

The Impact of Myth and Hippocratic Thought on the Evolution of Infectious Disease Medicine in the Ancient World

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Emma Carlson

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The "Hippocratic Conception" of medicine.

Hippocrates was a medical scholar of the late 5th century B.C. who, as I will illustrate in this thesis, introduced a new perspective beyond the idea of cures through penitence seen in authors such as Homer, leading the way to the practice of proto-medical thinking. In conjunction with redirecting medical study, Hippocrates is generally known for creating the first code of medical ethics in the practice of medicine, the Hippocratic Oath, that doctors are required to swear by even today. His work is collected in several of the first medical manuals in the ancient world: *On Airs, Waters, and Places*; *Of the Epidemics*; *On Regimen in Acute Diseases*; *On the Sacred Disease*; etc. These manuals, and *On Airs, Waters, and Places* in particular, as I will explain, were the first steps toward modern medicine, hence the use of the term proto-medical. However, the field lacked the technological capability for in depth analysis of diseases, leading physicians such as Hippocrates to fall back on religious explanations. Even when Hippocrates links disease to natural causes, natural phenomena were considered to be directed by the gods, and he never challenges this assumption of his religious culture. For this reason, Hippocrates ignored what he did not have the ability to investigate and focused his instruction on evident correlations first, such as a variety of symptoms appearing only in certain regions of Greece. Next, this method involved documenting what could be physically observed and employing tested methods of intervention, or the use of practices that positively affected a patient's condition, even if the reason for their success was unclear. Finally, in an attempt to relay this information efficiently and effectively, Hippocrates applied a particular ordering of his manuals for his pupils. With these three components of his work, he thereby established the turning point of medical treatment and investigation away from complete reliance on mythical explanations while still leaving space for it in deeper explanations. This approach was not entirely unique,

however, because of similar changes occurring in other literature during Hippocrates' time. His level of detail in correlation and the fourth aspect of his writing I will address, however, expanded upon the general principles of physician instruction that had been established which were more reliant on the religious ideals of Greek culture in their analysis of disease. In my examination of Hippocrates, I will illustrate these four aspects of his medical instruction using the main text *On Airs, Waters, and Places*. This text is the epitome of Hippocrates' proto-medical methods because it emphasizes first understanding different environments before distinctly associating clusters of symptoms to them; it also contains several examples of discrete organization that are both characteristic of the medical literature of the time and more proto-medical features.

To be more specific regarding what I will be discussing, in the first section of this chapter I will be providing a brief discussion on the *Iliad* to demonstrate how disease was intertwined with the myths of Greek society. Further in this section, I will describe how the practice of religion propagated those myths and their entanglement with disease for hundreds of years. The importance of myth in society remained steadfast even in the writings of Hippocrates, though he was one of the first medical scholars of his time to extend beyond the parameters of religion in the study of infectious disease. Accordingly, I will next analyze the idea of Hippocrates' correlative thinking and avoidance of references to the divine without outright denial in the text *On Airs, Waters, and Places*. The text contains the observations of different natural phenomena along with various endemic illnesses with brief mentions of acute diseases, which are discussed in more detail in *On Regimen in Acute Diseases*. The key characteristic of *On Airs, Waters, and Places* is that it draws connections between environmental factors, such as seasons, locations, water, wind, and lifestyles, and the diverse endemic diseases. The text demonstrates a greater

understanding of disease than that of a society basing health solely on myth, as evidenced in texts such as the *Iliad* that highlight pestilence as the wrath of the gods. These implications that the gods direct disease even if it is through nature, and the second aspect of Hippocrates I will discuss, include the use of prognosis and prevention to improve medical practice. Prognosis is not diagnosis, or the precise identification of each endemic disease or other acute illnesses; it allows for the overarching explanation to continue to be supernatural while subtly shifting to an alternate way of thinking in the field. This is most clear in Hippocrates' focus on using the correlations to affect some visibly positive change or keeping the names of some of his descriptions more vague to the point that they are useful but not definitive. The third aspect of his writing I will examine is his use of language, detail, and structure for efficient instruction, providing the basis for a proto-medical approach in clinical practice. Hippocrates realizes a clear interpretation of his writing is crucial to others repeating his methods for the betterment of the people. Finally, I will show that this clarity is a theme that became more present in the literature of his time, but he took this trend a step further in all of his writings towards the proto-medical. It was this slight shift in thinking during a time of established mythic beliefs that introduced a new age of medical investigation migrating away from supernatural credence.

The mythical conception of medicine.

The *Iliad*, a well-known epic myth about the heroes of the Trojan war, was an important text for the ancient Greeks and the source of knowledge used to understand why diseases occurred before the nascence of proto-medical literature. Its renowned status gave it an authoritative role in explaining the unseen, especially disease, for centuries. To demonstrate this influence, I will be examining how book I depicts the gods' ever-present hands in the movement of disease through a group of people as well as the actions taken based on religious belief,

including magic. Mirko Grmek states that Homer almost dismisses deadly illnesses entirely by assigning a god to blame in each case. Grmek, a French medical historian and scientist, wrote *Diseases in the Ancient Greek World* and provides detailed analyses of diseases in works such as the *Iliad* and Hippocrates' writing. Acute diseases, which kill people who were seemingly in perfect health, fell under this category of divine intervention because there was no apparent reason for their death other than deistic will or anger (Grmek, 1983; 14). They claimed that Apollo was the god of pestilence, among other things, and with Artemis being his sister, these figures were usually blamed for plague related deaths. While encouraging reconciliation with these gods for diseases, physically helping the sick was not considered very fruitful, and Grmek notes that touching them was also considered unholy (36). This led to a complete reliance on religious practice to affect positive change in illnesses. By strongly connecting disease with popular mythic stories, myth was carried through history along with the study of medicine and the development of those studies. I will first analyze how myth was strongly ingrained in the early literature that alluded to medical conditions through statements about divine will combined with facts, which gave it the long-lasting influence eventually observed in Hippocrates' work. I will also illustrate how these myths were perpetuated through the practice of religion.

