# Introduction to Clinical Reasoning and Clinical Decision Making
# Doc-in-the Box (DIB)

At the center of the intellectual life of the physician are two dynamic, wonderful, complicated and ever evolving enterprises; namely, clinical reasoning and clinical decision making. Defining these terms is a bit treacherous, but for the purposes of our exercises, we will use **clinical reasoning** to refer to the project of thinking through the presentation, clinical data and diagnostic test results with a goal of ***ultimately*** arriving at the correct diagnosis for a given patient. The Doc-in-the-Box sessions are **not** about guessing the correct diagnosis from the beginning. Paradoxically, guessing the correct diagnosis from the outset can in fact, hamper the development of sound clinical reasoning skills and foster the development of "bad habits" which may compromise your effectiveness as a practicing clinician. Our emphasis will be on helping each young physician learn **systematic** strategies to evaluate a patient and develop the intellectual discipline to generate a list of reasonable diagnostic possibilities. Once the list is made, we will learn how to reason through the relative likelihood of each possibility and the risks associated with "missing" a diagnosis. This then places us in a position to develop a logical strategy for evaluation and initial management.

While clinical reasoning is largely (if not exclusively) an intellectual process, the task of applying our thoughts to a particular patient we will refer to as **clinical decision making**. This task must incorporate all the elements of the clinical reasoning enterprise, but in addition, consider the patient's individual circumstances (such as social setting, insurance coverage, personal health attitudes etc). It also includes the ability to communicate with the patient and family regarding the rationale for the decision and its implementation. Our Doc-in-the-Box cases will give us ample opportunity to explore both clinical reasoning and clinical decision making in a way which hopefully will allow you to learn to think clearly. These skills are critical to the practicing clinician regardless of your discipline. They are just as important in psychiatry and orthopedics as in internal medicine.

## Definitions:

**Problem List:** This term most commonly refers to the assessment for progress notes being organized by the pateint's problems or diagnoses. For our purposes in Doc-in-the-Box, however, we will be creating one for each patient we discuss. It will include all the abnormalities noted from the history, physical and diagnostic evaluation. This forms the basis for our initial thinking about the patient. Using a puzzle metaphor, creating the problem list is like picking the side pieces out of a puzzle as a way of beginning. It allows us to frame the patient's problems.

**Differential Diagnosis**: A list of the diagnoses that can cause a particular problem.
The mind of the practicing physician begins generating potential causes of the patient's symptoms within seconds of beginning the history. We however will formalize this process and "externalize" it in order to teach. The first and arguably most important part of the differential is deciding which problem should be at its center. One must pick **a single problem** from the problem list and build your differential from that one problem. Most patients present with multiple issues, such as fatigue, weight loss, cough and a pleural effusion. Generally the problem around which one builds the differential should have as narrow a differential as

possible. In the example, fatigue would not be the best subject, but rather a pleural effusion. Using a puzzle metaphor again, the differential represents the different pictures that can be created with the puzzle pieces of a particular patient. Strategies to create such lists are found below under Hypothetico-Deductive Reasoning (HDR).

**Working Diagnosis:** After an initial evaluation including the history and physical, the working diagnosis is your *best guess* as to the most likely diagnosis. Committing to a working dx is important because this then helps you prioritize your evaluation and management. For example, if a patient presents with chest pain and your working diagnsois is a pulmonary embolus, that will lead you to order certain tests (PE protocol CT) first, rather than a test related to a cardiac cause (adenosine thallium). The working diagnosis may be right or wrong, and therefore often changes in the course of a patient's evaluation.

**Illness Script:** This term refers to the usual script (as in movie) including symptoms and exam findings for a patient who presents with a particular illness. Novices to clincial reasoning, often think only of the "classic" presentation such as exertional chest pain which radiates to the shoulder and jaw for cardiac ischemia. Each time you see a patient with a particular problem, you will learn from their story and modify your undertanding of the variety of illness scripts for particular maladies.

**Heuristics**: Refers to mental short cuts we use to assess the probabilities of diagnoses. These are based on many things including epidemological frequency, cause and effect, similarities to previous cases etc. They are useful, but carry the risk of errors. We will discuss this at length in our DIB sesssions.

**Summary Statement:** A sentence summarizing the patient's presentation with the **critical features** of the case. It is not a reharsh of the H&P. It requires the physician to collect, organize and synthesize the information about the patient. But it further requires the selection from a litany of options, the 3-4 critical pieces of data about the patient.

