Medical Regimen Adherence in the Management of Diabetes: What Psychologists Need to Know

Suzanne Bennett Johnson
Distinguished Research Professor
Florida State University College of Medicine
2012 President, American Psychological Association
Presentation Overview

- Increasing prevalence of diabetes and its consequences
- The daily management of diabetes; poor adherence is common and costly
- The role of the psychologists on the health care team
- Defining adherence
- Adherence and health status
- Provider adherence
- Adherence assessment
- Adherence intervention
- An ecological model for designing adherence interventions
- Recommendations for interested psychologists
Types of Diabetes

**Type 1**
- Usually diagnosed in childhood
- More common in Caucasians
- Requires daily insulin injections for survival
- No cure
- Cannot be prevented
- Less common

**Type 2**
- Usually diagnosed in older overweight adults
- More common in Blacks, Hispanics, Asians, Native Americans
- Some manage by diet and weight loss; most patients take oral meds; some take insulin
- Can be prevented
- More common
Diabetes Reduces a Patient’s Lifespan

Average Years Lost for Diabetic Individuals Compared With Non-diabetic

Women: 7.5 years
Men: 7.0 years

Diabetes Leads to a Shorter Life and a Poor Quality of Life

- A 2- to 4-fold increase in cardiovascular mortality
- The leading cause of new cases of end stage renal disease
- The leading cause of new cases of blindness in working-aged adults
- The leading cause of non-traumatic lower extremity amputations

Diabetes in Adults is Increasing Worldwide

Wild et al. Diabetes Care 2004
Diabetes in Children is Increasing Worldwide

Annual % Increase in Type 1 Diabetes
1990-1999

The DIAMOND Project Group. Diabetic Medicine 2006
Diabetes is Considered a Worldwide Epidemic

2000
- 2.8% of the world’s population
- 171 million people

2030
- 4.4% of the world’s population
- 366 million people

Wild et al. Diabetes Care 2004
Diabetes is a Complex Disease to Manage

- **Medication**
  - Multiple daily insulin injections for type 1
  - Daily oral medication or insulin injections for type 2

- **Blood Glucose Testing**
  - ≥ 4 blood glucose tests per day for type 1

- **Diet**
  - Food must be coordinated with insulin administration for type 1
  - Weight loss particularly important for type 2

- **Exercise:** improves insulin action for both type 1 and 2

- **Hypoglycemia:** (very low blood glucose) can occur for patients taking insulin and must be recognized and treated
Diabetes Regimen Adherence is Poor

- Medication adherence ranges from 31-87% across studies in systematic reviews (Odegard & Cappadocia, The Diabetes Educator, 2007)

- Adherence to other aspects of the regimen – diet, exercise, blood glucose testing – is generally poorer than medication adherence (Johnson, Diabetes Care, 1992; Patton, J of the American Dietetic Assoc, 2011)

- Poor adherence is associated with higher health care costs (Breitscheidel et al. J of Med Economics 2010)
Psychologists can be an Important Member of the Diabetes Health Care Team

- Managing diabetes requires a complex set of patient behaviors every day; poor diabetes regimen adherence is common
- Psychologists are experts on human behavior and can address patients’ difficulties adhering to the diabetes regimen
  - Adherence assessment
  - Adherence intervention
- Psychologists can also use their expertise to improve provider behavior and positively influence health systems to better promote adherence
- Psychologists can also play a role in preventing type 2 diabetes through lifestyle behavior change
Presentation Overview

- Increasing prevalence of diabetes and its consequences
- The daily management of diabetes; poor adherence is common and costly
- The role of the psychologists on the health care team

- **Defining adherence**
- **Adherence and health status**
- **Provider adherence**
- Adherence assessment
- Adherence intervention
- An ecological model for designing adherence interventions
- Recommendations for interested psychologists
Defining Adherence

“the extent to which a person’s behavior (in terms of medications, following diets, or executing lifestyle changes) coincides with medical or health advice”

Haynes et al, 1979
Health Advice – the Illusive Gold Standard

- Is the health advice communicated effectively to the patient?
- Is the health advice documented?
- Is the health advice given consistent with current standards of care?
- Would the health advice, if followed, actually make a difference in the patient’s health status?
Is health advice communicated effectively to the patient?

