

**Organizing Information to Enhance Recall and to  
Facilitate its Use in Clinical Decision Making  
Part I: Theory and Concepts**

- I) In 1994 Georges Bordage wrote an article entitled, *Elaborated Knowledge: A Key to Successful Diagnostic Thinking*. He recognized that many medical schools have encouraged and rewarded rote memorization. Rote memorization may cause students (or clinicians) to give long lists of diseases but they may have difficulty deciding on which one of those diseases is actually causing a specific patient's problem. They may have difficulty giving an "appropriate" differential (a differential that contains the likely diseases given the specific signs and symptoms exhibited), and have difficulty ordering that differential.

The "successful" clinician is one who makes connections between new information (the patient's history, physical, and lab findings) and information stored in memory. Memory recall, as well as problem solving, is most effective when the information stored in memory is well organized. The type of organizational structure seems to matter. You can think about storing facts in your head as similar to storing articles in a filing cabinet. How you organize your drawers and how you "tag", or name, your folders determine how easy or hard it is to retrieve the pertinent information. However, there are important differences. In your office, you probably have one system of filing information. In your brain, you may have multiple filing systems; multiple ways of storing and retrieving information. You may also store the same information in a number of different places (that's hard to do with articles). Storing information in multiple ways and multiple locations seems to be better than using only one method of storage. Consciously thinking about *how* you are storing the information is key. This way there are a number of "triggers" for retrieving information. Let's see how this works. For example, when evaluating an infant who is failing to gain weight, you need to know the following:

- A) What is required for someone to actually *gain* weight? They must eat food and then absorb the food. Then the absorbed nutrients must be utilized (metabolized) by the body. Lastly, they must absorb more calories than they expend. Therefore, the broad categories of "failure to gain weight" include:
- 1) Intake
    - a. Food does not get to the child (financial problems, depressed parent, etc)
    - b. Food gets to the child but not swallowed (poor suck, abnormal swallowing mechanism, abnormal esophagus)
    - c. Food gets in but does not stay down.
  - 2) Malabsorption
    - a. Fat malabsorption
    - b. Carbohydrate malabsorption
    - c. Protein Malabsorption
  - 3) Underutilization of calories (Inborn errors of metabolism)
    - a. Protein metabolism (aminoacidopathies)
    - b. Fat metabolism
    - c. Carbohydrate metabolism
    - d. Urea cycle defects
  - 4) Overutilization of calories (infection, hyperthyroidism, etc)

- B) The above represents an organizational strategy; a way we can organize our thinking regarding failure to gain weight. We used 4 drawers: Intake, Malabsorption, Underutilization and Overutilization of calories.
- C) My next task with the patient is to figure out which “category” (or categories) is causing the problem in *my* patient. In order to do this I must go to the folders in those drawers. For example, when I open the “Malabsorption” drawer, I see 3 folders labeled:
  - 1) Fat
  - 2) Carbohydrate
  - 3) Protein
- D) In the folder labeled “Fat” I see some “articles”:
  - 1) Pathophysiology of fat absorption (and therefore, *malabsorption*)
  - 2) Symptoms of fat malabsorption
  - 3) Physical signs of fat malabsorption
  - 4) Diseases that include fat malabsorption
- E) Having this organizational structure in my head is valuable in many ways:
  - 1) It makes it easier to store and also to retrieve the information.
  - 2) It **drives an efficient search strategy** when I’m evaluating my patient. I don’t have to ask about a hundred different diseases, rather I ask about 4 broad categories. Once I figure out in which category the problem lies (e.g., malabsorption) I efficiently search for which type of substance is being malabsorbed. Once I figure that out, I can look at my list of diseases that include that type of malabsorption. To be honest, I may not know a lot about those specific diseases, but once I’ve narrowed it down that far it is *much* easier to look up a particular disease rather than looking up everything that causes failure to gain weight.
  - 3) It gives me many ways to locate or retrieve specific conditions. In other words, I may have a specific disease (like CF) stored in many locations:
    - a. Failure to gain weight
    - b. Greasy stools
    - c. Malabsorption
    - d. Pulmonary disease
    - e. Abnormal sweat test.

The more connections I have, the more likely I will be able to make the correct diagnosis.

Storing information in ways that emulate how you gather information clinically is also advantageous. For example, in the case of our child with failure to gain weight:

- A) We normally do a “cardinal 7” history. Thus we ask about chronology. Therefore, we should put a folder entitled, “chronology” in the draw called, “failure to gain weight”. Inside the chronology folder we see the following facts:
  - 1) Prenatal failure to gain weight is caused by one set of diagnoses
  - 2) Failure to gain weight that began shortly after birth is caused by another set
  - 3) Failure to gain weight that begins at age 13 years is usually caused by a completely different set of diagnoses.
- B) We could easily look at other cardinal 7 features, for example, “context” (failure to gain weight that is associated with breastfeeding vs introduction of solid foods, etc)

- C) Thus the organization in our brain can drive the questions *or* the questions themselves can trigger the recall of stored information *especially* when the information is stored in an organized fashion.

We have been talking about “memory” but the reality is we are also talking about “thinking”. Thinking involves a recognition of relationships. Thinking may also involve taking new information *and* old information, breaking them down into smaller chunks, and putting them back together in novel ways. It involves a reorganization of information. This all requires finding the appropriate information in memory.

**Below are some more examples of strategies for storing or organizing information:**

- A) The successful clinician actively searches for **descriptors** (hyperacute, unilateral, severe, etc). Notice how a typical “Cardinal 7” interview will reveal those descriptors. This clinician has already organized information in his/her brain in ways that facilitate both connections and recall: The abdominal pain can be:
- 1) Chronic, recurrent, subacute, acute, or hyperacute [**Timing**]
  - 2) Periumbilical, RUQ, RLQ, bilateral, diffuse, etc [**Location**]
  - 3) Radiating or non-radiating [**Radiation**]

Each of these descriptors (timing, location, radiation, etc) are called axes.

- B) **Anatomically:**
- 1) The blood in the urine can come from the kidney, ureter, bladder, or urethra
  - 2) The cough may be caused by something in the respiratory system anywhere from the nose to the alveoli
- C) **Physiologically:**
- 1) Anemia is caused by decreased production, increased destruction, or blood loss.
  - 2) Acidosis is either anion gap positive or anion gap negative.

**Summary**

The successful clinician has many ways of organizing information. Organizational schema makes it much easier to store information as well as to retrieve it later. It is most efficient, when information is organized (stored in memory) in a way that enhances retrieval in real time. Thus, during a clinical encounter when we elicit history, PE, and labs, the very facts we uncover will act as triggers for the recall of information. In other words, information should be stored in the same way that it is used.