F*rom the clerkship primer*—Every attending physician will ask a student to give a short summary of the case either after a full presentation or in place of one. The student must interpret and synthesize many data points to arrive at this summary. The best one-sentence summary of a patient's clinical situation concisely highlights the most pertinent features without omitting any significant points. The sentence should contain the following three key components: the patient's epidemiology, the temporal pattern, and a syndrome statement. When using this format, the summary models an illness script, the basic construct that physicians use to recall and recognize a disease. The classic disease illness script emphasizes (1) who gets it, (2) how does it present with respect to time, and (3) what key features are expected at presentation.

Example: Summary of the Patient's Presentation:

- Epidemiology: Who is this patient?
    - Include only the patient demographics, past medical history, and social and family history that make him/her at risk for diseases that present in this manner.

    - Omit demographics, past medical history, and social and family history that are unrelated to the current clinical situation.
- Temporal pattern: How did the symptoms and signs presenting with respect to time?
    - Describe the chronology of the presentation: Is it acute or chronic? Constant or intermittent? Is it worsening or improving?
- Syndrome statement: What are the key clinical features of the presentation?
    - Construct this phrase by combining, prioritizing, and relating the identified problems.

**We will now begin to use these terms in thinking through a patient with an interesting, relatively simple and amusingly ironic problem. Read this case and come up with a summary statement on your own. Then compare to the one at the end of the handout.**

Cc: Large bruises and petechiae

HPI Pt is a 34 yo WM physician who was in excellent health until 7 days prior to admission. He developed a URI with cough, nasal discharge and was self treated with OTC meds. These symptoms resolved after 3 days and then the night prior to admission he was watching the world series after playing racquetball. He looked at his arms and pointed out to his racquetball partner, that these red spots are called petechiae, which he explained meant his platelets were very low. He then went to bed hoping they would be better in the am. When not, he came to you for futher evaluation and treatment. He has no headaches, melena, gum bleeding, joint bleeding, fatigue or other constitutional sx.

PMHx-negative

FHx-N/C

SHx: faculty member in heme/onc (guess who)

| | |
|---|---|
| Exam: | VS normal |
| General: | Healthy appearing male comfortable and in no distress |
| HEENT: | Normal—no gum hypertrophy or bleeding noted |
| Neck: | No adenopathy |
| Lungs: | clear |
| Heart: | RRR without M, S3 or S4 |
| Abdomen: | +BS, No masses, tenderness rebound or guarding. Spleen not enlarged |
| GU/Rectal: | Not done |
| Extremeties: | large ecchymoses on his back (where he was hit with the RB) and petechiae on his right arm and both shins. |

| | | |
|---|---|---|
| CBC: | White blood cells | 7400 with a normal differential |
| | HGB/HCT | 15/45 normal indices |
| | Platelet count | less than 1000 (normal 130-400k) |

**<u>What do you think? Come up with your own summary statement.</u>**

**Clinical reasoning** defined as above: the project of thinking through the presentation, clinical data and diagnostic test results with a goal of ***ultimately*** arriving at the correct diagnosis for a given patient. There are 3 basic strategies for clinical reasoning with hypothetico-deductive reasoning forming the foundation of clinical reasoning skills. It is used by novices for every patient and by experienced clinicians when reasoning outside their typical intellectual domain.

**Hypothetico-deductive Reasoning**: A formal Definition—*relating to, being, or making use of the method of proposing hypotheses and testing their acceptability or falsity by determining whether their logical consequences are consistent with observed data* (accurate but perhaps less than helpful) Also called Analytical reasoning;

**A more helpful discussion is from the clerkship primer.** In hypothetico-deductive reasoning, a differential list is based often on a single symptom or sign, such as the chief complaint. Each diagnosis in the list is then tested "back" to the patient's situation until the correct diagnosis is found (hence the nickname "backward thinking"). With a sufficiently complete list of diagnoses (i.e., the diagnosis is on the list!) and with time and persistence, this strategy works well. The drawbacks to backward thinking are its inefficiency and that it treats all diagnoses on the list as equally plausible. ... When using backward thinking, the key to finding the correct diagnosis is to ensure it is on the list: therefore, the longer the list, the better. Phrased another way, this method uses the differential as a net to catch all the possible fish, and then looks at each one picking those that make the most sense in the clinical context.