The most vivid example of the gods overseeing disease in mortals is Homer's reference to them in the *Iliad* as well as the individual characters' belief in them. The opening lines of the epic establish the gods as the main actors and that the following narrative is by their will or actions (Hom. *Il.* 1.1-5):

μῆνιν ἄειδε θεὰ Πηληϊάδεω Ἀχιλῆος
οὐλομένην, ἣ μυρὶ Ἀχαιοῖς ἄλγε' ἔθηκε,
πολλὰς δ' ἰφθίμους ψυχὰς Ἄϊδι προΐαψεν
ἡρώων, αὐτοὺς δὲ ἐλώρια τεῦχε κύνεσσιν
οἰωνοῖσί τε πᾶσι, Διὸς δ' ἐτελείετο βουλή.

Sing about the wrath, Muse, of Achilles son of Peleus
The destructive (wrath), which causes countless sufferings for the Achaeans
And which hurled many souls of heroes to Hades
And which rendered them prey to all dogs and birds of prey,
And the will of Zeus was being accomplished.

Besides suggesting that destruction and godly wrath are equivalent, the central tragedy of the book is defined as Zeus' will. It is stating that the god of the gods is in control of what follows in regard to destruction of the army. Directly following this passage, it is also clear that Apollo's reaction to Agamemnon's disrespectful behavior toward Chryses causes the deadly plague when it says νοῦσον ἀνὰ στρατὸν ὄρσε κακὴν, ὀλέκοντο δὲ λαοί / οὐνεκα τὸν Χρῦσιν ἠτίμασεν ἀρητιῆρα Ἀτρεΐδης (“[Apollo] Let loose upon the army an evil plague, the army was perishing, / because Agamemnon dishonored the priest Chryses” Hom. *Il.* 1.10-11). This line highlights divine wrath based on human actions, supporting the opening claim and the consistent theme of the *Iliad*. This theme is reinforced by the unwavering belief of the heroes as well; the “god-like” Achilles assumes within the first ten days of plague that Apollo is responsible. Though the readers were told this information, the actual characters in the epic were not. Because Achilles does not investigate the illness but blames a faulty sacrifice to Apollo, readers of the epic are encouraged to do the same when faced with pestilence. Achilles specifically says ὅς κ' εἴποι ὅ τι τόσσον ἐχώσατο Φοῖβος Ἀπόλλων, / εἴτ' ἄρ' ὅ γ' εὐχολῆς ἐπιμέμφεται ἠδ' ἑκατόμβης, (“Who might tell (us) why Phoebus Apollo was so angry / Whether he then finds fault with a vow or hecatomb,” Hom. *Il.* 1.64-65). Achilles' firm belief that the god is angry, and possibly from lack of religious penitence, it deepens the religious ties to disease. Introducing the plague in both ways is critical to attributing general conditions of sickness to the work, or wrath, of the divine and maintaining that theme throughout the narrative as well as the medical field.

Along with general cultural beliefs, early literature combines some accurate physical observations as well, thereby affirming these religious opinions about illness. This is most clearly seen after Apollo charges down to the army to afflict them, and an important detail about the disease's spread is added to the narrative (Hom. *Il.* 1.43-53):

ὥς ἔφατ' εὐχόμενος, τοῦ δ' ἔκλυε Φοῖβος Ἀπόλλων,
βῆ δὲ κατ' Οὐλύμποιο καρήνων χωόμενος κῆρ,
τόξ' ὄμοισιν ἔχων ἀμφηρεφέα τε φαρέτην:
ἔκλαγξαν δ' ἄρ' ὄϊστοὶ ἐπ' ὤμων χωομένοιο,
αὐτοῦ κινηθέντος: ὁ δ' ἦϊε νυκτὶ εἰοικώς.
ἔζετ' ἔπειτ' ἀπάνευθε νεῶν, μετὰ δ' ἰὸν ἔηκε:
δεινὴ δὲ κλαγγὴ γένετ' ἀργυρέοιο βιοῖο:
οὐρῆας μὲν πρῶτον ἐπώχετο καὶ κύνας ἀργούς,
αὐτὰρ ἔπειτ' αὐτοῖσι βέλος ἐχεπευκὲς ἐφίεις
βάλλ': αἰεὶ δὲ πῦραι νεκύων καίοντο θαμειαί.
ἐννήμαρ μὲν ἀνὰ στρατὸν ὄχετο κῆλα θεοῖο.

Praying he spoke in this way, and Phoebus Apollo heard him
And he came down from the highest peak of Mt. Olympus being angry in his heart
Having a bow on his shoulder and a quiver covered on both ends:
In fact the arrows rattled upon the shoulders of the angry god,
While he was moving: and he was going just like the night.
Then he had sat down far from the ships, and he let the arrow fly:
And a fearful twang arose from the silver bow:
First he attacked mules and swift dogs,
But then he was shooting sharp arrows being sent upon the men themselves:
Numerous funeral pyres of dead bodies were always burning,
For nine days arrows of the god were falling upon the army.

