

ABSTRACT

The USMLE Step exams are significant milestones and statistics for medical learners. The Step 1 exam, in particular, represents a critical data point referenced by residency programs when considering medical student applications. Despite the importance of this examination most study aids (textbooks, lectures, online videos, etc.) follow a paradigm of passive, individualized learning rather than collaborative, active engagement. This occurs despite abundant research that demonstrates substantial benefit of active participation in learning. Gamification, which can be described as the application of game-design elements and principles to information systems aimed to afford specific experiences and motivations, can enable learners to actively participate in an exchange of information. Participants in games have additional motivation to engage in the game itself and can retain contextual information when trying to remember important knowledge at later points. The purpose of this project is to apply the concept of gamification to Step 1-related medical information to provide students with a supplemental means of active preparation aimed toward collaborative study.

GAMIFICATION

Gamification is a topic that has been trending in recent years and is seeing growing use as an integrated teaching tool in post-graduate education. , While it is not necessarily a new term, increasingly it is drawing more focus as it appears to boost cognitive enhancement and synaptic activity. , , The process of gamification involves the adaptation of study techniques to include aspects of gameplay, which can include storylines, rewards, and external motivation, with the idea that these additional aspects can help increase a student’s interest in learning new material and reinforce knowledge gained. While not yet developed specifically for USMLE preparation, gamification has shown positive impacts on effective study in other areas and the similar adaptation of USMLE material could allow students to more efficiently engage Step 1 preparation.

DX Cards

A 21 year-old man, is seen in clinic today for a yearly check-up. He has been healthy and is currently enjoying college. He plays basketball at his university which helps to keep him active. He denies any drug and alcohol use. He is sexually active with one female partner and they consistently use barrier protection. Exam today is stable from previous visits. He has a positive wrist and thumb sign. His chest seems to mildly protrude in the area of the sternum. This has been present for as long as he can remember, and he has not had any chest pain. Cardiac auscultation reveals a mid-systolic click followed by a late systolic murmur.

DX:
Inherited mutation:
Heart murmur (most common with this condition):

DX: Marfan Syndrome
Mutated Gene: FBN1
Inheritance Pattern: Autosomal Dominant
Heart Murmur: Mitral Valve Prolapse

On the USMLE Step exams, while questions often reference specific diagnoses these are rarely the direct answer. More often, students are required to not only be able to recognize a specific diagnosis, but also be able to answer indirect questions relating to it. For example, a question stem could depict a patient with Osteogenesis Imperfecta, but rather than the answer being “Osteogenesis Imperfecta” the question could ask about the condition’s inheritance pattern, mutation, etiology, management, etc. So, the “DX Cards” were designed to train students to first think about the correct diagnosis then answer additional, related questions pertaining to the diagnosis.

To that end, a “DX” card can contain a vignette written similarly to that of a Step 1 question and players first have to ascertain the correct diagnosis. Then, they will be asked about other aspects of conditions, as listed above, to gain full credit for the card. Depending on the condition, some cards contain only 1 or 2 questions, while others can have up to 6 total questions.

Name It Cards

A disease caused by a defect in fibrillin that results in arachnodactyly, lens subluxation, aortic dissection and increased joint flexibility.

BONUS: What is the direction of lens subluxation seen in this condition?

Marfan Syndrome

BONUS: Upward

The “Name It Cards” were designed with a similar principle as the DX cards and contain certain pieces of information that relate directly to specific pathologies. However, rather than narrating a full vignette, they were condensed to 1 or 2 sentences and contain a limited number of key aspects of a condition that allow for a diagnosis. For example, a “Name-It” card referring to Ehlers-Danlos can read “A disease characterized by increased skin elasticity, hypermobility of joints, and increased risk of bleeds due to a defect of either Type V or Type III collagen [presentation depends on collagen type defect].

As the objective of these is to reinforce information contained in the “DX” cards, many of the conditions reiterated the key pieces of diagnostic information that is embedded in the DX vignettes.