These common scaffolds are used to help generate lists of differentials:

1. Anatomic Approach. The list is based on what anatomic structures are in the vicinity of the patient's complaint. This method works particularly well for *localized pain.*
2. Systems Approach (also known as Universal Differential Diagnosis).
   Lists are generated based on pathophysiology or underlying mechanisms of disease processes. The categories/systems are:

| | |
|---|---|
| Autoimmune | Inflammatory |
| Allergic/Immunologic | Metabolic |
| Degenerative | Neoplastic |
| Drugs | Nutritional |
| Endocrinologic | Psychiatric |
| Genetic/Congenital | Toxic |
| Iatrogenic | Trauma/Mechanical |
| Idiopathic | CardioVascular |
| Infectious | GI |

3. Mnemonic devices to recall lists are commonly used, but remember such lists are not all-inclusive such as **VINDICATE (V**ascular, **I**nfection/inflammatory, **N**eoplasm, **D**egenerative, **I**atrogenic, **C**ongenital/hereditary, **A**utoimmune, **T**oxic/metabolic, **E**ndocrine)

   Our Favorites **MMIIVDP** (not as easy to remember but more complete)

   **Metabolic** ;
   Endogenous—endocrine, electrolytes, liver failure etc
   Exogenous—drugs, toxins, exposures etc

   **Mass**
   Blood, fluid or pus
   Neoplasm- benign
   Malignant : primary or metastatic

   **Inflammatory :**
   Infectious—bacterial, viral, fungal, protozoan etc
   Non-infectious—allergic reactions, vasculitis, granulomatous lesions, SLE, etc

