THE PSYCHOMETRICS
OF
DIABETES SELF-MANAGEMENT
IN
AGING PATIENTS
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PhD
Professor

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University of Delaware
Newark, DE
• Why?
• Who??
• Cognitive Decline ~ Aging
• Cognitive Demands ~ DSM
  • Critical vs Difficult
• Psychometrics and DSM
• Case Studies
• Re-design DSME
Patient complaints

**Gripe-o-meter**

Scores are based on a 10-point scale, with 10 being most bothersome.

- Unclear explanation of problem: 8.1
- Test results not communicated fast: 7.9
- Billing disputes hard to resolve: 7.8
- Hard to get quick appointment when sick: 7.8
- Rushed during office visit: 7.8
- Too-early discharge from hospital: 7.7
- Issues discussed within earshot of other patients: 7.6
- Side effects not fully explained: 7.6
- Long wait for doctor in exam or waiting room: 7.6
- Hard to reach doctor by phone or e-mail: 7.0
- Doctor too quick to recommend tests: 6.7
- Inconvenient office hours: 6.5
- Doctor won’t renew prescription without visit: 6.2
- Doctor takes notes on device, not looking at patient: 6.2
- Must fill out many forms in waiting room: 6.1
- Doctor discourages alternative treatments: 5.7

Source: The Consumer Reports National Research Center. Differences of 0.4 points or less are not meaningful.
Why

and

Who
2015
Diagnosed Diabetes

Number and Percentage of U.S. Population with Diagnosed Diabetes

- Number of Persons
- Number of Adults
- Crude and Age-Adjusted Percentage
- Crude and Age-Adjusted Percentage of Adults
- Percentage by Age
- Percentage by Education
- Percentage by Sex
- Percentage by Race
- Percentage by Race and Sex
- Percentage by Age, Race, and Sex
- Percentage by Hispanic Origin
- Percentage by Hispanic Origin and Sex

Page last reviewed: March 17, 2013
Page last modified: March 17, 2013
FAST FACTS ON DIABETES

Diabetes affects 25.8 million people
8.3% of the U.S. population

DIAGNOSED
18.8 million people

UNDIAGNOSED
7.0 million people

Among U.S. residents aged 65 years and older, 10.9 million, or 26.9%, had diabetes in 2010.

About 215,000 people younger than 20 years had diabetes (type 1 or type 2) in the United States in 2010.

About 1.9 million people aged 20 years or older were newly diagnosed with diabetes in 2010 in the United States.

In 2005–2008, based on fasting glucose or hemoglobin A1c levels, 35% of U.S. adults aged 20 years or older had prediabetes (50% of adults aged 65 years or older). Applying this percentage to the entire U.S. population in 2010 yields an estimated 79 million American adults aged 20 years or older with prediabetes.

Diabetes is the leading cause of kidney failure, nontraumatic lower-limb amputations, and new cases of blindness among adults in the United States.

Diabetes is a major cause of heart disease and stroke.

Diabetes is the seventh leading cause of death in the United States.
## Diagnosed and Undiagnosed Diabetes Among People Aged 20 Years or Older, United States, 2010

<table>
<thead>
<tr>
<th>Group</th>
<th>Number or Percentage Who Have Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥ 20 years</td>
<td>25.6 million or 11.3% of all people in this age group</td>
</tr>
<tr>
<td>Age ≥ 65 years</td>
<td>10.9 million or 26.9% of all people in this age group</td>
</tr>
<tr>
<td>Men</td>
<td>13.0 million or 11.8% of all men aged 20 years or older</td>
</tr>
<tr>
<td>Women</td>
<td>12.6 million or 10.8% of all women aged 20 years or older</td>
</tr>
<tr>
<td>Non-Hispanic Whites</td>
<td>15.7 million or 10.2% of all non-Hispanic whites aged 20 years or older</td>
</tr>
<tr>
<td>Non-Hispanic Blacks</td>
<td>4.9 million or 18.7% of all non-Hispanic blacks aged 20 years or older</td>
</tr>
</tbody>
</table>

Sufficient data are not available to estimate the total prevalence of diabetes (diagnosed and undiagnosed) for other U.S. racial/ethnic minority populations.
Diagnosed and undiagnosed diabetes

Estimated percentage of people aged 20 years or older with diagnosed and undiagnosed diabetes, by age group, United States, 2005–2008

- 20–44: 3.7%
- 45–64: 13.7%
- ≥65: 26.9%

New cases of diagnosed diabetes

Estimated number of new cases of diagnosed diabetes among people aged 20 years or older, by age group, United States, 2010

About 1.9 million people aged 20 years or older were newly diagnosed with diabetes in 2010.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>New Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-44</td>
<td>465,000</td>
</tr>
<tr>
<td>45-64</td>
<td>1,052,000</td>
</tr>
<tr>
<td>65+</td>
<td>390,000</td>
</tr>
</tbody>
</table>

Source: 2007–2009 National Health Interview Survey estimates projected to the year 2010
Pre-Diabetes and Diabetes Trends among Seniors in the United States

<table>
<thead>
<tr>
<th>U.S. Seniors Diabetes Data and Forecasts</th>
<th>2010</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>40,229,000</td>
<td>63,907,000</td>
</tr>
<tr>
<td>Pre-diabetes</td>
<td>20,115,000</td>
<td>31,954,000</td>
</tr>
<tr>
<td>Diagnosed diabetes</td>
<td>7,901,000</td>
<td>12,551,300</td>
</tr>
<tr>
<td>Undiagnosed diabetes</td>
<td>2,920,600</td>
<td>4,639,700</td>
</tr>
<tr>
<td>Total with diabetes (diagnosed and undiagnosed)</td>
<td>10,821,600</td>
<td>17,191,000</td>
</tr>
<tr>
<td>Total with pre-diabetes or undiagnosed diabetes</td>
<td>23,035,600</td>
<td>36,593,700</td>
</tr>
</tbody>
</table>