In this excerpt, after Apollo hears Chryses's prayer to afflict Agamemnon for refusing to return his daughter, he strikes the animals with his arrows of plague first. When diseases first enter a human population and overtake them seemingly without warning, the animals are usually infected first. Today we often see disease endemic to animals jump species causing pandemonium among people with no idea how to tackle the infection, such as Ebola from bats or

the bird flu from fowl populations.¹ The trail of infection in the *Iliad*, thus, concurs with what is documented today. Homer understands that animals would be carrying the disease first and yet steadfastly claims Apollo was responsible, simply shifting the aim of his bow. This was the only explanation available that seemed most logical at the time without further observational studies. The small amount of observable fact with the myth imposes strong belief in a cause of pestilence in early mythological literature and sets a precedent for future integration of these doctrines into the culture. By immediately setting the stage of the narrative in light of the gods and adding some truthful observations about disease, authors including Homer reinforce the pantheistic religion of Greece in infectious disease study as a means to understand what cannot be explained with their level of technological development and lack of proto-medical observation.

Though these elements together support the use of the gods to propel the story forward, it is the continuous and intentional action based on these myths that allow for the sustained influence of divinity in medicine, seen both in accounts of the heroes in the *Iliad* and several other historical references.² I will focus on the mentions of religious practice in the *Iliad*, and first how Achilles' unwavering belief and quickly assuming attitude about where the disease originates set in motion the actions to right Agamemnon's misstep (Hom. *Il.* 1.57-67):

οἱ δ' ἐπεὶ οὖν ἤγερθεν ὀμηγερέες τε γέροντο,
τοῖσι δ' ἀνιστάμενος μετέφη πόδας ὠκὺς Ἀχιλλεύς:
Ἄτρεΐδη νῦν ἄμμε παλιμπλαγχθέντας οἴω
ἄψ ἀπονοστήσειν, εἴ κεν θάνατόν γε φύγοιμεν,
εἰ δὴ ὁμοῦ πόλεμός τε δαμᾶ καὶ λοιμὸς Ἀχαιοῦς:
ἀλλ' ἄγε δὴ τινα μάντιν ἐρείοιμεν ἢ ἱερῆα
ἢ καὶ ὄνειροπόλον, καὶ γάρ τ' ὄναρ ἐκ Διὸς ἐστίν,
ὅς κ' εἴποι ὅ τι τόσσον ἐχώσατο Φοῖβος Ἀπόλλων,
εἴτ' ἄρ' ὁ γ' εὐχολῆς ἐπιμέμφεται ἠδ' ἐκατόμβης,
αἶ κέν πως ἀρνῶν κνίσσης αἰγῶν τε τελείων

¹ The COVID-19 pandemic was also caused by animal to human transmission.

² Other references include Thucydides Book II where the people calls upon seers for guidance and act on their revelations (Thuc. 2.54.4-5).

βούλεται ἀντιάσας ἡμῖν ἀπὸ λοιγὸν ἀμῦναι.

When they assembled and then were all gathered together,
And swift-footed Achilles standing up was speaking to them:
“Son of Atreus, I think it good that having been driven back
We will return home back again, only if indeed we should escape death,
If as it seems likely at the same time the war and plague will overcome the Achaeans
But indeed come let us ask some prophet or priest,
Or dream interpreter, for a dream is from Zeus,
Who might tell (us) why Phoebus Apollo was so angry
Whether he finds fault with a vow or hecatomb,
In the hope that somehow having accepted the odor of lambs and unblemished goats
He may wish to ward off destruction from us.”

He believes that the only way to stay the disease is to call upon prophets, priests, and seers so that they may converse with the gods to determine the reason they are wrathful. He specifically states that they should ask if they did not hold to their vows or provide a particular hecatomb rather than trying to find a physical remedy or separating the ill from the healthy soldiers.

Though Homer talks about the use of seers in communication with the gods, Daniel Ogden, an author who collected various sources on magic recorded in ancient literature, notes that he never directly mentions magic and incantations until the *Odyssey* (41). This is not saying that Homer did not agree with magical practice until later but indicates there was a strong belief that acting on religious dogma needed to be specific or align with a given situation. By being precise in this regard and describing the positive results, the confidence in magic and religious practice was strengthened. In the case here, direct communication with the god is the required action; Achilles turns to seer Calchas to determine exactly why Apollo is attacking them to determine the correct course of action (Hom. *Il.* 1.68-73):

ἦτοι ὃ γ' ὡς εἰπὼν κατ' ἄρ' ἔζετο: τοῖσι δ' ἀνέστη
Κάλχας Θεστορίδης οἰωνοπόλων ὄχ' ἄριστος,
ὃς ἦδη τά τ' ἐόντα τά τ' ἐσσόμενα πρό τ' ἐόντα,
καὶ νήεσς ἠγήσατ' Ἀχαιῶν Ἴλιον εἴσω
ἦν διὰ μαντοσύνην, τήν οἱ πόρε Φοῖβος Ἀπόλλων:

ὁ σφιν ἐν φρονέων ἀγορήσατο καὶ μετέειπεν.