Recall of recommendations by the health care team and by patients in a diabetes clinic. Adapted from Page et al (1981).
Is the health advice consistent with current standards of care?

<table>
<thead>
<tr>
<th>Sequest et al 2005</th>
<th>Percent</th>
<th>Physician Adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual cholesterol exam</td>
<td>58%</td>
<td></td>
</tr>
<tr>
<td>Biannual HAIC</td>
<td>57%</td>
<td></td>
</tr>
<tr>
<td>Annual dilated eye exam</td>
<td>17%</td>
<td></td>
</tr>
<tr>
<td>Statin use of LDL is $\geq 130$ mg/dl</td>
<td>31%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coon &amp; Zulkoski 2002</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual cholesterol exam</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>Biannual HA1C</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>Annual dilated eye exam</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Weight and height at last visit</td>
<td>&lt;30%</td>
<td></td>
</tr>
<tr>
<td>Blood pressure at last visit</td>
<td>&gt;90%</td>
<td></td>
</tr>
<tr>
<td>Microalbumin-to-creatinine ratio</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>
Would the health advice, if followed, actually make a difference in the patient’s health status?

It depends on the effectiveness of the treatment.

Fig. 4. The relationship between health behavior and health outcome as a function of inert, weak, and strong treatments.
Defining Adherence

“the extent to which a person’s behavior (in terms of medications, following diets, or executing lifestyle changes) coincides with medical or health advice”

Haynes et al, 1979
Inadvertent versus Willful Nonadherence

- Inadvertent nonadherence: the patient fails to follow the prescribed health advice due to knowledge or skill deficits; the patient often believes he or she is adherent.

- Willful nonadherence: the patient has the necessary knowledge and skills but knowingly fails to follow the prescribed health advice; the patient is usually aware that he is not adherent.
Inadvertent nonadherence due to knowledge or skill deficits is common.
Presentation Overview

- Increasing prevalence of diabetes and its consequences
- The daily management of diabetes; poor adherence is common and costly
- The role of the psychologists on the health care team
- Defining adherence
- Adherence and health status
- Provider adherence
  - Adherence assessment
  - Adherence intervention
  - An ecological model for designing adherence interventions
Best Diabetes Adherence Assessment Tools

- **Electronic monitors**
  - Blood glucose testing meters (date, time, blood glucose result)
  - Medication Event Monitoring Systems (MEMS) caps for oral medications (date, time)

- **Questionnaires**
  - Self-Care Inventory
  - Diabetes Regimen Adherence Questionnaire

- **24 hr Recall Interviews or Diaries**
  - Detailed information about multiple adherence behaviors

- **Glycosylated hemoglobin A1C (HAIC)**
  - HAIC is the gold standard measure of the patient’s diabetes control; it is NOT recommended as an adherence measure

Quittner et al., J of Pediatric Psychology, 2008
# A Selective Comparison of Adherence Assessment Methods

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Behavior</th>
<th>Self-Report</th>
<th>24 hr Recall Interview</th>
<th>Electronic Monitor</th>
<th>Pharmacy Refills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellis et al 2005</td>
<td>Type 1 Diabetes Adolescents</td>
<td>No. blood glucose tests/day</td>
<td>1.8</td>
<td>2.2</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.2</td>
<td></td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maikranz et al 2006</td>
<td>Pediatric Transplant Patients</td>
<td>% prescribed medication taken</td>
<td>97.5%</td>
<td></td>
<td></td>
<td>69.2%</td>
</tr>
<tr>
<td>Modi et al 2006</td>
<td>Cystic Fibrosis Children</td>
<td>% prescribed medication taken</td>
<td>89.5%</td>
<td>27.4%</td>
<td>42.5%</td>
<td>46.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnson et al 2008</td>
<td>Type 1 Diabetes Children</td>
<td>No. blood glucose tests/day</td>
<td>5.8</td>
<td>4.5</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.0</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### A Selective Comparison of Adherence Assessment Methods

