



Diabetes Management and Emerging Wireless Solutions:

Changing the Rules of the Game



Medical Automation Conference 2008
Herndon, VA
December 12, 2008



Imagine, if you would ...

A day in the life of an auto worker with diabetes

The day is just starting, but Frank is already behind. After missing his usual breakfast, he's feeling quite hypoglycemic and anxious about the long day ahead of him.

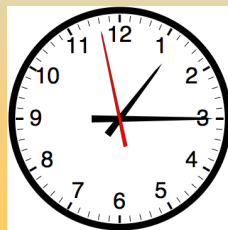


With increasing dizziness, he forgets his educator guidelines and reverts to Plan B – get to the ER. He didn't quite have time to ensure that work will continue – the line will just have to stop.



The nurses who triaged him last time are both glad and sad to see him again so soon. With a BG of 46 mg/dL, he is quickly given an amp of D-50

It's a busy day at the clinic. Frank is feeling better with the glucose shot, but he's now worried about the mountain of work he most certainly will face. He's still waiting to be discharged.



The third incident in just two months. The foreman is concerned about Frank's ability to be productive on the job.

His case worker – who just got the news – laments not being in touch with him sooner.



Wrong place. High-moving pace. Saving face. Frank is really worried about his job and how diabetes is getting in the way.



“A Tale of Two Journeys”

An opportunity to help both Frank and the diabetes ecosystem

Frank’s Journey

- ❖ Could wireless-enabled solutions have played a role to help Frank?
- ❖ Could these solutions deliver utility, and the ease of use and personality required to **engage** and **sustain** Frank’s involvement?
- ❖ Who, within Frank’s diabetes “inner circle”, must adopt similar solutions to unlock the full value potential?

Diabetes Ecosystem’s “Journey”

- ❖ Can wireless-enabled solutions play a role in helping the entire ecosystem to cope with the rising diabetes epidemic?
- ❖ Is it reasonable – and indeed, **essential** – for wireless-enablement to act as a catalyst to “raise the bar” for clinical innovation in the ecosystem?
- ❖ Which broader stakeholders could the ecosystem interact with in order to optimize the ROI on wireless-enabled solutions?

Is Frank’s challenge representative of the ecosystem’s challenge ... or is his opportunity indicative of the inevitable transformation ahead?



“Traditional” Healthcare Levers

Many disparate efforts; One growing problem

Disease Management

- Focused Patient Attention
- Outbound Calls
- EMR/PHR Integration

Pharmaceutical Innovation

- New Compounds
- Clinical Trials and Claims
- Generics and Supply Chain Management

\$2.3T US Annual Spend
80%+ on Chronic Disease
Growing Care Gap



Device Innovation

- “Smart Devices”
- Wire-free Data Transfer
- Advanced UX Design

Healthcare Plan Design

- “Pay For Use”: New CPT Codes
- “P4P”: Incenting Practice-based Improvement
- Productivity: Reduction in Non-Billable Efforts



Emerging Innovation Levers

Information-enablement will harness “convergence” of disparate efforts

~~Disease~~ Health and Wellness Management

- 360-degree View
- Preventive, Acute, Maintenance
- Non-linear, Networked

~~Pharmaceutical~~ Pharmacokinetic Innovation

- Cause and Effect Simulation
- Data, Information, Knowledge
- Behavior Change

**Real-time Information
Distributed Care Networks
Automated Systems**

~~Device~~ Solution Innovation

- User-driven Applications
- Multi-purpose Devices
- Personalized Content

~~Healthcare Plan~~ Value Chain Design

- “Pay For Use”: New CPT Codes
- “P4P”: Incenting Practice-based Improvement
- Productivity: Reduction in Non-Billable Efforts

Wireless is Critical to This Convergence!



So WHAT Is Wireless in Our Context?

A technological means to support a clinical end

What Wireless IS

- ❖ A solution platform ...
 - ... That enables real-time information sharing and collaboration ...
 - ... Such that ecosystem stakeholders can easily and securely access relevant, contextual and timely information ...
 - ... In a manner that fits well into their day-to-day life and standard workflow ...
 - ... To enhance health outcomes, reduce operational costs, and stimulate/sustain the necessary behavior change to deliver value

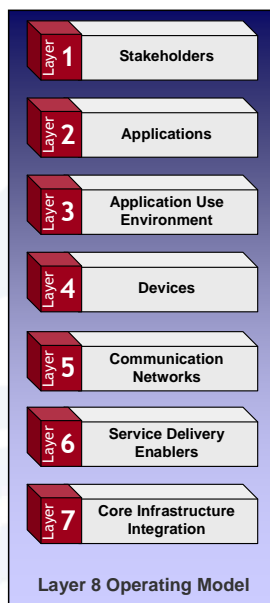
What Wireless IS NOT

- ❖ Just a technology (e.g., Bluetooth, RFID, etc.)
- ❖ Just another application (e.g., ringtone, game, etc.)
- ❖ Just a device (e.g., cell phone, data card, RFID tag, etc.)
- ❖ Just an electronic health record (e.g., electronically capturing data at the “point of consumption”)
- ❖ “Silver Bullet” for driving operational efficiency in the ecosystem