In truth speaking thus he sat down: Calchas son of Thestor,
The best seer by far, stood up among them,
Who knew what is now and what will be and what was before
And who led the ships of the Achaeans to Ilium
Through the gift of prophecy, which Phoebus Apollo granted to him.
He addressed and spoke to them with good intent.

The seer is supposedly granted his gifts by Apollo and came with “good intent.” Calchas’ goodwill along with the plague suggest that the *Iliad* is illustrating a cultural ideal that the gods control the good as well as the bad, brought on by Apollo in this case. Calchas provides the necessary instructions for atonement, and by following them, the army is able to curb the wrath of Apollo. The connection to the wrathful god and desire to help the Achaeans reinforces a dynamic between the people and their idols. Within this dynamic, Homer focuses on the gods’ power in the lives of people and how communication with this realm can effect positive change in pestilence in the rest of book I, instilling the sense that the world and especially disease are under the command of the pantheon.

The *Iliad* contains various examples of the gods’ influence in the spread of disease and the practice of religion. The apparent supernatural action in the *Iliad* and other ancient texts addressing disease set the foundation of myth in medicine that continued to pervade the evolution of medical thought. It was this foundation that led to attempts to communicate with the gods and work with them to heal people that created the authority of religious practices in medicine. As time continued, however, medical scholars such as Hippocrates chose to begin investigating disease rather than dismissing it as godly will and paved the way to proto-medical thought.

Hippocrates Section I: Natural Correlates Turning Focus Away from the Gods.

In *On Airs, Waters, and Places*, Hippocrates focuses on how environmental factors correlate to disease type and prevalence, especially the seasons' and location's effect on water quality, as well as that of general lifestyle choices. Throughout these explanations he markedly avoids acknowledgement of deities without outright denying their influence. Hippocrates begins this manual broadly with the fact that the seasons and particular locations are unique, and he later describes how they make people more prone to endemic illnesses, suggesting diseases return with a given season. He states they should consider first the seasons and ὅ τι δύνανται ἀπεργάζεσθαι ἐκάστη: οὐ γὰρ εἰκόασιν ἀλλήλοισιν οὐδέν, ἀλλὰ πολὺ διαφέρουσιν αὐταί τε ἐφ' ἐωυτέων καὶ ἐν τῆσι μεταβολῆσιν (“...whatever each season is able to produce: for they are not the same one to the other in any way, and they themselves differ by much from themselves and in their changes” Hp. *Aer.* 1). When he states the seasons are not the same, he means changes in both the weather as well as symptoms will occur though he puts off listing symptoms until he is able to emphasize the importance of observing environmental differences. In conjunction with the correlation to seasons' changes and disease in the remainder of the text, he organizes diseases by areas to which they are endemic and whether or not a disease in that area would be acute: τοῖσι μὲν ἀνδράσι ταῦτα τὰ νοσήματα ἐπιχώριά ἐστι: καὶ χωρίς, ἣν τι πάγκοινων κατάσχη ἐκ μεταβολῆς τῶν ὥρέων... (“These diseases are endemic to these men; and besides if some epidemic disease from the changing of the seasons should take hold...” 4). Throughout the document he continues to emphasize the direct connection between the disease he describes and these initial environmental shifts. This indicates the diseases he is covering are a regular and foreseeable occurrence that correlate to the seasons' changes in those locations, irrespective of the gods' mood swings. If it was punishment, these diseases would not likely recur annually and

only in certain cities, whereas it could still be assumed other acute diseases were the wrath of the pantheon.

If the presentation of endemic illness alludes to the fact that diseases are not necessarily linked to Greek religion, it points to the need to find more correlated factors to better understand diseases and to help sick individuals. Hippocrates' writings follow this logic because immediately after the assertion of seasonal diseases in *On Airs, Waters, and Places*, Hippocrates describes locations in which waters originate, and that their unique properties dictate the illnesses specific to that region as well (1):

δεῖ δὲ καὶ τῶν ὑδάτων ἐνθου μεῖσθαι τὰς δυνάμιας: ὥσπερ γὰρ ἐν τῷ στόματι διαφέρουσι καὶ ἐν τῷ σταθμῷ, οὕτω καὶ ἡ δύναμις διαφέρει πολὺ ἐκάστου. ὥστε ἐς πόλιν ἐπειδὴν ἀφίκηται τις, ἧς ἄπειρός ἐστι, διαφροντίσαι χρὴ τὴν θέσιν αὐτῆς, ὅπως κεῖται καὶ πρὸς τὰ πνεύματα καὶ πρὸς τὰς ἀνατολάς τοῦ ἡλίου. οὐ γὰρ τὸ αὐτὸ δύναται ἦτις πρὸς βορέην κεῖται καὶ ἦτις πρὸς νότον οὐδ' ἦτις πρὸς ἥλιον ἀνίσχοντα οὐδ' ἦτις πρὸς δύνοντα. ταῦτα δὲ χρὴ ἐνθου μεῖσθαι ὡς κάλλιστα καὶ τῶν ὑδάτων περὶ ὡς ἔχουσι, καὶ πότερον ἐλώδεσι χρέονται καὶ μαλθακοῖσιν ἢ σκληροῖσι τε καὶ ἐκ μετεώρων καὶ πετρωδέων εἴτε ἀλυκοῖσι καὶ ἀτεράμνοισιν: καὶ τὴν γῆν, πότερον ψιλὴ τε καὶ ἄνυδρος ἢ δασεῖα καὶ ἔφυδρος καὶ εἴτε ἔγκοιλός ἐστι καὶ πνιγηρὴ εἴτε μετέωρος καὶ ψυχρή.

