Beyond Websites:
mobile diagnostics, rules engines and social networks
for developing 'SMART' patients
• technology enhanced version of DCCT / UKPDS
• what makes a SMART patient?
• practitioners can't afford to develop SMART patients
• SMART patients practice self-care & change behavior
• SMART patients offer efficiencies & improved outcomes
• extender platform & program design requirements
• SMART patient interventions as part of a Cycle of Care
• case study examples
• clinical trial results
• summary
how to develop a SMART patient

Measure  Understand  Act

Simplicity  Reinforce  Teachable

S M A R T  p a t i e n t s
Nice Car.

Nice Charts.
Nice Car.
Now What?

Nice Charts.
providers need SMART patients

Non-Reimbursed Provider Time

- NULL
- U
- A
- UA
- M
- MU
- MA
- MUA

SMART Patient

- high touch: poor reimbursement, poor outcomes
- medium touch: poor reimbursement, average outcomes
- low touch: favorable reimbursement, superior outcomes

e.g. - Self-Care Style = Reactionary
who benefits from SMART patients?

**Providers:**
- No extra work – extender time
- Favorable reimbursement scenarios
- Streamlined clinical workflow
- Confidence in blood sugar logbooks
- Behaviors reinforced between visits
- Improved patient outcomes
- Fewer missed appointments
- Automatic feedback following prescribed changes to patient regimen

**Patients:**
- No extra work - simple tools
- Time savings
- Automated feedback
- Improved control (fewer severe hypos and extended hyperglycemia)
- Provider satisfaction
- Independence & Confidence
- Rapid & sustained attainment of therapy appropriate A1c's

**Payers:**
- Compliance verification
- Lots of data to tie interventions to corresponding outcomes
- Lower Cost of Care
- Measurable Return On Investment

**Caregivers:**
- Peace of mind
- Time savings
- provider satisfaction
- Improved family relationships
Step 1) Instead of a website, focus on desired outcomes & sustained patient participation

Step 2) Design a system to accomplish the outcomes objectives:
- Be mindful of your patient demographics (not everyone goes online!!)
- Focus on outcomes that you can measure easily
- Build around scenario based protocols – not specific technologies
- No extra work! - Make sure data collection is accurate and transparent
- Keep it simple for everyone involved (patients, providers and caregivers)

Step 3) Develop program procedures including roles and responsibilities for your healthcare extender partner as well as your staff
- Understand the difference between education and medical advice
- Outsource 'customer support' functions to your extender
- Plan to incorporate educational interventions at the teachable moment
enabling the SMART patient

education

biometrics

friends & family

physicians

diabetes educators

program staff
enabling the SMART patient

the SMART patient

mobile diagnostics

rules engine

the social network

education

biometrics
Rapidly increase patient knowledge, proficiency and self-sufficiency

Recruitment

Enrollment

EMR Integration

Fulfillment

Analysis

Appropriate Intervention

Monitoring & Education

extender  SMART patient  provider  social network  payer
SMART interventions

Automated Care System

Fulfilment Center

care kit
supplies
0.1CV-A1c

Real-time Data

Lab Results

Personal Health Record

Automated Analysis

Diabetes Education Content

SMART patient

supporters

providers
SMART interventions

Automated Care System

- Fulfilment Center
- care kit
- supplies
- 0.1CV-A1c

Automated Analysis

- blood glucose logbook
- risk alerts
- compliance alerts
- appointment Reminders
- surveys
- dynamic education
- newsletters
- program staff
- incentives

Real-time Data

- Lab Results

Diabetes Education Content

- Personal Health Record

SMART patient

supporters

providers

Fulfilment Center

Incentives

Care kit

Supplies

0.1CV-A1c
SMART interventions

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- Fulfilment Center
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- Lab Results
- Diabetes Education Content
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  - newsletters
  - program staff
  - incentives

SMART patient
- supporters
- providers

Automated Care System
- Real-time Data
- Lab Results
- Personal Health Record

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Healthcare Extenders Symposium – Beyond Websites: SMART Patients
SMART interventions

intervention at the teachable moment... in real-time
SMART interventions

intervention at the teachable moment... in real-time
intensive management

• **Limits w current care delivery**
  - time & effort required for provider directed education involves significant non-reimbursed time
  - training time, phone calls, faxed data charting, data review, patient follow-up
  - Scheduled office visits are not always kept
  - Scheduled office visits are not always efficient (no data or unreliable data)
  - Gap in care between visits vs. Continuum of Care is unavoidable

• **Solution via Diabetes Health Care Extender**
  - System engages physician based on exception-based risk algorithms
  - Appt & medication reminders mean fewer missed appointments and meds
  - Abnormal hemoglobins are detected and patient referred to physician
  - A1c is accurate and available at time of office visit
  - **NON-REIMBURSED TIME IS MINIMIZED**
  - **PATIENT FEEDBACK FROM INFREQUENT SMBG CHECKS IMPROVES CONTROL**
Beta-cell preservation via intensive management

• **Limits w current care delivery**
  - Lack of reliable feedback – no data available, incomplete and not timely
  - Patient safety requires setting of high blood sugar targets
  - Residual beta cell function rapidly deteriorates
  - Inordinate amount of staff time spent collecting, tabulating and contacting patient

• **Solution via Diabetes Health Care Extender**
  - System engages provider staff based on schedule and/or risk algorithms
  - Immediate provider feedback following frequently prescribed changes
  - Dynamic education reinforces new patient training – accelerates proficiency
  - **NON-REIMUBURSED TIME MINIMIZED**
  - **IMPROVED PATIENT SAFETY & SATISFACTION WITH PROVIDER**
insulin pump starts