   **Iatrogenic/injury**

   **Vascular/Hemodynamic**
   Vascular—Clots, spasms, atherosclerosis etc
   Hemodynamic—CHF, low oncotic pressure etc

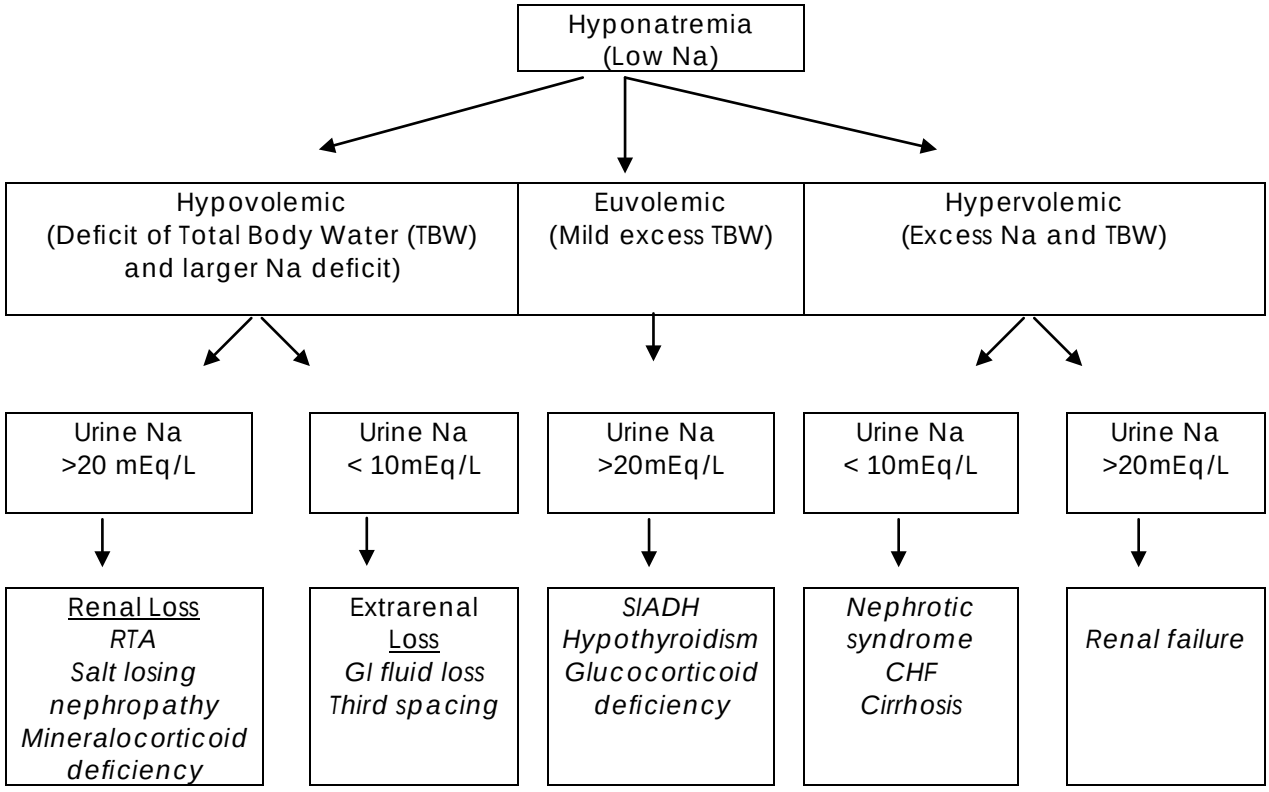
   **Degnerative/hereditary**

   **Psychiatric**

4. Other sources of lists: with electronic access to information, it is easy to find differential diagnostic lists in places like *The 5-Minute Clinical Consult*,

Ferri's *Instant Diagnosis*, and *UpToDate* and Diagnoaurus
http://accessmedicine.com/diag.aspx

**The Scheme-Inductive Approach**; (forward thinking) The differential is based on adding characteristics of the syndrome to narrow the list of potential diagnoses, e.g., hyponatremia (as below), anemia (macrocytic, normocytic, or microcytic?) or gastrointestinal bleeding (upper or lower?). There are many common algorithms in clinical medicine. Experienced physicians group related diagnoses to develop their own algorithms that use branching logic to help solve clinical problems. Expert diagnosticians use branch points to guide clarifying questions while obtaining the history. Look for different forward thinking algorithms in basic medical textbooks and pocket manuals for the wards. Below find an example of such algorithms for hyponatremia.




**Pattern Recognition:** (again from the primer) Physicians often instantaneously recognize the patterns of diseases with which their patients present. Pattern recognition is a common strategy used in everyday life. When a nephew recognizes his great-aunt, it is instantaneous. He thinks, "Great Aunt Minnie!" He did not try a forward thinking approach" "Here is a little old lady with blue hair, orthopedic shoes, and an outrageous orange handbag. I know who this must be, my Great Aunt Minnie!" He did not consider hypothesis testing: "This is a little old lady. Could it be the Queen of England? Could it be my grandmother?" When pattern recognition is used in medicine, the trigger for the diagnosis is the disease, not the syndrome and not the symptom. The physician arrives at

the diagnosis by instantaneously processing and synthesizing the patient's clinical information to recognize that the patient's presentation exactly matches the disease's illness script. To use this method of reasoning, the physician must have clinical experience; have an excellent knowledge base of classic disease illness scripts; be adept at processing, prioritizing, and synthesizing clinical information into the patient's illness script; and use a compare and contrast mentality. Until a physician has a great deal of clinical experience, diagnostic errors can be made if pattern recognition is attempted prematurely. With this method, knowledge has become organized into complex networks, in which the multiple branching algorithms are interlinked.

There are finally 2 hallmarks defining the development of an expert: (1) Clinical experience (2) Reflective practice. Hence, in order for young physicians to move in a timely manner through the stages from Novice to Advanced beginner then Competent and finally Proficient and Expert, each must learn the discipline of reflective practice. The expert, without processing formally all the data, intuitively knows the most likely answer and/or direction. An excellent example of pattern recognition is in the world of art. Most people, who have even a small amount of experience looking at art, recognize quickly that this as Impressionism.

# Doc In the Box

**Key Features to Success**

- Proper case selection
    - Real cases with real outcomes and possibility of harm
    - Adaptability of cases to meet the needs of the learners
- Student participation
    - Students forced to act in physician roll (do all the heavy lifting)
    - Everyone participates (voluntarily or not)
    - Looking things up and asking for help from colleagues encouraged
- Limited teacher role
    - Don't serve as references or consultants
    - Allow students to wrestle with the case
    - Share where they (the teachers) may have gone wrong with the cases
    - Create conducive atmosphere (humor used liberally)
    - Anticipates common pitfalls and brings them to light as needed