Complications:

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual impairment</td>
<td>1,607,800</td>
<td>2,435,000</td>
</tr>
<tr>
<td>Renal failure</td>
<td>20,250</td>
<td>26,700</td>
</tr>
<tr>
<td>Leg amputations</td>
<td>27,180</td>
<td>31,400</td>
</tr>
<tr>
<td>Annual deaths attributable to diabetes</td>
<td>109,520</td>
<td>135,900</td>
</tr>
<tr>
<td>Total annual cost (2010 dollars)</td>
<td>$105.7 B</td>
<td>$168.0 B</td>
</tr>
<tr>
<td>Annual medical costs</td>
<td>$74.3 B</td>
<td>$118.1 B</td>
</tr>
<tr>
<td>Annual nonmedical costs</td>
<td>$31.4 B</td>
<td>$49.9 B</td>
</tr>
</tbody>
</table>

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Physical Health

Neuropathy
Vision & hearing problems
Balance problems
Polypharmacy

Cognitive Ability

Memory loss
Dementia
Decreased processing speed
Slower learning

Complexity of DSM Tasks

Many, varied, changing
Constant learning & reasoning
“Means-to-ends” uncertain
Age-related cognitive decline

Basic information processing ($G_F$)

Basic cultural knowledge ($G_C$)

Learning & reasoning ability

Age 8

Age 80
Normal age-related cognitive changes*

“Crystallized” intelligence [past learning]
- Breadth/depth of general knowledge (e.g., language)
- Accrued over lifetime based on fluid intelligence, education, interests

“Fluid” intelligence [on-the-spot learning & reasoning]
- Aptness in processing information (e.g., learning, reasoning, abstract thinking, problem solving)
- Reflects overall integrity of brain (speed, connectedness, etc.)

*This is the norm, but individuals vary a lot around the norm!

Source: Figure 1 in Salthouse, T. A. (2009). Selective review of cognitive aging, J of Int Neuropsych Soc, 16, 754-760.
Normal age-related cognitive changes

“Crystallized” intelligence [past learning]
- Breadth/depth of general knowledge (e.g., language)
- Accrued over lifetime based on fluid intelligence, education, interests

“Fluid” intelligence [on-the-spot learning & reasoning]
- Aptness in processing information (e.g., learning, reasoning, abstract thinking, problem solving)
- Reflects overall integrity of brain (speed, connectedness, etc.)

DSM tasks require “fluid intelligence”

Source: Figure 1 in Salthouse, T. A. (2009). Selective review of cognitive aging, J of Int Neuropsych Soc, 16, 754-760.
Normal age-related cognitive changes

“Crystallized” intelligence [past learning]
- Breadth/depth of general knowledge (e.g., language)
- Accrued over lifetime based on fluid intelligence, education, interests

“Fluid” intelligence [current ability to learn & reason]
- Aptness in processing information (e.g., learning, reasoning, abstract thinking, problem solving)
- Reflects overall integrity of brain (speed, connectedness, etc.)

Source: Figure 1 in Salthouse, T. A. (2009). Selective review of cognitive aging, J of Int Neuropsych Soc, 16, 754-760.
Your patient is an elderly professor starting a new meter and/or insulin device.

He may be literate and express understanding (*crystallized intelligence*),

but that does not guarantee he can perform

the new DSM task (*fluid intelligence*).
What do teachers, nurses, nuclear plant operators and people with diabetes have in common??
Their “jobs” have heavy cognitive burdens that pile up.

- Learn and recall relevant information
- Reason and make judgments
- Deal with unexpected situations
- Identify problem situations quickly
- React swiftly when unexpected problems occur
- Apply common sense to solve problems
- Learn new procedures quickly
- Be alert & quick to understand things

*Job analysis by Arvey (1986)*
The challenges in DM self-management

- Diabetes self-management is inherently complex
- Relentless, evolving cognitive demands
- Frequent cognitive overload
- Non-compliance/non-adherence → High-risk errors
Goal: Maintain blood glucose within normal limits

Learn about diabetes in general (At “entry’)
- Physiological process
- Interdependence of diet, exercise, meds
- Symptoms & corrective action
- Consequences of poor control

Apply knowledge to own case (Daily, Hourly)
- Implement appropriate regimen
- Continuously monitor physical signs
- Diagnose problems in timely manner
- Adjust food, exercise, meds in timely and appropriate manner

Coordinate with relevant parties (Frequently)
- Negotiate changes in activities with family, friends, job
- Enlist/capitalize on social support
- Communicate status and needs to practitioners

Update knowledge & adjust regimen (Occasionally)
- When other chronic conditions or disabilities develop
- When new treatments are ordered
- When life circumstances change

Conditions of work—24/7, no days off, no retirement
CDEs recognize the cognitive burdens of DSM

and instruct to reduce those burdens
Improving the literacy level (readability) of educational materials does not guarantee comprehension and/or compliance because it does not reduce cognitive demands.
Readability doesn’t make a complex task easy

To be or not to be, that is the question.