- **Limits w current care delivery**
  - Data intensive and inefficient
  - Data often delivered in disorganized fashion or missing altogether
  - Psycho-social family issues and inaccurate timestamps make it difficult to trust data

- **Solution via Diabetes Health Care Extender**
  - Data automatically collected and appended to personal health record
  - Data is from the registered meter with accurate timestamps managed by atomic clock
  - Both patient and provider do nothing extra in order to work from the same logbook
  - Resultant blood glucose levels following prescribed changes are available to the team
  - Manual tabulation and patient communications are more efficient
  - Skilled personnel spend time conversing & educating patient vs. record keeping
  - **NON-REIMUBURSED TIME MINIMIZED**
  - **IMPROVED PATIENT SAFETY & SATISFACTION WITH PROVIDER**
Hypothesis: Technology Enhanced Diabetes Social Support Networks May Improve Blood Sugar Control in Patients with Type 1 and also Type 2 Diabetes.

Non-Randomized, No Control, Interventional, Behavioral & Educational

- A1c at enrollment and every 90 days
- SMBG as prescribed
- Surveys & Education
- Hemoglobin screening
  - N = 1/31 (3%) variant hemoglobin
- No changes to prescribed therapy
- Incentive for participants
- Participation incentive
- Automated blood sugar collection device
- Rules Engine for educational messaging
- Social Network for reinforcement
- Duration = 12 months
- type 1 adults
- type 2 adults

Result:
N = 1/31 (3%) found w/ variant hemoglobin & referred to physician
Preliminary results after 9 months

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Type 1</th>
<th>Type 2</th>
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<tbody>
<tr>
<td>Total Patients</td>
<td>31</td>
<td>6</td>
<td>25</td>
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<tr>
<td>Avg Entry A1c</td>
<td>7.35</td>
<td>7.32</td>
<td>7.36</td>
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<tr>
<td>Avg Exit A1c</td>
<td>6.55</td>
<td>6.75</td>
<td>6.51</td>
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<tr>
<td>Net Change</td>
<td>-0.79</td>
<td>-0.57</td>
<td>-0.85</td>
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</tbody>
</table>

% of Population Experiencing A1c Reduction

- $>-0.3$: Type 1 n = 2, Type 2 n = 19, All n = 21
- $>-0.5$: Type 1 n = 2, Type 2 n = 16, All n = 18
- $>-1.0$: Type 1 n = 2, Type 2 n = 10, All n = 12

A1c Segmented by Reduction vs. Increase

<table>
<thead>
<tr>
<th></th>
<th>Avg A1c Reduction</th>
<th>Avg A1c Increase</th>
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<tbody>
<tr>
<td>Type 1</td>
<td>-1.35 (50%)</td>
<td>0.18 (50%)</td>
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<tr>
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<td>3</td>
<td>3</td>
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<tr>
<td>Type 2</td>
<td>-1.10 (84%)</td>
<td>0.48 (16%)</td>
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<tr>
<td></td>
<td>21</td>
<td>4</td>
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<tr>
<td>Total</td>
<td>-1.18 (77%)</td>
<td>0.36 (23%)</td>
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<td>7</td>
</tr>
</tbody>
</table>

Preliminary results after 9 months

Avg A1c Reduction

- Type 1: -1.35
- Type 2: -1.10
- Total: -1.18

Avg A1c Increase

- Type 1: 0.18
- Type 2: 0.48
- Total: 0.36

Net Change

- Type 1: -1.35
- Type 2: -1.10
- Total: -1.18

Preliminary results after 9 months
Technology Enhanced DCCT & UKPDS Style Intervention is Feasible

- significant reduction in A1c's observed
- sustained participation is assured based on 90%+ patient satisfaction rating
- education based on dynamic assessment of patient record
- education delivered at the teachable moment... in real-time
- blood glucose meters can play a greater role as an intensive management tool

Extenders Reduce Non-Reimbursed Practitioner Time

' SMART ' Patients Enjoy the Benefits of a Cycle of Care vs. Episodic Care

Practitioners Are Using Extender Platforms to Develop SMART Patients Today

Researchers Can Now Use Extender Platforms to Study & Optimize Scenario-Based Intervention Algorithms To Improve Outcomes and Enhance Clinical Workflow
References:

1. Wireless Diabetes Management System; Poster Presentation 2003 Diabetes Technology Society: December 2002 – April 2003; Stephen Ponder MD CDE, Driscoll Children’s Hospital with support from Diabetech.


3. Diabetes Care 26:1475-1479, 2003 Modem Transmission of Glucose Values Reduces the Costs and Need for Clinic Visits, H. Peter Chase, MD1, Jerusha A. Pearson, BA1, Clare Wightman, BA1, Mary D. Roberts, MD1, Adam D. Oderberg, BA1 and Satish K. Garg, MD

4. “Artifactually Low Hemoglobin A1c in a Patient with High Hemoglobin F” Daniel E. Sabath, MD, PhD, CLINICAL DIABETES, VOL. 18 NO. 4 Fall 2000 - CASE STUDIES

5. "How to reconcile high blood glucose with normal A1C", DOC News, June 1, 2005, Volume 2 Number 6 p. 5, Mary Ann Emanuele, MD, Nicholas V. Emanuele, MD

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