**Conference Format**

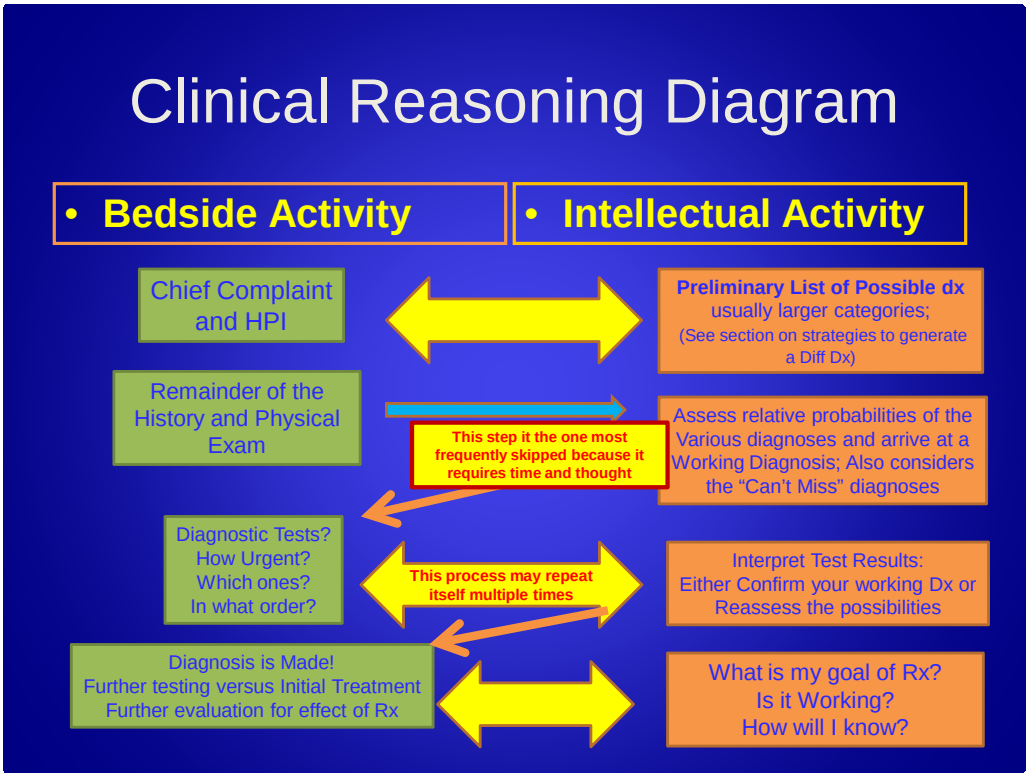
- Location: a comfortable conference room with a writing board and chairs/sofas arranged like a living room such that all students are "in front"
- Time: one hour and 15 minutes, twice weekly, and optional
- Attendance: 6-16 students on average, varies according to student clinics and other patient responsibilities that arise
- General atmosphere: very low-pressured by emphasizing the thinking process over "right" vs. "wrong" answers and through the use of humor to encourage student interaction
- Student roles:
    - One student is selected to be "it", the "doc" for the case who does all the test and treatment ordering
    - All other students are his/her "consultants" who can advocate for certain diagnoses, work-ups and treatments to the "doctor" but they can't take over unless asked

## Consider once agin the case above:

**What was your summary statement? How does it compare with the one below?**

*The patient is a 34 yo previously healthy male who presents with easy bruising and petecheie after an upper respiratory infection.*

In the diagram below, we have tried to present the relationship between what a physician is doing at the bedside and what should be going on his/her mind. It may be helpful to review this as a group, but try to work through it on your own. Try to take our case and in your mind, fill in the boxes with content specific for this patient.




Try to come up with your own Differential diagnosis using whatever resources you wish. Below you will see a Differential Diagnosis for severe thrombocytopenia from Diagnosaurus. After we have filled in the boxes with data for this specific patient. Please try it yourself before you refer to the "answer slide".

