

MediPrepare Open Source Project – Blog

How doctors think

Part 1 Fever

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Abstract

This blog describes the way Dr. White, a distinguished veterinarian doctor, thinks. We will use ‘fever in a horse’ as an example and make use of his [EK \(Expert Knowledge\)-tool](#). Dr. White worked on this for over 30 years, collecting signs-disease combinations from [veterinary medical journals](#) (about 50 out of 179). I like to use his tool because it demonstrates how doctors think, and everybody can follow the process. Basically the thinking of all doctors is [evidence based and logical](#). However, keep in mind what [William Osler](#) so eloquently said ‘*Medicine is a science of uncertainty and an art of probability*’. Try to follow the described process to get the grasp of the complexity of medicine with the focus on [preventing tunnel vision](#) at all cost. In this case Dr. White has to find his way in over 855 possible causes of the fever. Eventually, in Blacky, 32 possible diagnoses remain. In [Part 2](#) I will discuss in more detail how to approach ‘fever’ in humans in a way every doctor is trained. This blog is part of a series about the context of doctors in which they have to work and survive in.

The call and initial thinking process

Dr. White receives a call about a 3 years old warm-blooded otherwise healthy stallion Blacky with a fever of 41,6°C. Dr. White likes to be thorough, ‘[Every patient a king](#)’, and he starts with what is called an [emergency triage](#). This means that he wants to evaluate the need, extend and time frame, for life-saving care. Normal temperature for horses is up to around 38.5°C. In casu the temperature is 41.6°C, so Dr. White is alarmed and asks several questions about [the vital signs](#): Q1. Is the horse breathing, how high is the pulse rate, and Q2. behaving normally? Answer: Breathing is 50/min, which is higher then normally up to 18/min; Heart rate is [85/min](#), which is too high for his age. The answer: The behavior is that the horse is much less active then normal, but in fact is restless, a [sign of colic](#). This means there is a reason for him to see the horse within 30-60 minutes. Q3: Did the horse [exercise excessively](#) or could he have [heat stroke](#)? Answer: No. That means there is no reason to assume the high temperature is based on [hyperthermia](#). Q4: Did he drink properly? Answer: No, only a few liters in last 12 hours. Dr. White knows that he should investigate further within 30 min and asks the owner to give the horse some extra water, pending his arrival. He should check the temperature, heart rate and respiratory rate, every 30 minutes. Dr. White thinks about the case during his trip through the fields to the stables.

In the experience of Dr. White, not considering [the worst case scenario](#) easily leads to tunnel vision and missed diagnosis, which is prevalent in about [40% of cases](#), and which [leads to death or may endanger](#) a whole stable.

Category 1	Category 2	Category 3	Category 4	Category 5
Resuscitation	Emergency	Urgent	Semi-urgent	Non-urgent
				
Examples: Heart attack, major car accident	Examples: Severe blood loss, overdose	Examples: Head injury (conscious), breathing difficulties, infection	Examples: Sprained ankle with possible fracture, eye inflammation	Examples: Cut not requiring stitches, common cold
Deadline: Immediate (seconds)	Deadline: Within 10 minutes	Deadline: Within 30 minutes	Deadline: Within 1 hour	Deadline: Within 2 hours

[Source](#)

What may be the cause of this fever?

To help Dr. White you may visit Dr. White's ‘[consultant.vet](#)’ tool, and help him diagnose the cause of this fever. He worries about the 7 causes in horses of [sudden dying](#) and the furious diseases [killing horses within 24 hours](#). Also crossing his mind are deadly intoxication, fever after vaccinations and causes by medications. You can try to get as grasp of the possible causes of this fever in this horse following the next [steps in his tool](#): search by signs, click sign list, select a system, all, find ‘fever, pyrexia, hyperthermia’, scroll down, add to signs, search for diagnosis (**855 possible diagnoses!**), choose species ‘equine’, and check again (the number is down to **308**), adding colic brings the number down the possible causes to **142**.

At arrival it becomes clear that during the last 24 hours Blacky has a combination of [colic and diarrhea](#). The number of possible causes goes down to **84**. Blacky is becoming slightly more lethargic now, and Dr. White also finds a little blood in the stool. The number now goes

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Search by Signs

Species: Equine ▼

Sign Keyword:

Search Sign List

Clear

Signs: ☒ Diarrhea

☒ Bloody stools, feces, hematochezia

☒ Fever, pyrexia, hyperthermia

☒ Dullness, depression, lethargy, depressed, lethargic, listless

☒ Colic, abdominal pain

Search for Diagnoses

[32 Possible Diagnoses](#)

[Source](#)

down to **32**, of which a large number is unlikely, such as snakebite, poisoning, and a series of diseases which would have developed in slower pace. Dr. White remembered seeing a [flock of geese](#) and he remembered the connection of salmonellosis in 50% of geese, and the sensitivity of [warmbloods](#) for horse [salmonellosis](#). So Dr. White decides to take some blood for investigations to confirm his possible diagnosis. He also worries about infection of other horses at the stables. Blacky is taken to the vet-clinic for intensive treatment, with a variety of measures including infusions of fluids. After several days he is recovered and running around as before. Indeed, the cause salmonellosis was confirmed.



[Source](#)

The art of avoiding tunnel vision

[Dr. William Osler](#), one of the most important educators and grounding fathers of modern medicine, insisted that his students would learn from seeing and talking to his patients or their proxies. The process of finding the right diagnosis or a small number of choices is called ‘[differential diagnosis](#)’, which is based on the collection of data at the source, the patient. Finding the correct diagnosis is one of the most important tasks of doctors. Not considering a diagnosis makes it unlikely that it will be found. This is a major cause of the many medical mishaps, in the USA the third leading [cause of death](#). There are a lot of reasons doctors do not practice what they have learned in medical school, such

as [burn out](#), [financial worries](#), [divorce](#), [law suits](#), [very limited time](#) for appointments - on average less than 5 minutes-, [cognitive overload](#) by [technostress](#) and forced [administrative task](#), together with the ‘need to respond’ to calls and interruptions, because it could mean a life threatening event awaits immediate action.

Would you step in a car driven by someone with a clinical burn out, financial worries, constantly answering the mobile, always in a hurry? Why then do you go to a doctor who is not able to perform the most important task at hand, diagnosing a complaint? If indeed your doctor interrupts within the first **11 seconds**, you maybe should consider going to an other doctor.

For many patients it will be an eye opener how doctors have to find their way in 50.000 diseases, symptoms and signs. Dr. White had to consider ‘only 855’. It is amazing that in 60% of cases doctors do indeed find the correct diagnosis. Patients can help their doctor with this difficult task. How, we will explain that in following blogs.

* **Tunnel vision** is a very serious problem, not only in medicine but in [whole society](#). Help your doctor by presenting your case with care and in an intelligent way. Medicine needs [democratization](#), patients need [empowerment](#), and doctors should do what they have learned best, diagnose and treat.

* Some interesting references:

- [Explaining Tunnel Vision](#)
- [Tunnel Vision in Medicine](#)
- [Diagnostic Error and Tunnel Vision](#)
- [Tunnel Vision is Common](#)
- [Cognitive Bias in Medicine](#)
- [Evidence based differential diagnosis](#)
- [What can patients do to help their doctor?](#)