It is necessary to consider the properties of the waters: for just as they differ in the mouth/by taste and in weight, so also the property of each differ much. So that whenever someone arrives to a city, of which he is inexperienced, it is necessary to consider the placement of it, in what way it is positioned both with respect to the winds and the rising of the sun: whatever city lies to the North does not have the same properties, and whatever city lies to the South, nor whatever city lies to the rising sun [the East] nor whatever city lies to the setting sun [the West]. It is necessary to consider these things as well as possible and about how the waters are disposed, and whether the people use marshy and soft waters or hard ones from high and stony places, whether they use briny or harsh ones: and as for the soil, whether it is both bare and dry or leafy and wet, or whether sunken or stifling, or raised high and cold.

Hippocrates is associating regions to different water sources, adding more detailed correlations to his narrative. The properties of various regions are described in detail to explain that διαφροντίσαι χρὴ (“it is necessary to consider”) water sources from springs versus water from marshes, or sources more accessible to certain populations in specific regions. We know today

that different environments are more conducive to specific types of infectious bacteria, viruses, and parasites, leading to a range of infections and concurring with Hippocrates' observations. Marshy places in particular will have larger populations of fungus and moss populated by infectious bacterial species. The soils that are moist and in dark environments are also much more conducive to bacterial growth, contaminating surrounding water (Alberts et. al., 2019). Since microorganisms were not known to exist, it would be understandable for people to attribute unhealthy waters to a curse from or wrath of the gods. Though Hippocrates does not suggest this, he provides vague explanations for his observations that allow for the belief in deities to persist. He again does not include the list of symptoms that appear after ingesting these waters until later; rather, he spends a significant amount of space emphasizing the differences which eventually leads the reader to the conclusion that all these differences combined will result in sets of symptoms (2):

εἰ γὰρ ταῦτα εἰδείη τις καλῶς, μάλιστα μὲν πάντα, εἰ δὲ μή, τὰ γε πλεῖστα, οὐκ ἂν αὐτὸν λανθάνοι ἐς πόλιν ἀφικνεόμενον, ἧς ἂν ἄπειρος ἦ, οὔτε νοσήματα ἐπιχώρια οὔτε τῶν κοινῶν ἢ φύσις, ὁκοίη τίς ἐστίν: ὥστε μὴ ἀπορεῖσθαι ἐν τῇ θεραπείῃ τῶν νούσων μηδὲ διαμαρτάνειν: ἃ εἰκός ἐστι γίνεσθαι...

For if someone should know these things well, especially all these things, if not, then at least most of these things, then it would not escape his notice coming to the city with which he might be without experience, neither the endemic diseases, nor the nature of common diseases, of whatever sort there is: so that he not be at a loss in treatment of diseases, and may not go astray as regards things which are likely to happen...

Hippocrates is claiming that it is necessary to understand the environmental factors he originally introduced in order to be prepared for various illnesses. These two sections are in sequence, clearly demonstrating a correlation that does not depend on divine explanations.

Having established that seasons affect water differently based on where they originate and these, in turn, impact health, Hippocrates attempts to draw a more clear connection between the regions and waters by observing the air. He thus highlights how water can be unhealthy

depending on the quality of the surrounding air, which is impacted by both seasons and location

(6):

τοῦ δὲ θέρους ἔωθεν μὲν αὖραι ψυχραὶ πνέουσι καὶ δρόσοι πίπτουσι: τὸ δὲ λοιπὸν ἥλιος ἐγκαταδύνων ὥστε μάλιστα διέψει τοὺς ἀνθρώπους, διὸ καὶ ἀχρόους τε εἰκὸς εἶναι καὶ ἀρρώστους, τῶν τε νοσημάτων πάντων μετέχειν μέρος τῶν προειρημένων: οὐδὲν γὰρ αὐτοῖς ἀποκέκριται. βαρυφώνους τε εἰκὸς εἶναι καὶ βραγχώδεας διὰ τὸν ἥερα, ὅτι ἀκάθαρτος ὡς ἐπὶ τὸ πολὺ αὐτόθι γίνεται καὶ νοσώδης: οὔτε γὰρ ὑπὸ τῶν βορείων ἐκκρίνεται σφόδρα:

And during the summer, cold breezes blow at dawn, and dew falls: the rest of the day the sun is sinking down so that it scorches the people, for which reason it is likely that they are pale and sickly, and that they take part in all of the aforementioned diseases: for none are distinguished by them. It is likely that they are gruff-voiced and subject to hoarseness through the air, because it is generally impure and unhealthy there: for the waters are never very separated from the North winds:

This excerpt mentions a particular season, how the region itself affects general health, and links it back to the “aforementioned” disease; after correlating these elements again, he draws new connections to the air and water. Without denying deities, Hippocrates is discovering connections between natural elements and human health that do not rely on the pantheon. Interestingly, the winds were also thought to be controlled by the gods, allowing for those who most strongly believe in Greek religion to cling to this idea even if the winds indirectly impact disease.