Ingredients of readability:
- **ASW**: Average syllables per word
- **ASL**: Average words per sentence

\[206.835 - (84.6 \times \text{ASW}) - (1.015 \times \text{ASL})\]

\[(0.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59\]
## Typical literacy items, by difficulty level
### National Adult Literacy Survey (NALS), 1993

<table>
<thead>
<tr>
<th>NALS difficulty level (&amp; scores)</th>
<th>% US adults (age 65+) peaking at this level</th>
<th>Simulated everyday tasks</th>
</tr>
</thead>
</table>
| **5** (375-500)                  | 3% (~0%)                                   | ▪ Use calculator to determine cost of carpet for a room  
▪ Use table of information to compare 2 credit cards |
| **4** (325-375)                  | 15% (4%)                                   | ▪ Use eligibility pamphlet to calculate SSI benefits  
▪ Explain difference between 2 types of employee benefits |
| **3** (275-325)                  | 31% (16%)                                  | ▪ Calculate miles per gallon from mileage record chart  
▪ Write brief letter explaining error on credit card bill |
| **2** (225-275)                  | 28% (33%)                                  | ▪ Determine difference in price between 2 show tickets  
▪ Locate intersection on street map |
| **1** (0-225)                    | 23% (47%)                                  | ▪ Total bank deposit entry  
▪ Locate expiration date on driver’s license |
How to minimize errors in DSM

1. Target the most critical tasks

2. Identify complexity (cognitive difficulty) of DSM tasks

3. Deliver instruction based on both complexity of tasks and ability of person.

4. Use integrated devices, “reminders,” telehealth, apps (??)
Critical vs. Difficult

DSM tasks
Survey of Diabetes Health Care Providers

"Identifying the most critical challenges in diabetes self-management"

A joint research project of the University of Delaware and the Delaware Division of Public Health

UD School of Education, Linda S. Gottfredson, PhD
UD Center for Disabilities Studies, Eileen Sparling, EdM
DPH Diabetes Prevention and Control Program, Kathy Stroh, MS, RD, CDE

This project’s aim is to develop more effective diabetes self-management tools, especially for individuals who also have an intellectual disability. The project’s first step is to survey professionals like you who are in a position to report diabetes patients’ most difficult challenges in learning and performing essential tasks in self-management.

Thank you for your participation. Please know that your name, answers and all other personal information will be kept confidential. Participation is completely voluntary. Data from all participants will be pooled before analysis and reporting. Please contact Eileen Sparling at sparring@udel.edu or 302-831-1802 if you have any questions.

Part I - Characteristics of tasks in diabetes self-management

Definitions: Managing one’s diabetes is a complex job. Not only is it difficult for patients to learn and perform well, but it can have dire consequences for their health and well-being if not performed well. We are interested in two characteristics of various tasks in diabetes self-management:

- **Criticality:** How critical is it for patients (or their caregivers) to actually perform this task as required?
- **Intellectual difficulty:** How difficult is it for patients (or their caregivers) to learn how to perform this task well?

This project’s aim is to identify self-management tasks that are both critical and difficult to learn in order to set priorities in instruction.
• More complex tasks generate more cognitive errors

• Aging (more functional deficits) increases the risk of error

• Errors on critical tasks are more dangerous

• Highest risk of harm occurs at intersection of critical and difficult
Rankings of task criticality and difficulty

<table>
<thead>
<tr>
<th>CORE TASKS IN DIABETES SELF-CARE</th>
<th>How critical to health?</th>
<th>How hard to learn?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average rank by providers (1=least, 3=most)</td>
<td></td>
</tr>
<tr>
<td>EAT HEALTHY DIET</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat correct serving sizes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Identify foods with carbs</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Eat on schedule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GET EXERCISE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognize signs when to stop</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Exercise correct amount</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Time exercise relative to food, meds</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MONITOR BLOOD SUGAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognize when sugar too high or low</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Use correct testing technique</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Monitor blood sugar on schedule</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>USE MEDICATION CORRECTLY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take meds in correct amount and time</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Identify meds that raise blood sugar</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Respond correctly when dose delayed</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SPOT &amp; SOLVE PROBLEMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take correct action with sugar too low</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Follow sick day rules</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Plan for disruptions in routine</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>REDUCE RISKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call doctor if sugar persistently high</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Inspect feet daily for sores</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Schedule required eye &amp; dental exams</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ADAPT SELF OR SITUATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify barriers to effective self-care</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Identify stressors that raise blood sugar</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Recognize signs of depression</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>IF TAKING INSULIN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time meals &amp; exercise relative to insulin</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Use correct technique when using insulin</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Adjust units of insulin as needed</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

“1” = ranked most critical/difficult of 3 core tasks

Tasks ranked within 8 categories
Do all staff agree about task criticality and difficulty?
Examples of DSM errors that may not seem “critical” or “difficult”
Changing Doses Can Be Confusing

A woman with newly diagnosed type 2 diabetes mellitus and also on blood pressure and anti-lipid medication was given prescriptions for glucophage 500mg QD for one week, and then an increase to two 500mg tablets the second week.

On her return appointment, diabetes education was prescribed and the patient was instructed to continue on her other medications. During a review of her treatment regimen during the fourth week after the initial prescription, the patient reported having gastrointestinal side effects.

After questioning the patient further and digging a little deeper, the medical staff discovered that she was taking two 500mg glucophage at bedtime just once weekly.

Switching her schedule to one 500mg tablet before breakfast and dinner cut down on the side effects and improved the blood glucose control by the time she returned for more education three weeks later.

Lesson Learned:

Following up with patients whenever there is a change of medication or dosage can help prevent medication errors.

Martha Mendez, RN, MSN, CCRN
Changing Medications

At a recent support group meeting, a patient raised his hand and told me that he had been prescribed both Lantus and Levemir, and was taking them both at night.

I advised him that he would not have been prescribed both since they were both long-acting insulins. However, the patient insisted he was started on 10 units of Lantus and then was ordered 13 units of Levemir and told to take them both.

After the support group meeting, I called his physician's office and advised them of the patient's medication regimen. The medical staff person then told me the patient had been switched from Lantus to Levemir due to issues with weight, and it was assumed he understood that he would no longer be taking Lantus. The doctor's office was very appreciative of my report since the patient had been doing this for 3 months with some low blood sugars in the morning.

Lesson Learned

When changing drug regimens, make absolutely sure the patient understands what is being discontinued, and what medications are being added as replacement(s).