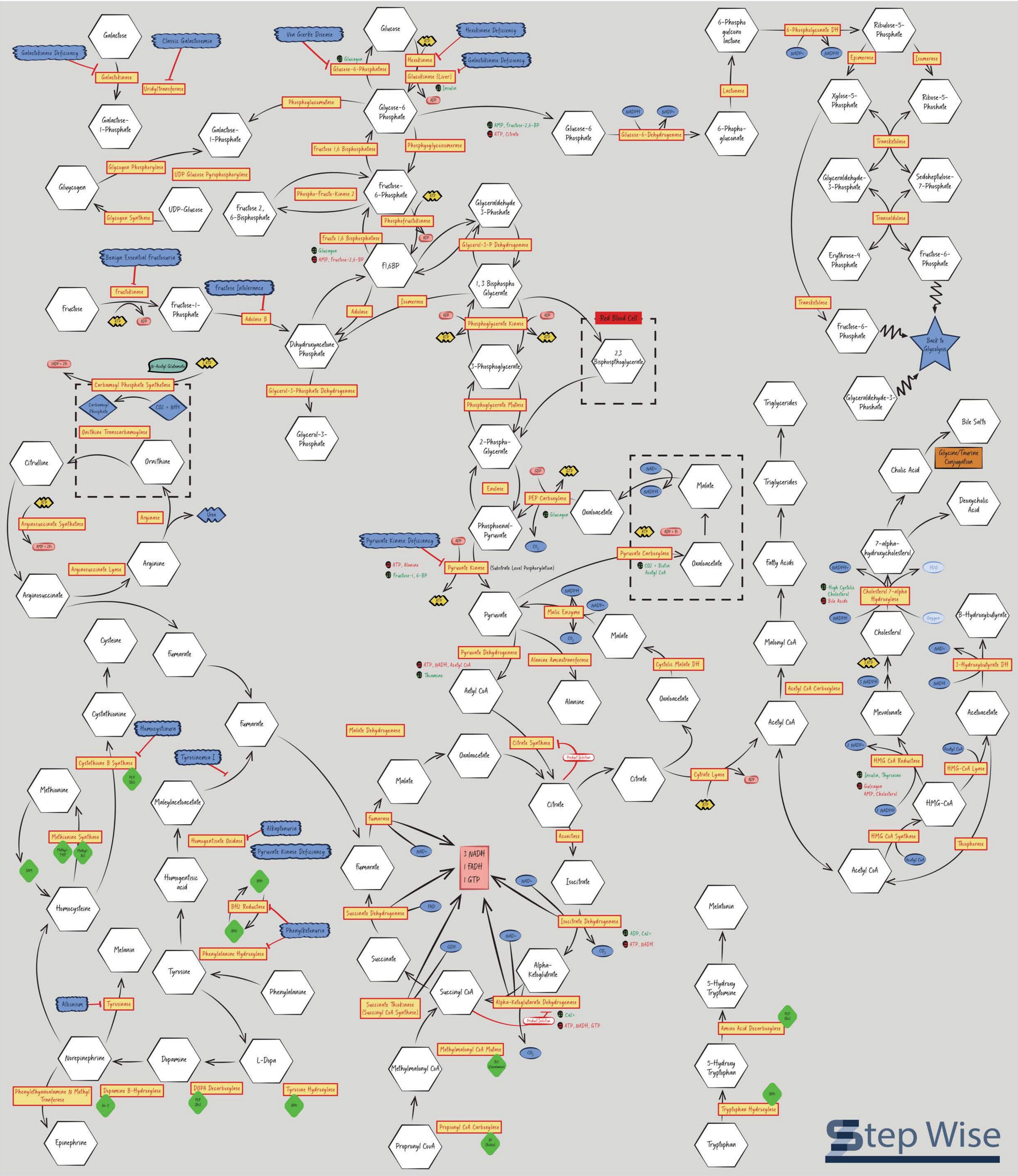
Primary Cards

For patients who inherit a mutation in the FBN1 gene, they tend exhibit a wide range of various signs and symptoms that are attributable to their disease. What genetic term refers to this range of signs and symptoms as seen in patients who inherit a mutated FBN1 gene?

Variable Expressivity [Marfan Syndrome]

The DX Cards represent the ‘bread-and-butter’ of the game, but the ability to answer quick, directed questions is an additional, vital skill on test day. Practicing this ability is the purpose of the “Primary” cards. Rather than including an entire patient vignette, one of these cards might ask a simple, straightforward question like “An indirect inguinal hernia enters the internal inguinal ring lateral to what anatomic structure?

While these cards do not contain as much information as normal USMLE style questions, they were developed and designed to build off the content represented in the DX Cards. So, many of them also contain additional information related to a specific diagnosis. They were created like this for a couple of reasons. First, the expected amount and complexity of information required for medical students to know about certain pathologies can vary. The “Primary” cards, even though the answer is generally direct, can help promote a more complete picture of the conditions depicted in the “DX” cards. Additionally, some medical topics are seen more often and in greater detail on the Step exams and these cards provide a means to reinforce such high-yield information.



Findings Cards

What physical exam finding associated with Marfan Syndrome refers to the protrusion of a patient’s thumbnail beyond the ulnar border of his/her hand when crossed?

Thumb Sign

The “Findings” Cards were originally developed to ask simple primary-type questions specific to certain physical exam findings. This was too narrow of a window, however, so the card’s question types were expanded to include other types of findings like those that can be found with tissue or fluid analysis, imaging, as well as chief complaints, etc. So, these cards can read questions like “What term refers to shortness of breath?” [answer: dyspnea] or “Associated with asthma, what histologic finding can show trapped epithelial cells that have been killed by eosinophilic major basic protein?” [answer: Curschmann Spirals]. Like the “Primary” and “Name-It” cards, the “Findings” questions were written to emphasize key information from the DX cards.