Hippocrates, however, seems to go slightly beyond general correlations which allow ample room for divine explanation when he decides to delve further into specific details about the types of ingested waters in a truly proto-medical fashion. Addressing water quality draws a direct connection much more similar to cause and effect because contaminated water will result in sick individuals. We know now water simply needs purification prior to ingestion and Hippocrates did as well, addressing this in the following section of *On Airs, Waters, and Places* on his description of rain water: ταῦτα μὲν ἐστὶν ἄριστα κατὰ τὸ εἰκός; δεῖται δὲ ἀφέψεσθαι καὶ

ἀποσήπυσθαι... (“These things are best in all likelihood: but they need to be refined by boiling and purified...” 8). This avenue of thought allows him to continue further to more causal than correlative effects; he writes about waters in general, regardless of location, due to their evident effect on the health of those individuals (8):

καὶ γλυκύτατά ἐστι καὶ λεπτότατα καὶ λαμπρότατα. τὴν τε γὰρ ἀρχὴν ὁ ἥλιος ἀνάγει καὶ ἀναρπάζει τοῦ ὕδατος τὸ τε λεπτότατον καὶ κουφότατον... τὰ δὲ ἀπὸ χιόνος καὶ κρυστάλλων πονηρὰ πάντα. ὁκόταν γὰρ ἅπαξ παγῆ, οὐκ ἔτι ἐς τὴν ἀρχαίην φύσιν καθίσταται, ἀλλὰ τὸ μὲν αὐτοῦ λαμπρὸν καὶ κοῦφον καὶ γλυκὸ ἐκκρίνεται καὶ ἀφανίζεται, τὸ δὲ θολωδέστατον καὶ σταθμωδέστατον λείπεται.

And so rain water is lightest and sweetest and finest and clearest: to begin with, the sun evaporates and snatches up the finest and lightest of water... And water from snow and ice is all unpleasant: for whenever it has been frozen once, still it recovers not in the original state, but the bright and light and sweet part of it separates and disappears, the muddiest and part most full of sediment is left.

The detail in this section indicates that it is “unpleasant,” which in the context of the complete section means ingestion results in sickness. This passage exemplifies Hippocrates’ trademark observation and implies it is impurity in the water that carries sickness with it, or causes it. This would appear to be denial of the gods but, once again, he never explicitly does this and is careful to include those factors, such as wind, that were believed to be directed by gods. His writing regarding waters, thus, provides an example of the proto-medical that distinctly moves away from the pantheon while not severing that connection.

In an effort to determine natural causes of disease, he also expands to patient lifestyles or history in section one, explaining how they impact infection severity or why patients contract an illness in the first place. This overall trend demonstrates an understanding of direct cause and effect. Hippocrates’ work indicates he understands the significance of lifestyle and patient history because there is distinct foreground provided on waters and locations before delving into specific diseases as well as speaking directly about their daily habits. Where people live and

what they are regularly exposed to, or ingesting, heavily impacts general health and lifestyle habits because of local industries or access to certain activities. In regard to their daily habits, he specifically says δὲ χρῆ ... καὶ τὴν δίαιταν τῶν ἀνθρώπων, ὁκοίη ἡδονται, πότερον φιλοπότηται καὶ ἀριστηταὶ καὶ ἀταλαίπωροι ἢ φιλογυμνασταὶ τε καὶ φιλόπονοι καὶ ἐδωδοὶ καὶ ἄποτοι (“It is necessary to consider ... the lifestyle of people, in which way they enjoy themselves, whether lovers of drink and ones who eat lunch and lazy ones, or both athletes and industrious ones, and eat much and are not given to drink.” 1). Regardless of being more susceptible to disease, symptoms also differ between individuals based on their choices. For example, if an elderly man with a history of smoking is experiencing the flu, his condition is likely to escalate to pneumonia whereas a fit, young woman may experience mild flu-like symptoms. Modern medical practitioners are required to gather past patient history and general demographic information for this reason.³

The broad overview of recognizing external factors on patient health is the foundation of Hippocrates’ manual for medical treatment and modern practice; it is the beginning of the shift to proto-medical thinking. Though the direct connection to healthy living and having a stronger immune system seems obvious today, in ancient times it still did not eliminate the idea that the gods might choose to punish people who were living poorly. Removing direct references to the pantheon was a critical component of creating the first proto-medical literature. However, the lingering presence of higher powers and lack in technological capability, that prevents Hippocrates from denying their role in his correlations, demonstrates the influence of deeply ingrained values preventing a swift evolution to modern medical thought.

Hippocrates Section II: Prognosis in Favor of Diagnosis.

³ This information was gathered from personal experience and classes in E.M.T. Basic.

The greatest lack of separation from the gods as directors of disease in Hippocrates' work is the absence of diagnosis in favor of prognosis. Diagnosis is defined by the National Institutes of Health (NIH) as the “[classification of] the sick patient as having or not having a particular disease” (Croft et. al., 2015). Conversely, prognosis is defined as “the likelihood of future outcomes in patients with a given disease or health condition” (Croft et. al., 2015). The first requires a medical license while the second is a simple prediction based on observable, correlated evidence but not necessarily a determined condition. Similarly to other authors such as Homer in the *Iliad*, Hippocrates avoids diagnosis. This was due to the overall cultural attribution of health to blessing and symptoms being a result of the loss of that blessing. Diagnosing a person with a distinct illness circumvents the divine as inflicting wrath because illness becomes something that is identifiable. This influence led to prognosis and prevention instead, and several examples are present in *On Airs, Waters, and Places*. I will first provide an example of prognosis that is characteristic of much of the main text. Next I will analyze how the practice of prognosis in Hippocrates's work is also more loose than what we see in modern healthcare because he categorizes illness into vaguely broad terms. By describing diseases this way even with the substantial amount of detail, he avoids diagnosis and remains within religious boundaries. Finally, I will circle back to how Hippocrates uses prognosis to effect positive change and teach prevention in patients despite religious hindrance.