Jeanne Hennan, RN, CDE

Report Medication Errors to ISMP:

Diabetes in Control is partnered with the Institute for Safe Medication Practices (ISMP) to help ensure errors and near-miss events get reported and shared with millions of health care practitioners. The ISMP is a Patient Safety Organization obligated by law to maintain the anonymity of anyone involved, as well as omitting or changing contextual details for that purpose. Help save lives and protect patients and colleagues by confidentially reporting.
The Wrong "Sugar-Free" Candy

At a recent diabetes education class I gave for a local utility company, we went over label reading. The discussion on sugar alcohols was very lively as patients noticed the number of sugar-free foods that contain these products.

I explained that these have little or no effect on raising glucose levels in non-insulin using patients and that, like fiber, they could subtract this number from the total carbs. The Pecan Delights from Russell-Stover were quite popular with only 1 net carb per 2 pieces of candy.

During the next session I asked if they'd tried any of the foods discussed the week before. Most patients reported positive results, and a couple -- who tested their glucose after eating the candies -- found no increase in glucose levels.

However, one gentleman complained that his glucose increased over 100 mg/dl on the 3 occasions he tried the product. I found this odd and others in the class thought he was cheating. He then pulled out the package and my patients saw immediately what was wrong. The fellow had bought "fat free" not "sugar free" -- 4 pieces of this "fat free" candy had 83 carbs rather than the 2 carbs he thought he was getting. His wife picked the candy up at the grocery store for him, mistakenly thinking he wanted "fat free." I am quite proud of these patients for figuring out the solution themselves.

Lesson Learned
Patients are often looking for ways to control their glucose levels without giving up everything they like, so recommending products that can help is a good idea. Ask them to write down the full name and description of specific products recommended though, and also talk to their spouses and any other caregivers about their dietary needs.

Shan Davis, ARNP, CDE

Report Medication Errors to ISMP
Insulin Pen Delivery Failures

I just encountered the second patient in the past six months new to using pens who was "taking" the insulin with the inner needle shield left on.

The first was an 82-year-old gentleman who had started on 10 units of Lantus and was calling in his weekly numbers. The physician had been increasing the dose over the phone. The patient was also coming to our Diabetes Education Center for Medical Nutrition Therapy, and on one visit he happened to mention to the dietician that his insulin was starting to "leak" when he took it. The dietician then asked me to evaluate the situation and determine the cause. On his next visit, the patient demonstrated his technique and I quickly discovered the error. The insulin overflow likely did not occur until the dose increased past 20 units.

In the second instance, a 63-year-old female in one of our diabetes education classes asked what might be causing bleeding with her recent injections? There were two other insulin users so I threw the question out to them. The first question they asked was, was she re-using the pen needles? She stated she was. She also shared with the group that she liked to inject in one particular abdominal site because it hurt less. I reviewed all of the abdominal sites appropriate for injection excluding areas within one inch of the navel. She had thought she had to take it within one inch of her navel. She also shared that she had previously taken her injection with the "little cover" on the needle.

Lesson Learned:

- Always have your patients demonstrate how they use their pens. Ask them if they are taking off both covers. Review each insulin user's technique, timing they take it at any new encounter.
- The quality of the outcome is directly related to the quality of the communication. Confirm that the instructions are understood and properly implemented before releasing the patient.
Grams vs. grams on label

Diabetes Disaster Averted #11: Label Literacy

I am a diettian working as a diabetes educator. I often work with patients on insulin, and teach insulin to carb ratios and correction factors.

Patients need to be able to read food labels and know portion size in order to dose their mealtime insulin correctly. I often get referred patients who have had some education about food choices and carbs and I help them determine these ratios.

I was reviewing a patient’s food logs and insulin dose, and I questioned the amount of carbohydrate he had stated for a particular food item, as it seemed high. I quickly found out the patient was actually looking at the weight of the food item in grams instead of looking at Total Carbohydrates grams on the food label.

The patient had erroneously calculated a higher insulin dose based on weight grams not carb grams. Luckily, he experienced no hypoglycemia.

Now I make sure to point out to patients the difference in serving weight and Total Carbohydrates, and to use only the value next to Total Carbohydrates (adjusting for serving size).

He has not been the only patient who gets confused by this.

Marilyn Baker, MS, RD, CDE

Take home message:

In addition to looking at weight grams patients often use the % of daily allowance as the amount of carbs they eat. And even the most experienced counter can make a big mistake. It is always good to remind your patients exactly what they should be looking for on the label each time you see them.

Diabetes Disaster Averted #60: Helping Patients Decipher Nutrition Labels

I had a patient who came in for instruction on carbohydrate counting in order to dose his insulin based on his carbohydrate intake. I instructed him on the use of food lists and food labels. When the patient returned for follow-up, his doses of insulin did not correlate with the amount of carbohydrate in some of his foods.

I asked him where he got the amount of carbohydrate in a particular food. It turns out he was using the weight of the food in grams listed at the top of the food label (e.g., 56 grams), rather than the amount listed next to Total Carbohydrates (24 g). His blood sugars were still elevated, so luckily he had not experienced any hypoglycemia. We again reviewed how to read a food label, and the patient was able to calculate the correct amount of carbohydrate.

Lesson learned:

Never assume a patient knows how to read a food label. Now I point out the difference between the weight in grams and the total carbs.

Marilyn Baker, MS, RD, CDE
Goal: Maintain blood glucose within normal limits

Learn about diabetes in general (At “entry’)
- Physiological process
- Interdependence of diet, exercise, meds
- Symptoms & corrective action
- Consequences of poor control

Apply knowledge to own case (Daily, Hourly)
- Implement appropriate regimen
- Continuously monitor physical signs
- Diagnose problems in timely manner
- Adjust food, exercise, meds in timely and appropriate manner

Coordinate with relevant parties (Frequently)
- Negotiate changes in activities with family, friends, job
- Enlist/capitalize on social support
- Communicate status and needs to practitioners

Update knowledge & adjust regimen (Occasionally)
- When other chronic conditions or disabilities develop
- When new treatments are ordered
- When life circumstances change

Conditions of work—24/7, no days off, no retirement
Insights on error from psychometrics

Science of accurately *measuring* differences in *cognitive performance* (in training, education, jobs, etc.)