**Assessment:** **Severe Thrombocytopenia:**

Diffential Dx from Diagnosaurus

## Thrombocytopenia

### Etiology

**Decreased production (bone marrow disorder)**

Aplastic anemia

Hematologic malignancies

Myelodysplastic syndrome

Megaloblastic anemia

Chronic alcoholism

Other infiltrative process, e.g., myelofibrosis, infection

**Increased destruction**

Immune disorders

- Idiopathic thrombocytopenic purpura
- Drug-induced, e.g., heparin, sulfonamides, thiazides, quinine
- Secondary (chronic lymphocytic leukemia, systemic lupus erythematosus)
- Posttransfusion purpura

Disseminated intravascular coagulation

Thrombotic thrombocytopenic purpura

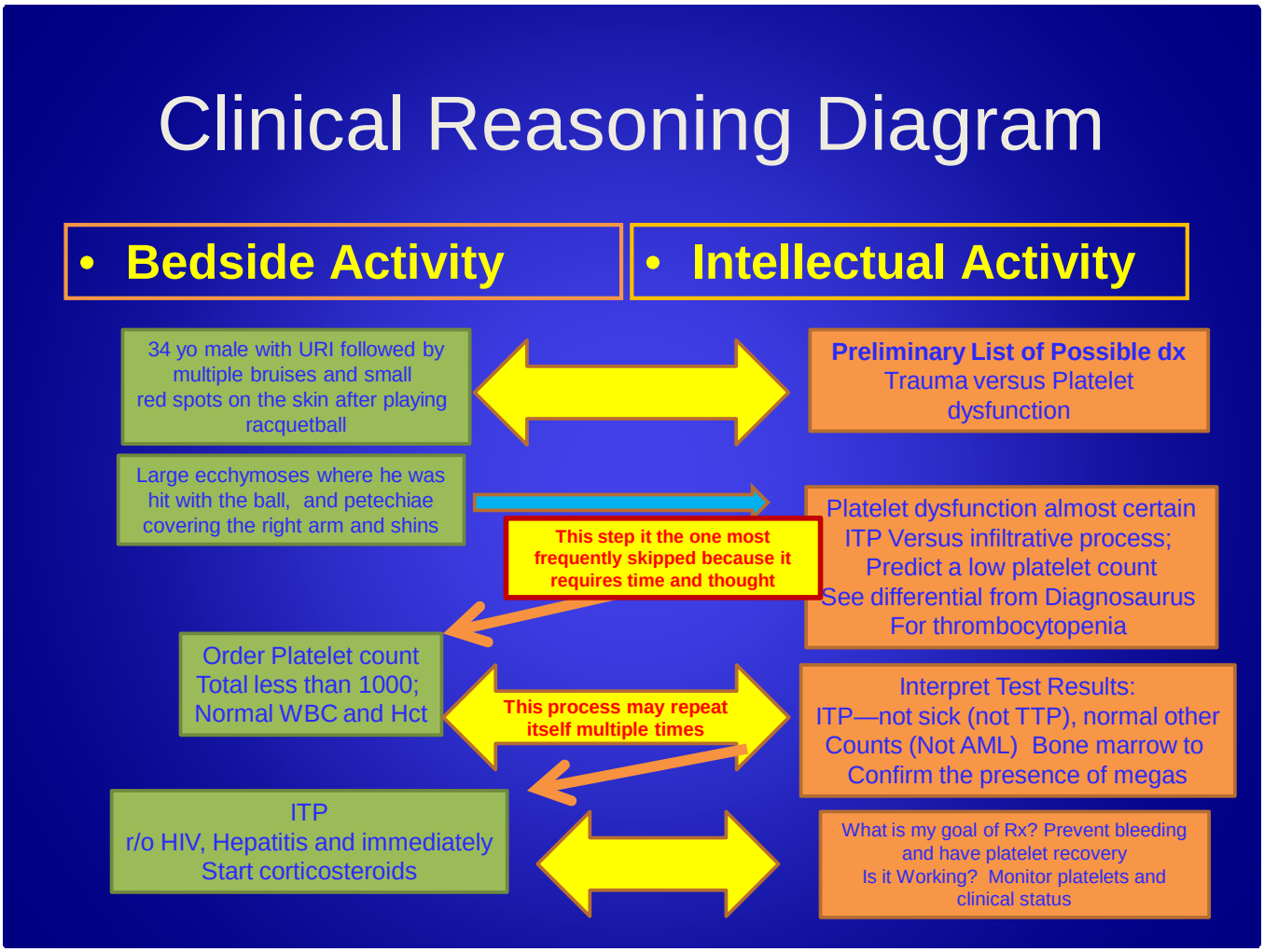
Hemolytic uremic syndrome

Sepsis

Viral infections, AIDS

Liver failure

Preeclampsia-eclampsia

**Splenic sequestration**

# Clinical Reasoning Diagram