De-composing a Wireless Solution

Healthcare-relevant innovation can occur at many layers



Adapted from PRTM's AIM® Architecture for the Mobile Enterprise

Each solution “layer” sustains its own innovation drivers and “clock speed”

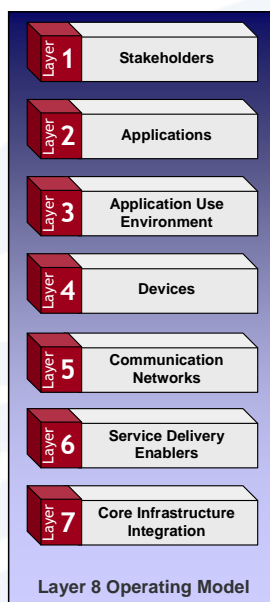
- ❖ **Layer 1 – Stakeholders**
 - Targeted segments, value proposition and therapies
 - “Segment of one”
- ❖ **Layer 2 – Applications**
 - Real-time, multi-variate data capture
 - Longitudinal pattern analysis
 - Information sharing and collaboration
 - Text, audio and video content
- ❖ **Layer 3 – Environment Enablers**
 - Location-specific technologies
 - Voice-to-text: Real time and cached
- ❖ **Layer 4 – Devices**
 - Personal area network-ready devices
 - Integrated medical/communication devices
 - Embedded communications devices



De-composing a Wireless Solution

Healthcare-relevant innovation is occurring at many layers

Continued



Innovation within certain layers can spark innovation at other layers

- ❖ **Layer 5 – Communications Gateways**
 - 3G/4G Cellular: 1xEVDO, LTE
 - OFDM/4G: WiFi and WiMAX
- ❖ **Layer 6 – Services**
 - Integrated patient-facing tools
 - Integrated clinician-facing tools
 - Integrated business-facing tools
- ❖ **Layer 7 – Core Operations Integration**
 - EMR/PHR integration
 - Healthcare provider workflow integration
- ❖ **Layer 8 – Business Model**
 - Pay for performance
 - Incentives
 - Real-time actuarial models



Initial population “experience level” helped to confirm “ease of use” tenet

- ❖ Pilot Participant Average Ages: (N=30)
 - Control Patients: 54 Yrs Old
 - Intervention Patients: 50 Yrs Old
- ❖ Intervention Group
 - 60% of intervention patients were African-American
 - 60% with only high-school or GED
 - Had Type 2 diabetes on average > 7.5 years
 - Only 1 Intervention patient had ever used SMS prior to trial
 - No reports of system difficulty
- ❖ Control Group
 - Only received 35% of requested logbooks from control group
 - No control patient received nutrition recommendations from physician
- ❖ Both groups
 - Not one patient knew what their BG goals were or how to count carbs
- ❖ Health care provider and patient satisfaction with the system was both clinically and statistically significant

Making an Impact on PCP Behavior

Initial 30-patient pilot demonstrated significant potential for provider adoption

Medication Changes	Intervention	Control
Drug changes made by HCP upon study entry*	4 pts oral meds titrated/initiated	4 pts oral meds titrated/initiated
Oral drugs titrated during study	8	0
Oral drugs added/changed during study	4	0
Insulin added to insulin naïve patient during study	2	0
Long acting insulin titrations	6	0
Short acting insulin titrations	6	5
Total medication changes after study entry	27	5
Total number of patients with med changes (excluding changes made upon study entry)	10**	2**

*These were changes the HCP provider made day patient was enrolled. **Study Effect

Difference in prescribing behavior p-value = 0.0001





Dramatic Improvements in A1c Outcomes

The improved outcomes were achieved in 90 days

Control Group

Patient	Beg A1c	End A1c
P1E	9	9
P2E	Drop Out	Drop Out
P3E	9	10.1
P4E	8.7	8.4
P5J	8.2	5.7
P6F	11.9	11.5
P7J	7.6	7.3
P8M	Drop Out	Drop Out
P9M	Drop Out	Drop Out
P10M	7.6	7.9
P11M	8.1	6.9
P12M	7.9	8.2
P13M	9.1	7.5
P14M	11.3	9.6
P15D	Drop Out	Drop Out
	8.95	8.37

0.58-point decrease in A1c

Intervention Group

Patient	Beg A1c	End A1c
P23E	15.5	6.3
P27J	8.9	7.1
P26J	10.1	7.8
P28J	7.7	6.9
P33J	10.6	7.2
P30J	8.3	8
P31J	8.2	6.7
P29F	8.4	7.4
P32N	10	10.1
P35N	Drop Out	Drop Out
P36J	8.4	6.6
P38J	8.3	6.5
P37J	9.2	7.2
P39D	10	9.5
P40M	Drop Out	Drop Out
	9.51	7.48

2.03-point decrease in A1c

❖ Intensive glucose control reduces the risk of any cardiovascular event by 42% and the risk of heart attack, stroke, or death from cardiovascular disease by 57%.¹