A prime example of prognosis instead of diagnosis can be seen in section four of *On Airs, Waters, and Places* which focuses on listing symptoms of the endemic diseases within a particular region (4):

ἀνάγκη δὲ ὧδε ἔχειν, ὁκόταν αἱ κοιλίαι σκληραὶ ἔωσιν: ἔμπυοὶ τε πολλοὶ γίνονται ἀπὸ πάσης προφάσιος. τούτου δὲ αἴτιόν ἐστι τοῦ σώματος ἡ ἔντασις καὶ ἡ σκληρότης τῆς κοιλίης. ἡ γὰρ ξηρότης ῥηγματίας ποιεῖ εἶναι καὶ τοῦ ὕδατος ἡ ψυχρότης. ἐδώδου δὲ ἀνάγκη τὰς τοιαύτας φύσις εἶναι καὶ οὐ πολυπότας: οὐ γὰρ οἶόν τε ἅμα πολυβόρους τε

εἶναι καὶ πολυπότας: ὀφθαλμίας τε γίνεσθαι μὲν διὰ χρόνου, γίνεσθαι δὲ σκληρὰς καὶ ἰσχυράς, καὶ εὐθέως ρήγνυσθαι τὰ ὄμματα: αἰμορροΐας δὲ ἐκ τῶν ῥινῶν τοῖσι νεωτέροισι τριήκοντα ἐτέων γίνεσθαι ἰσχυρὰς τοῦ θέρους: τὰ τε ἱερὰ νοσεύματα καλεούμενα, ὀλίγα μὲν ταῦτα, ἰσχυρὰ δέ. μακροβίους δὲ τοὺς ἀνθρώπους τούτους μᾶλλον εἰκὸς εἶναι τῶν ἐτέρων: τὰ τε ἔλκεα οὐ φλεγματώδεα ἐγγίνεσθαι οὐδὲ ἀγριοῦσθαι: τὰ τε ἥθεα ἀγριώτερα ἢ ἡμερώτερα. τοῖσι μὲν ἀνδράσι ταῦτα τὰ νοσήματα ἐπιχώρια ἐστί...

But it must be so, wherever bowels are hard; sufferings from an abscess are numerous because of any provocation; the tension of the body and the hardness of the bowels is the cause of this; for the dryness causes them to be prone to rupture, and the coldness of the water does as well. And it is necessary that the natures of such a kind of person are given to eating, and not given to drinking, for it is not possible at the same time to be both eating much and drinking much; and ophthalmias happen after some time, and the eyes become hard and severe, and directly rupture; and severe bleedings from the nose afflict those younger than thirty years during the summer; and the so-called sacred diseases [epilepsy], on one hand these are few, and on the other hand severe. It is more likely that they be long-lived than other people; and un-inflamed sores break out but they will not become malignant, and their characters are more fierce than more tame. These diseases are endemic to these men...

This text lists several different types of symptoms, all of which do not belong to a single illness, evidenced by Hippocrates' own use of the word νοσήματα ("diseases"). Here, there is no separation within the term ταῦτα τὰ νοσήματα ἐπιχώρια ἐστί ("these diseases are endemic" 4) other than age and, later on in this section, sex. Despite the lack of distinction between particular illnesses, he did use some categorization so his observations are not meaningless groups of information. This provides just enough organization of symptoms to determine "the likely future outcomes for a patient," or to prognose, without adding so much detail that groups of symptoms are labeled for diagnosis. This is a theme that continues to arise as Hippocrates describes other regions throughout *On Airs, Waters, and Places*.

In this excerpt he also mentions the ἱερὰ νοσεύματα, or the sacred disease. The sacred disease is epilepsy and, by itself, is not a disease, rather a symptom of underlying neurological problems or a side effect of a health condition. The NIH states that "epilepsies are a spectrum of brain disorders ranging from severe, life-threatening and disabling, to ones that are much more

benign” (National Institute of Neurological Disorders and Stroke). Ogden explains that Hippocrates’ mentions of epilepsy were thought of as a supernatural possession by the Greeks rather than a medical condition that could be treated, namely because they were technologically incapable of studying the neurological cause (18). Additionally, epilepsy involves intense spasms and is, without a detailed understanding of neuronal activity, a virtually inexplicable event; it would have been a logical assumption in their culture to assume this is a possession by a spirit or god. This is a key example of medical literature’s inability to separate from the religious culture due to strong belief in illness being supernatural and Hippocrates’ need to list significant observations despite what may or may not be causing them. In this case it is referred to as simply a severe symptom within the greater category of afflictions due to location and age, though it is still not explicitly separated from the influence of the religious culture, especially being named the “sacred” disease. Hippocrates does not reference the fact that it is believed to be a possession but a necessary observation for creating correlations, demonstrating the essence of Hippocrates’ methods in *On Airs, Waters, and Places* to record all elements of a disease for prognosis.