Studies error: kinds, number, sources, consequences, control

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
4. Compounding of device & person errors increases with age
5. Criticality of errors increases with age

Applies to diabetes self-management
Sample patient’s operational challenge

Goal: Maintain blood glucose within normal limits

Learn about diabetes in general (At “entry’)
- Physiological process
- Interdependence of diet, exercise, meds
- Symptoms & corrective action

Apply knowledge to own case (Daily, Hourly)
- Implement appropriate regimen
- Continuously monitor physical signs
- Diagnose problems in timely manner
- Adjust food, exercise, meds in timely and appropriate manner

Coordinate with relevant parties (Frequently)
- Negotiate changes in activities with family, friends, job
- Enlist/capitalize on social support
- Communicate status and needs to practitioners

Update knowledge & adjust regimen (Occasionally)
- When other chronic conditions or disabilities develop
- When new treatments are ordered
- When life circumstances change

Conditions of work—24/7, no days off, no retirement

Hypoglycemia

Huge glycemic excursions

4 days BG readings
Must prevent being knocked off course—or get back on course

- Preventing/minimizing excursions is *cognitive* process
- 24/7 job for patient
Cognitive errors increase with age

Complexity of DSM Tasks

Cognitive burden of DSM

Cognitive errors increase with age

Physical health
- Neuropathy
- Vision & hearing problems
- Balance problems
- Polypharmacy

Cognitive ability
- Memory loss
- Dementia
- Decreased processing speed
- Slower learning

Cognitive burden of DSM

Means to ends uncertain

Constant learning & reasoning

Many, varied, changing

Error
Psychometrics and DSM

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
4. Compounding of device & person errors
5. Criticality of errors
FDA standards for BG monitor accuracy

- Current FDA standards
  >95% of meter readings within 20% of lab reference value (within 15% for BG <75)
Sample results on BG meter accuracy

Kuo et al. (2011).
Accuracy of 7 meters.

All evaluated under controlled conditions

Accuracy profiles differ
Under controlled conditions

But patients don’t live in controlled conditions

Psychometrics and DSM

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
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5. Criticality of errors
User errors can degrade BG readings
(effect electrochemical reactions in monitor)

Figure 15. Sugary substances such as cookies (Chips Ahoy) raised glucose readings substantially. Lotions had only a minor effect and soap had almost none.

Figure 7. Effect of temperature on strip accuracy. Glucose strips are fragile and must be stored for limited time under specific conditions. Shown here is the effect of storing strips at 40 °C (104 °Fahrenheit) for an extended time.
Factors that affect patient’s use of devices

The ability of a user to operate a medical device depends on his or her personal characteristics, including:

- Physical size, strength, and stamina,
- Physical dexterity, flexibility, and coordination,
- Sensory abilities (i.e., vision, hearing, tactile sensitivity),
- Cognitive abilities, including memory,
- Medical condition for which the device is being used,
- Comorbidities (i.e., multiple conditions or diseases),
- Literacy and language skills,
- General health status,
- Mental and emotional state,
- Level of education and health literacy relative to the medical condition involved,
- General knowledge of similar types of devices,
- Knowledge of and experience with the particular device,
- Ability to learn and adapt to a new device, and
- Willingness and motivation to use a new device.

THESE same factors affect the use of information
Patients must act to keep BG within healthy limits

- Preventing/minimizing excursions is *cognitive* process
- Spotting hazards is *cognitive* process
- 24/7 job for patient
Psychometrics and DSM

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
4. Compounding of device & person errors
5. Criticality of errors
Complexity invites error in using devices.
Cognitive complexity invites error in using device/information, such as meters, food labels, insulin, Rx
Patient's interface with label—cognitively complex

<table>
<thead>
<tr>
<th>Nutrition Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macaroni and Cheese</strong></td>
</tr>
<tr>
<td><strong>Serving Size</strong></td>
</tr>
<tr>
<td><strong>Servings Per Container</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
</tr>
<tr>
<td>Calories from Fat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Daily Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
</tr>
<tr>
<td>Saturated Fat</td>
</tr>
<tr>
<td>Cholesterol</td>
</tr>
<tr>
<td>Sodium</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
</tr>
<tr>
<td>Dietary Fiber</td>
</tr>
<tr>
<td>Sugars</td>
</tr>
<tr>
<td>Protein</td>
</tr>
</tbody>
</table>

| Vitamin A | 4% |
| Vitamin C | 2% |
| Calcium | 20% |
| Iron | 4% |

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

<table>
<thead>
<tr>
<th>Calories:</th>
<th>2,000</th>
<th>2,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>Less than 65g</td>
<td>Less than 60g</td>
</tr>
<tr>
<td>Sat Fat</td>
<td>Less than 20g</td>
<td>Less than 25g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Less than 300mg</td>
<td>Less than 300mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>Less than 2,400mg</td>
<td>Less than 2,400mg</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>300g</td>
<td>375g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>25g</td>
<td>30g</td>
</tr>
</tbody>
</table>
Psychometrics and DSM

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
4. Compounding of device & person errors
5. Criticality of errors
### Core Tasks in Diabetes Self-Care

<table>
<thead>
<tr>
<th>EAT HEALTHY DIET</th>
<th>GET EXERCISE</th>
<th>MONITOR BLOOD SUGAR</th>
<th>USE MEDICATION CORRECTLY</th>
<th>SPOT &amp; SOLVE PROBLEMS</th>
<th>REDUCE RISKS</th>
<th>ADAPT SELF OR SITUATION</th>
<th>IF TAKING INSULIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat correct serving sizes</td>
<td>Recognize signs when to stop</td>
<td>Recognize when sugar too high or low</td>
<td>Take meds in correct amount and time</td>
<td>Take correct action with sugar too low</td>
<td>Call doctor if sugar persistently high</td>
<td>Identify barriers to effective self-care</td>
<td>Time meals &amp; exercise relative to insulin</td>
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<tr>
<td>Identify foods with carbs</td>
<td>Exercise correct amount</td>
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<td>Eat on schedule</td>
<td>Time exercise relative to food, meds</td>
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<td>Plan for disruptions in routine</td>
<td>Schedule required eye &amp; dental exams</td>
<td>Recognize signs of depression</td>
<td>Adjust units of insulin as needed</td>
</tr>
</tbody>
</table>