❖ Every 1 point drop in A1c reduces the risk of diabetes, kidney, eye, and nerve disease by 40%.²

Difference in A1c decrease p-value = 0.03*

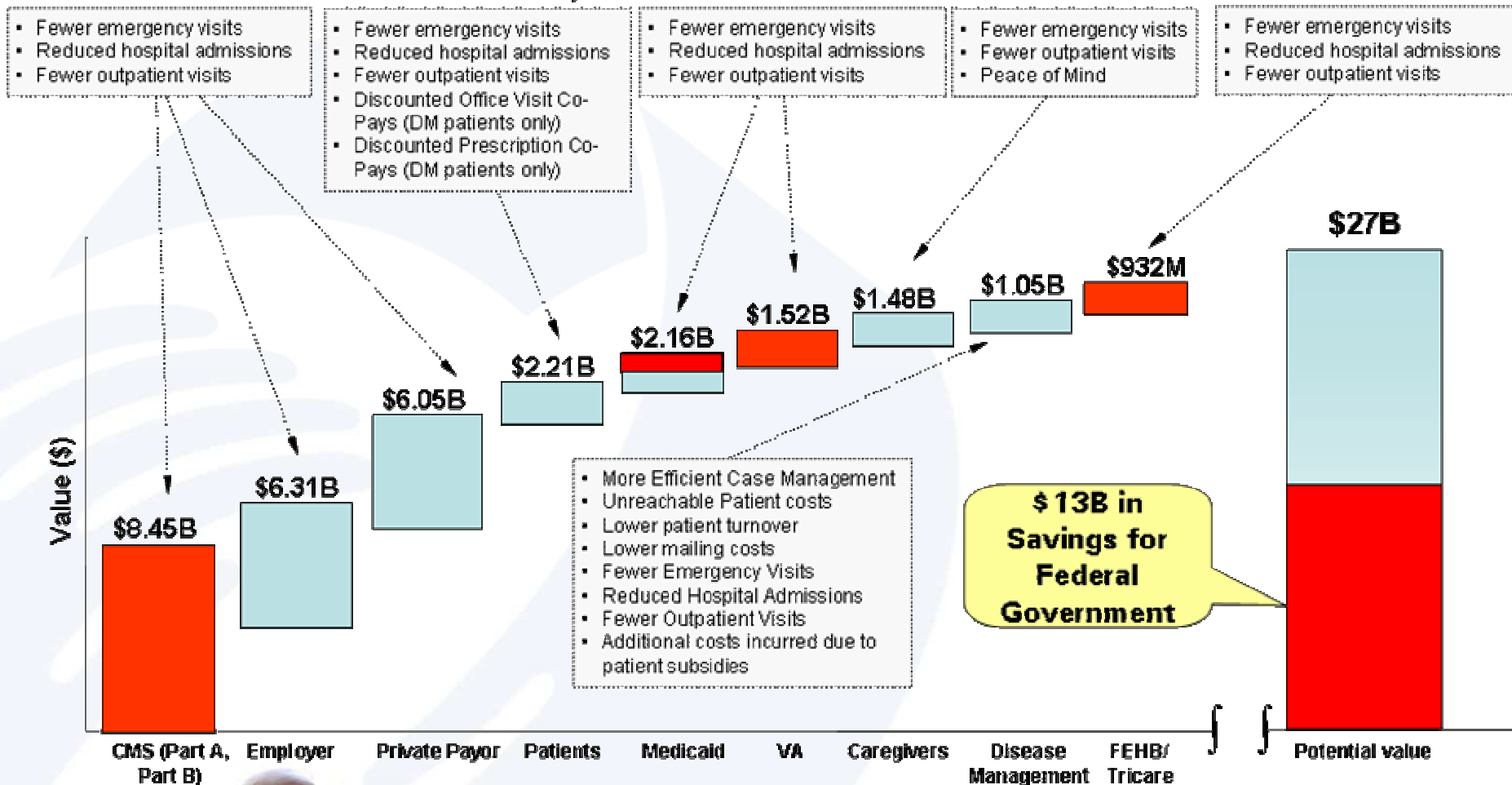
¹Nathan DM, Cleary PA, Backlund JY, et al. *N Engl J Med*. Dec 22 2005;353(25):2643-2653

²National Institute of Diabetes and Digestive and Kidney Diseases. 2005

From Clinical Utility to Business Value

Transforming care in the diabetes ecosystem

Value Drivers Across the "Healthcare System" ¹



¹ 2000 Mercy Health Center in Laredo, TX Telemedicine Diabetes Disease Management Case Study



Revisiting our friend, Frank

Imagine if ...

- ❖ Frank and his co-workers who suffer from diabetes have access to their own, real-time information sharing and collaboration tool ...
- ... Such that their HCPs and educators can easily and securely access relevant, contextual and timely information ...
- ... In a manner that fits well into their day-to-day lives and standard workflow ...
- ... To enhance health outcomes, reduce operational costs to their employer, and excite them to take control of their diabetes

It's not imagination anymore ... it's happening!

