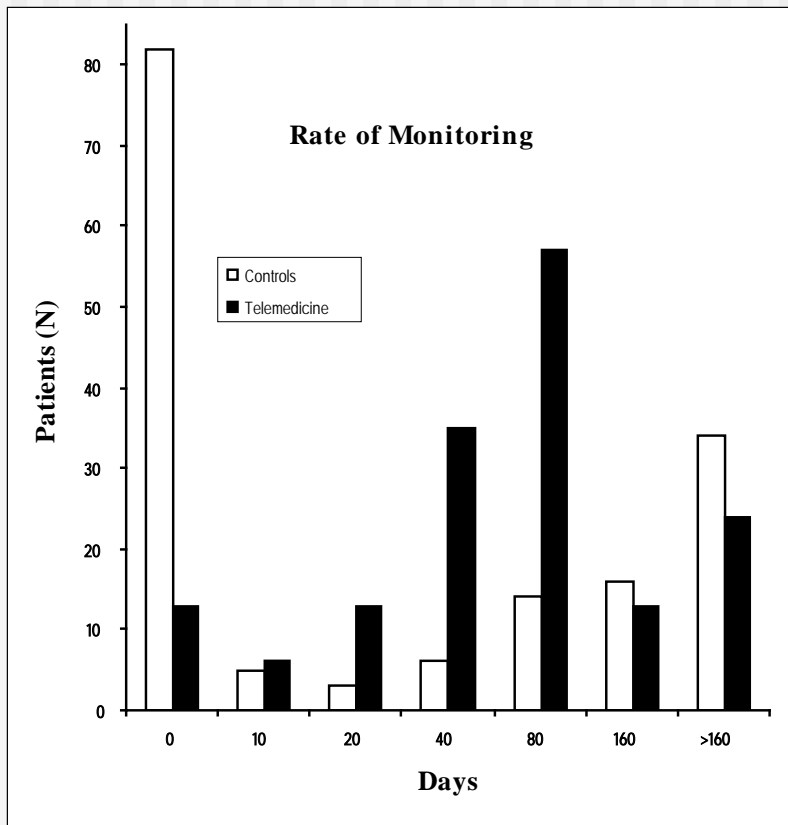
Cost
Nurse's Time - Asynchronous

➢ Asynchronous Communication is more Efficient

➢ BP Outcomes are Similar

➢ HF Outcomes Improved

➢ Who Pays for Nurse to Respond to Patient

➢ Automated Systems Show Promise

Self-Monitoring
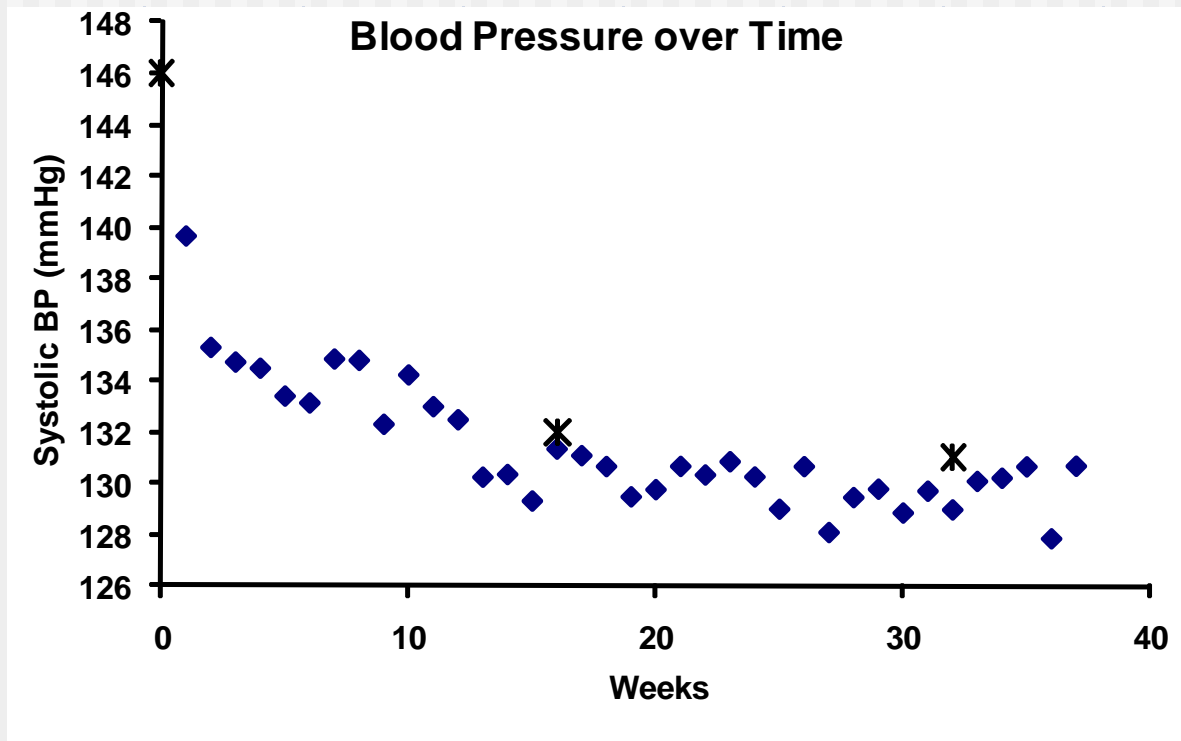## Telemedicine Usage

CVD Risk Reduction Study; 465 Pts with moderate risk of CVD; Randomized to Standard Care or Telemedicine, given <u>BP meters with memory</u> Followed for 1 year

Telemedicine

Non-Monitors ➔ Monitors

Self-Monitoring Documented

Self-Monitoring
Blood Pressure over Time

- Rapid Decrease in BP
- Home BP values lower than office

Education
Telemedicine Screens

- Patient   Doctor
- Input Data (messages)   Pt Review
- Medications   Medications
- Lab Data   Lab Data
- Review   Scheduler
- **Education**   User Log

Education
Telemedicine Screens

- Out of 196 Patients, only 2% access Educational Screens

- Take Home Message ➔ Push Education

Feedback to Practice

"Your patient has been provided with a copy."
Framingham CVD Risk Score: 12%