### All increase cognitive load

**Core tasks:**
- Interdependence
- Multi-step
- Must extinguish old habits
- “If-then” decisions

**Work conditions:**
- Time pressure
- Distractions
- Unpredictability
- Interruptions

**Cognitive complexity**

**Cognitive interferences (drains)**

**Cognitive overload**
Intersecting hazards *magnify* (not just add to) BG error

- Meter accuracy
- Degraded strips
- Contaminants on hands
SMBG error

Wrong Carb/label calculation

BG

???? Insulin
Psychometrics and DSM

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
4. Compounding of device & person errors
5. Criticality of errors
Critical Errors

And

Critical Incidents
From 30 diabetes health providers (MD, RN, RNP, RD, CDE, other)

Survey reports of “critical incidents”

**Critical Error:**
Did not understand causal nexus:
food, Rx, blood sugar

<table>
<thead>
<tr>
<th>CORE TASKS IN DIABETES SELF-CARE</th>
<th>How critical to health?</th>
<th>How hard to learn?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average rank by providers</td>
<td>(least=3, 1=most)</td>
</tr>
<tr>
<td><strong>EAT HEALTHY DIET</strong></td>
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<td></td>
</tr>
<tr>
<td>Eat correct serving sizes</td>
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<td>2</td>
</tr>
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Took Rx on time:
- but delayed meal
- or ate only a salad

**hypoglycemia**
Sick, not eating/vomiting:
- no insulin or **DKA**
- took same dose **risked hypo**

Critical Error:
Did not shift rule when conditions changed
### CORE TASKS IN DIABETES SELF-CARE

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</table>

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Eating to prevent hypoglycemia, not testing blood glucose, no physical activity:
- chronic high sugar

**Critical Error:**
Could grasp only one cause, one effect, one tactic at a time
### CORE TASKS IN DIABETES SELF-CARE

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<tr>
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<th>How critical to health?</th>
<th>How hard to learn?</th>
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</tr>
</tbody>
</table>

**Critical Error:**
One goal
(avoid immediate pain)
One tactic
(avoid medical treatment)

Did not control diet
chronic high sugar
poor wound healing
Feared pain of treating necrotic foot nearly lost foot

From 30 diabetes health providers (MD, RN, RNP, RD, CDE, other)
Teaching to reduce critical errors in DSM
Bloom’s Taxonomy of Learning Objectives
(2001 revision)

Bloom’s levels = continuum of cognitive complexity

<table>
<thead>
<tr>
<th>lower order thinking skills</th>
<th>higher order thinking skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>remember</td>
<td>create</td>
</tr>
<tr>
<td>recognizing (identifying)</td>
<td>generating (hypothesizing)</td>
</tr>
<tr>
<td>recalling (retrieving)</td>
<td>planning (designing)</td>
</tr>
<tr>
<td>interpreting (clarifying, paraphrasing, representing, translating)</td>
<td>checking (coordinating, detecting, monitoring, testing)</td>
</tr>
<tr>
<td>exemplifying (illustrating, instantiating)</td>
<td>differentiating (discriminating, distinguishing, focusing, selecting)</td>
</tr>
<tr>
<td>classifying (categorizing, subsuming)</td>
<td>analyzing (coordinating, detecting, monitoring, testing)</td>
</tr>
<tr>
<td>summarizing (abstracting, generalizing)</td>
<td>execute (carrying out, implementing)</td>
</tr>
<tr>
<td>inferring (concluding, extrapolating, interpolating, predicting)</td>
<td>applying (cooperating, implementing)</td>
</tr>
<tr>
<td>comparing (contrasting, mapping, matching)</td>
<td>analyzing (cooperating, implementing)</td>
</tr>
<tr>
<td>explaining (constructing models)</td>
<td>applying (cooperating, implementing)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cognitive complexity</th>
</tr>
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<tbody>
<tr>
<td>Treatment goals</td>
</tr>
<tr>
<td>Patient assessment</td>
</tr>
<tr>
<td>DSME activities &amp; materials</td>
</tr>
</tbody>
</table>

(Table 1 adapted from Anderson and Krathwohl, 2001, pp. 67–68.)
What are we asking the patient to do ???????

- Identify
- Memorize
- Recognize
- Measure
- Calculate
- Repeat

- Collect
- Identify Pattern
- Modify
- Predict
- Interpret
- Distinguish
- Compare
- Cause/Effect

Make observations

- Use concepts to solve non-routine problems
  - Draw conclusions
    - Connect
  - Apply Concepts
    - Create
Strategies in DSME

Bloom’s taxonomy of educational objectives (cognitive domain)*

Simplest tasks
1. Remember
   - recognize, recall, identify, retrieve

2. Understand
   - paraphrase, summarize, compare, predict, infer

3. Apply
   - execute familiar task, apply procedure to unfamiliar task

4. Analyse
   - distinguish, focus, select, integrate, coordinate

5. Evaluate
   - check, monitor, detect inconsistencies, judge effectiveness

6. Create
   - hypothesize, plan, invent, devise, design

Most complex tasks

Bloom’s Taxonomy is the basis for effective DSME with elderly patients, because it focuses on the *complexity of the learning*.
Psychometrics and DSM

1. Device error (test accuracy)
2. Person error (cognitive mistakes)
3. Task demands (cognitive burden)
4. Compounding of device/INFORMATION & person errors
5. Criticality of errors
Complexity invites error in using devices

Figure 2. Use-Related Hazards, Device Failure Hazards, and Their Intersection.