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Behavior</th>
<th>24 hr Recall Interview</th>
<th>Direct Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reynolds et al 1990</td>
<td>Type 1 Diabetes Children</td>
<td>AM injection time PM injection time</td>
<td>7:28 17:35</td>
<td>7:41 17:48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise frequency  Exercise duration</td>
<td>3.0 47.2 min</td>
<td>3.6 45.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No. of blood glucose tests</td>
<td>1.9</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No. meals/snacks Calories consumed</td>
<td>3.7 2336 36.4% 47.4 2.2</td>
<td>4.9 2979 35.4% 50.0% 3.4</td>
</tr>
</tbody>
</table>
Best Adherence Interventions for Patients with Type 2 Diabetes

- Medication adherence can be improved by
  - Free or low cost
  - Reduce dose frequency
  - Reminders like blister packs

- Lifestyle Interventions & Self-management training
  - Lifestyle interventions – diet & **exercise**
  - Skills to improve glycemic control
  - Coping skills

- Education alone not effective

Norris et al, Diabetes Care, 2001
Lifestyle Interventions Can Prevent Type 2: the Diabetes Prevention Program (DPP)

Best Adherence Interventions for Patients with Type 1 Diabetes

- **Behavioral interventions**
  - Behavioral methods
  - Parent training
  - Problem Solving

- **Multicomponent interventions**
  - Use of more than one intervention including family or behavioral interventions, and skills training

- **Education alone not effective**

Kahana S et al, J of Ped Psychology, 2008
Best Strategies to Improve Provider Adherence

- System wide structures that enhance provider adherence to practice guidelines
  - Computerized tracking systems
  - Medical record audits and feedback
- Collaborative patient-provider approaches
  - Empower patients to ask questions
  - Provider-patient collaborative goal setting
- Education alone not effective

Van Dam et al. Patient Education & Counseling, 2003
STeP Program: a Patient Provider Collaboration

- Patient records and plots 7 blood glucose test results at specified times for 3 days before the clinic visit.
- Primary care physician uses these data and an evidence based algorithm to make changes to the patient’s regimen.
- This approach has resulted in changes in provider behavior and improved glycemic control for the participating patients.
- Intervention materials available at www.behavioraldiabetes.org/studies/STeP-Study.html.

Polonsky et al, Diabetes Care, 2011
<table>
<thead>
<tr>
<th>Provider Behavior</th>
<th>STeP Program</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of patients for whom a change in recommended treatment occurred the first visit</td>
<td>76%</td>
<td>28%</td>
</tr>
<tr>
<td>% of patients for whom insulin was recommended</td>
<td>42%</td>
<td>23%</td>
</tr>
<tr>
<td>Percent of visits where a change in recommended treatment occurred</td>
<td>54%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Polonsky et al, Diabetes Care 2011
STeP Program Effects on Patients’ HAIC

Polonsky et al, Diabetes Care, 2011

Controls
Adherent
Nonadherent

Adjusted Mean HbA1c (%)

Baseline M1 M3 M6 M9 M12

ACG (n=161)
STG/a (n=130)
STG/na (n=58)

-0.5%
(P=0.0025)
An Ecological Model for Diabetes Care

Access to resources in daily life
Continuity of quality clinical care
Follow-up and support
Enhancing skills
Collaborative goal setting
Individualized assessment

FIGURE 1—Correspondence of ecological levels of influence with resources and supports for self-management.

Fisher et al, Am J of Public Health 2005
Recommendations for Interested Psychologists

- The prevalence of diabetes is increasing; currently considered an epidemic worldwide
- Provider & patient behavior critical to diabetes management
- Behavior is critical to the prevention of type 2 diabetes
- Psychologists are experts in human behavior and have much to offer in terms of treatment, prevention and research
- Evidenced-based adherence assessment tools are available
- Evidence-based adherence intervention strategies are available
- Use an ecological model when designing interventions
- Get involved! The health care system, science and patients need your expertise!
Presentation Overview

- Increasing prevalence of diabetes and its consequences
- The daily management of diabetes; poor adherence is common and costly
- The role of the psychologists on the health care team
- Defining adherence
- Adherence and health status
- Provider adherence
- Adherence assessment
- Adherence intervention
- An ecological model for designing adherence interventions
- Recommendations
Resources


- National Institutes of Diabetes and Digestive Disease [http://www2.niddk.nih.gov/](http://www2.niddk.nih.gov/)