Blood Pressure (mmHg) **167/86***	Weight (lbs) 137
Pulse (beats/min) **102***	Body Mass Index 25.1
SpO2 (%) 98	6 minute walk test (ft) 936
	Cigarettes per Day 0
Fasting Blood glucose (mg/dl) **324***	Total Cholesterol (mg/dl) **267***
	HDL (mg/dl) **40***
Hbg A1c (%) **12.9***	LDL (mg/dl) **130***
	Triglycerides (mg/dl) **486***

Urine microalbumin (mg/L) **30.1***
Urine microalbumin/creatinine ratio (mg/g) **80***

Feedback to Practice
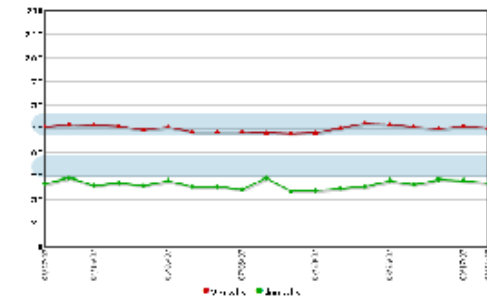
Feedback to Practice

➢ From CVD Risk Reduction Study, Reports faxed to the PCP
  52% of Pts took the report to their office visit
  75% Discussed their values with their PCP

➢ From current HTN Study, Reports faxed to PCP
  One institution misplaced 14 reports

➢ Faxing works!

➢ But direct transfer to EMRs would be better

Feedback to Practice

Medication Adherence

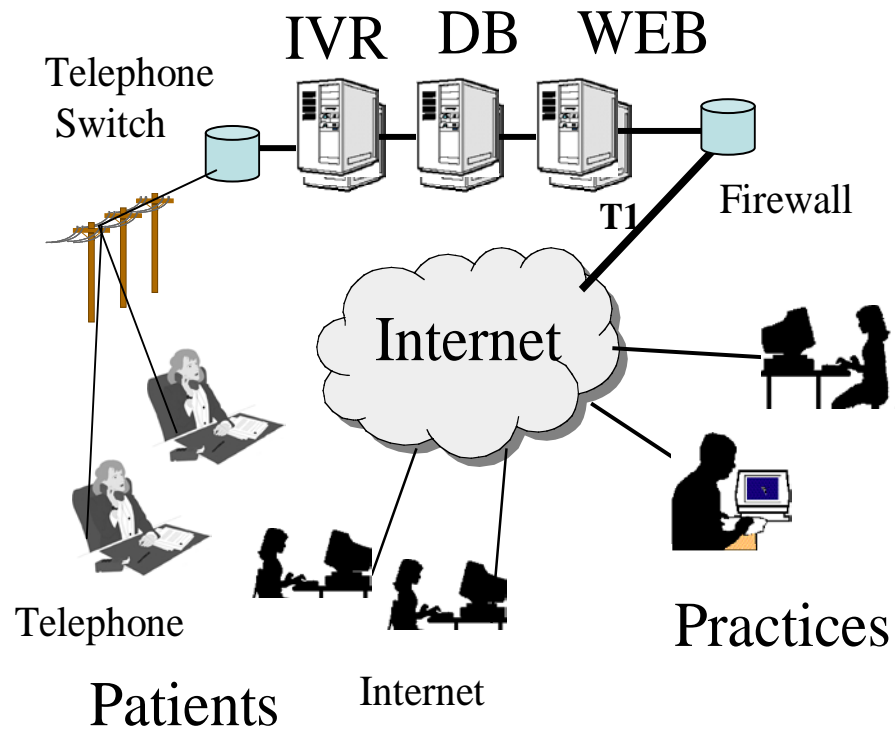|	**$4** **30-Day**	**$10** **90-Day**
■ **Cholesterol**		
Lovastatin 20mg tab. 30. 90		
Pravastatin 40mg tab 30. 90		
■ **Blood Pressure**		
Amiloride-HCTZ 5mg-50mg 30. 90		
Enalapril-HCTZ 5mg-12.5mg. . . 30. 90		