Use-related hazards occur for one or more of the following reasons:

- Device use requires physical, perceptual, or cognitive abilities that exceed the abilities of the user;
- The use environment affects operation of the device and this effect is not recognized or understood by the user;
- The particular use environment impairs the user’s physical, perceptual, or cognitive capabilities when using the device to an extent that negatively affects the user’s interactions with the device;
- Device use is inconsistent with user’s expectations or intuition about device operation;
- Devices are used in ways that were not anticipated; or
- Devices are used in ways that were anticipated but inappropriate and for which adequate controls were not applied.

COMPLEXITY ALSO INVITES ERROR IN USING information
Changing doses can be confusing

Complexity of task/opportunity for error:

Patient must recognize that this is an **addition** to the Rx schedule.
Inference was assumed.
Patient had “literal thinking”.

**DSME:**
Remember to clarify “Addition”
Explicit instructions about what to remember.
Do not assume that patient can infer new Rx schedule.
Confirm instructions.

**Source of error:**
Person error (cognitive mistakes)
Task demands (cognitive burden)

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**Changing Doses Can Be Confusing**

A woman with newly diagnosed type 2 diabetes mellitus and also on blood pressure and anti-lipid medication was given prescriptions for: glucophage 500mg QD for one week, and then an increase to two 500mg tablets the second week.

On her return appointment, diabetes education was prescribed and the patient was instructed to continue on her other medications. During a review of her treatment regimen during the fourth week after the initial prescription, the patient reported having gastrointestinal side effects.

After questioning the patient further and digging a little deeper, the medical staff discovered that she was taking two 500mg glucophage at bedtime just once weekly.

Switching her schedule to one 500mg tablet before breakfast and dinner cut down on the side effects and improved the blood glucose control by the time she returned for more education three weeks later.

**Lesson Learned:**
Following up with patients whenever there is a change of medication or dosage can help prevent medication errors.

*Martha Mendez, RN, MSN, CCRC*
Changing insulins – 2 long-acting

Complexity of task/opportunity for error:

Patient did not recognize that the change in Rx = subtract 1 Rx, add different Rx. Inference assumed.

**DSME:** Patient understands types of insulin. Stop current insulin. Start different insulin. Assess hearing loss.

Do not assume that patient can infer changed Rx.

**Source of error:**
Person error (cognitive mistakes) Task demands (cognitive burden)
Substituting is more complex than adding or subtracting something.
Insulin pen

Complexity of task/opportunity for error:

The device use is inconsistent with her expectations or intuition about device operation. (cf FDA list)

**DSME:** Assume that patient has preconceptions about insulin device.
Deconstruct steps for using pen.
Demonstrate use.

Source of error:
Person error (cognitive mistakes)
Task demands (cognitive burden)

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**Insulin Pen Delivery Failures**

I just encountered the second patient in the past six months new to using pens who was "taking" the insulin with the inner needle shield left on.

The first was an 82-year-old gentleman who had started on 10 units of Lantus and was calling in his weekly numbers. The physician had been increasing the dose over the phone. The patient was also coming to our Diabetes Education Center for Medical Nutrition Therapy, and on one visit he happened to mention to the dietician that his insulin was starting to "leak" when he took it. The dietician then asked me to evaluate the situation and determine the cause. On his next visit, the patient demonstrated his technique and I quickly discovered the error. The insulin overflow likely did not occur until the dose increased past 20 units.

In the second instance, a 53-year-old female in one of our diabetes education classes asked what might be causing bleeding with her recent injections? There were two other insulin users so I threw the question out to them. The first question they asked was, was she re-using the pen needles? She stated she was. She also shared with the group that she liked to inject in one particular abdominal area because it hurt less. I reviewed all of the abdominal sites appropriate for injection excluding areas within one inch of the navel. She had thought she had to take it within one inch of her navel. She also shared that she had previous taken her injection with the "little cover" on the needle.

Lesson Learned:
- Always have your patients demonstrate how they use their pens. Ask them if they are taking off both covers. Review each insulin user's technique, timing they take it at any new encounter.
- The quality of the outcome is directly related to the quality of the communication. Confirm that the instructions are understood and properly implemented before releasing the patient.
These tasks were low complexity.

Cognitive complexity was minimal.

But

tasks were difficult for these patients, because their cognitive abilities were declining.
## Typical literacy items, by difficulty level

**National Adult Literacy Survey (NALS), 1993**

<table>
<thead>
<tr>
<th>NALS difficulty level (&amp; scores)</th>
<th>% US adults (age 65+) peaking at this level</th>
<th>Simulated everyday tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 (375-500)</td>
<td>3% ~0%</td>
<td>▪ Use calculator to determine cost of carpet for a room</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Use table of information to compare 2 credit cards</td>
</tr>
<tr>
<td>4 (325-375)</td>
<td>15% 4%</td>
<td>▪ Use eligibility pamphlet to calculate SSI benefits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Explain difference between 2 types of employee benefits</td>
</tr>
<tr>
<td>3 (275-325)</td>
<td>31% 16%</td>
<td>▪ Calculate miles per gallon from mileage record chart</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Write brief letter explaining error on credit card bill</td>
</tr>
<tr>
<td>2 (225-275)</td>
<td>28% 33%</td>
<td>▪ Determine difference in price between 2 show tickets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Locate intersection on street map</td>
</tr>
<tr>
<td>1 (0-225)</td>
<td>23% 47%</td>
<td>▪ Total bank deposit entry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Locate expiration date on driver’s license</td>
</tr>
</tbody>
</table>
Sugar-free candy

Complexity of task/opportunity for error:

Caregiver (wife) did not recognize the difference between sugar free & fat free. Patient did not examine label or did not recognize error. Error was “contagious”.