Access

Access
Ease / Flexibility / Cost

52% have incomes <$25,000/Yr

➢ Averaging Over 2 Transmission / Week

➢ 61% Using Telephone Access

➢ Flexibility ➔ Needed,
   But Hard to Address in a Research Study

Design Philosophy

- <u>Costs</u>

  Hardware ?

  ✓ Asynchronous Communication – Automated Messages!

- <u>Strengthen Patient-Provider Relationship</u>

  ✓ Self-Monitoring – Effective, Documented

  Education?   -   Push Educational Messages

  ✓ Communication / Feedback with PCP – Fax?, EMR!

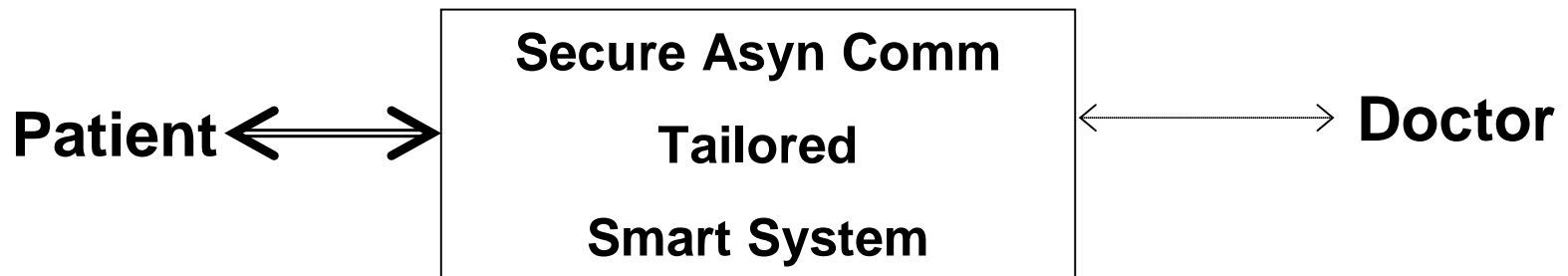- <u>Access</u>

  Easy / Flexibility / Cost? – Needed and Hard!

Always Behind Technology Curve

- Facebook
- Mark Zuckerberg – Oct 28, 2003
- 400 million members
- 61 PubMed References

- Text Messaging
- ???? People Texting
- 147 PubMed References

Planned Updates

Patient ⟷
┌─────────────────────┐
│ **Secure,**   │
│ **Asynchronous**   │ ⟷ │TTRC│ ⟷ **Doctor**
│ **Communication**   │
└─────────────────────┘

Patient ⟷
┌─────────────────────┐
│ **Secure Asyn Comm** │
│   │
│ **Tailored**   │ ⟷ **Doctor**
│   │
│ **Smart System**   │
└─────────────────────┘

- ➤ **Guidelines**
- ➤ **Automated Reminders to Patients**
- ➤ **Automated Review of Data**
- ➤ **Built-in Intelligence**
- ➤ **Tailored Messages to Patient**

Tailored Messages

- **Automated Tailored Messages to Patient**
  - ✓ Know gender, age, medical condition, insurance coverage, etc.
  - ✓ Monitoring status – at goal, not at goal, not monitoring
  - ✓ Behavioral Mining (Click Stream   Mining)
- Dynamic Tailoring of Messages

Temple Telemedicine Research Center

Thank You

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