DSME: Deconstruct label. Recognize that label is complex. Review “Sugar-free” vs “Fat-free”. Include family in DSME.

Source of error:

Person error (cognitive mistakes) Task demands (cognitive burden) Compounding of device/information & person errors
Grams vs. grams on label

Diabetes Disaster Averted #11: Label Literacy

I am a dietitian working as a diabetes educator. I often work with patients on insulin, and teach insulin to carb ratios and correction factors.

Patients need to be able to read food labels and know portion size in order to dose their mealtime insulin correctly. I often get referred patients who have had some education about food choices and carbs and I help them determine these ratios.

I was reviewing a patient’s food logs and insulin dose, and I questioned the amount of carbohydrate he had stated for a particular food item, as it seemed high. I quickly found out the patient was actually looking at the weight of the food item in grams instead of looking at Total Carbohydrates grams on the food label.

The patient had erroneously calculated a higher insulin dose based on weight grams not carb grams. Luckily, he experienced no hypoglycemia.

Now I make sure to point out to patients the difference in serving weight and Total Carbohydrates, and to use only the value next to Total Carbohydrates (adjusting for serving size).

He has not been the only patient who gets confused by this.

Marilyn Baker, MS, RD, CDE

Take home message:

In addition to looking at weight grams patients often use the % of daily allowance as the amount of carbs they eat. And even the most experienced counter can make a big mistake. It is always good to remind your patients exactly what they should be looking for on the label each time you see them.

Diabetes Disaster Averted #60: Helping Patients Decipher Nutrition Labels

I had a patient who came in for instruction on carbohydrate counting in order to dose his insulin based on his carbohydrate intake. I instructed him on the use of food lists and food labels. When the patient returned for follow-up, his doses of insulin did not correlate with the amount of carbohydrate in some of his foods.

I asked him where he got the amount of carbohydrate in a particular food. It turns out he was using the weight of the food in grams listed at the top of the food label (e.g., 56 grams), rather than the amount listed next to Total Carbohydrates (24 g). His blood sugars were still elevated, so luckily he had not experienced any hypoglycemia. We again reviewed how to read a food label, and the patient was able to calculate the correct amount of carbohydrate.

Lesson learned:

Never assume a patient knows how to read a food label. Now I point out the difference between the weight in grams and the total carbs.

Marilyn Baker, MS, RD, CDE
Grams vs. grams on label

Complexity of task/opportunity for error:

Patient did not recognize the correct location for CHO grams. Label is inherently complex.

**DSME:** Identify correct location for CHO grams. Differentiate weight in grams vs Total CHO. Locate total CHO.

Do not assume that patient understands label!

**Source of error:**
- Person error (cognitive mistakes)
- Task demands (cognitive burden)
- Compounding of device/information & person errors.
Patient's interface with label—cognitively complex

Label ambiguities invite consequences/additional errors, e.g. inaccurate measuring, Rx dose, interpretation of BGs.
<table>
<thead>
<tr>
<th>Nutritional Value</th>
<th>Amount Per Serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>170</td>
</tr>
<tr>
<td>Fat Cal.</td>
<td>80</td>
</tr>
<tr>
<td>Total Fat</td>
<td>9g (13%DV)</td>
</tr>
<tr>
<td>Sat. Fat</td>
<td>3g (15%DV)</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
</tr>
<tr>
<td>Cholest.</td>
<td>15mg (5%DV)</td>
</tr>
<tr>
<td>Sodium</td>
<td>135mg (6%DV)</td>
</tr>
<tr>
<td>Total carb.</td>
<td>21g (7%DV)</td>
</tr>
<tr>
<td>Fiber</td>
<td>1g (3%DV)</td>
</tr>
<tr>
<td>Sugars</td>
<td>12g</td>
</tr>
<tr>
<td>Protein</td>
<td>3g</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>(0%DV)</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>(0%DV)</td>
</tr>
<tr>
<td>Calcium</td>
<td>(0%DV)</td>
</tr>
<tr>
<td>Iron</td>
<td>(6%DV)</td>
</tr>
</tbody>
</table>

Percent Daily Values (DV) are based on a 2,000 calorie diet.

Opportunities for error:
- Format = confusing display of information.
- No clear distinction between items.
Opportunities for error:
Irrelevant information.
Opportunities for error:
Confusion between 2 locations for nutrition information.
Better, but……

Pros:
- Fewer items
- Single vertical list
- Major headings stand out

Cons:
- Lots of irrelevant info
- Seemingly inconsistent info
Bloom’s taxonomy of educational objectives (cognitive domain)

**Simplest tasks**
1. **Remember**
   - recognize, recall,
   - Identify, retrieve
2. **Understand**
   - paraphrase, summarize,
   - compare, predict, infer,
3. **Apply**
   - execute familiar task,
   - apply procedure to unfamiliar task
4. **Analyze**
   - distinguish, focus, select,
   - integrate, coordinate
5. **Evaluate**
   - check, monitor, detect inconsistencies, judge effectiveness
6. **Create**
   - hypothesize, plan, invent,
   - devise, design

**Most complex tasks**

**Location of relevant CHO gms**
- Carb vs non-carb ??
- Sequence of label Total CHOs = imp;
- “Sugars” not = Total CHOs Volume vs wt
- How many CHO gms in 1 serving ?
- Subtract fiber gms from CHO gms

**Distractors**
- CHOs vs Fiber vs Fat
- Part of meal vs snack OK?
- CHOs in intended serving ?
- CHOs vs Fat/Chol vs Na

**Plan a meal or snack**
Food label revision…
DSME must include *cognitive accessibility* of information & materials.

Even if the DSM “job” did not get more complex,

cognitive decline makes it more difficult.
CDEs recognize the cognitive burdens of DSM, especially in the elderly and instruct to reduce those burdens.
Thank you.

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