Avoiding diagnosis, Hippocrates was able to continually affect positive change in patient cases by generally categorizing symptoms into two broad groups: endemic or acute diseases. *On Airs, Waters, and Places* focuses its descriptions on the endemic category and Hippocrates provides a completely different manual, *On Regimen in Acute Diseases*, for detailed observations of acute illness. The restriction of identification to two classes allows him to evade diagnosis while still teaching physicians about expected endemic diseases versus acknowledging the appearance of new epidemics in the region. The occurrence of a plague, for example, would have been uncharacteristic of the documented regions and immediately suggested to physicians that a new illness was present. He also categorizes symptoms affecting one particular part of the body

into broad labels.⁴ A direct example of this in *On Airs, Waters, and Places* is dysentery, the inflammation of the bowels due to bacterial infection (10):

ἦν δὲ ὁ μὲν χειμῶν ἀρχμηρὸς καὶ βόρειος γένηται, τὸ δὲ ἦρ ἔπομβρον καὶ νότιον, ἀνάγκη τὸ θέρος πυρετῶδες γίνεσθαι καὶ ὀφθαλμίας καὶ δυσεντερίας ἐμποιεῖν ... ὥστε τοὺς πυρετοὺς ἐπιπίπτειν ὀξυτάτους ἅπασιν, μάλιστα δὲ τοῖσι φλεγματῆσι. καὶ δυσεντερίας εἰκός ἐστι γίνεσθαι καὶ τῆσι γυναιξὶ καὶ τοῖς εἶδεσι τοῖς ὑγροτάτοισι.

And if the winter is dry and northern, and the southern spring is very rainy and damp, it is necessary that during the feverish summer ophthalmias and dysenteries are to come about ... with the result that acute fevers fall upon all, and especially the phlegmatic ones. And dysenteries are likely to occur in women and in the most wet constitutions.

The dysenteries here are described as coming upon anyone with a more phlegmatic constitution after a particularly wet spring season, but modern medicine has defined dysentery as caused by ingestion of the bacterial species *Shigella dysenteriae* from contaminated water (Zaidi et. al., 2014). The presence of extra moisture in this passage leading to these infections in addition to infections of the eye, ophthalmias, only alludes to general bacterial infection. This information suggests that the dysenteries Hippocrates mentions could be from any infection resulting in an agitated or bleeding digestive system. Despite the lack of distinction between vastly different diseases, the initial recognition and quarantine would be enough to avoid spread throughout the population. Hippocrates seems to infer this when telling his pupils to recognize the presence of symptoms and separate those individuals from the general population for treatment. The positive results from such quarantines would encourage the practice of prognosis. Aphasia and asthma were also described in vague terms in other portions of Hippocrates' work (Grmek 1983; 37). Aphasia is now defined as a localized brain injury disrupting speech while ancient texts could have encompassed a range of disorders into this term, including being a mute or speaking nonsense. Additionally, the term asthma would include any form of shortness of breath as minor

⁴ This is not diagnosis either because several diseases may affect a particular part of the body.

as exercise or major as a punctured lung.⁵ However, the positive results from intervention led to greater focus on these practices in Hippocrates' work and a decreased need to define the underlying condition unlike modern medicine, making this a truly proto-medical text. The shift from complete assignment to the gods to logical prognosis and possible relief from the symptoms, or quarantining the sick, was a great turning point in ancient medicine while not too radical for the times.

Even though Hippocrates focused on broad categorization, he understood that a complete, ordered analysis of patient presentation in case studies was important before attempting to prescribe remedies for that illness, and yet, he found prognostic practice sufficient for this purpose as well. In contemporary medicine “[prognosis] research aims to understand the likelihood of different outcomes, which factors predict these likelihoods, how best to estimate an individual’s likelihood of different outcomes, and how this information can be used to target interventions and improve outcomes” (Croft et. al. 2015). The general idea of prognosis then, is being able to affect positive results in individual cases rather than cure a disease, an area Hippocrates most exemplifies. In emergency medicine this practice is implemented on a regular basis, as technicians do not have the medical qualifications to diagnose (Mistovich and Karren 2014; 1-11). The sequence in which patients present symptoms and which is most pressing for them is a significant indicator for the type of illness they have contracted without a concrete diagnosis, what should be addressed first, or how severe it will become. Being able to determine these three things can often be sufficient to save a patient’s life and in some instances avoid

⁵ This theme of generalization was also present in ancient references to leprosy. The first mention of leprosy appeared several hundred years before the Hippocratic corpus in Leviticus, but it was neither named nor referred to under this name for some time. Only initial symptoms were recorded because of swift quarantine; thus, the term *lépra* was often used in various literatures but did not refer to leprosy, only boils or flaky skin (Grmek 1983; 157).

advanced care or diagnosis of a particular disease. Hippocrates did not have the knowledge of modern physicians but could clearly affect change in patient conditions using prognosis just as the process works today. The ability to provide supportive care with a prognosis and not necessarily require diagnosis encouraged postponement of this practice and general assignment of blame to the pantheon.

In case studies where Hippocrates' descriptions are very specific for effective prognosis, his work is markedly proto-medical because it is parallel to modern emergency medicine and has allowed modern medical scholars, mentioned by Grmek, to diagnose the described disease. Grmek referred to his work as a "diagnosis in disguise" (293). The meaning here is that modern medical scholars are occasionally able to decipher which illnesses Hippocrates describes even though he does not complete the diagnostic process himself. This illustrates Hippocrates' position within a god-based society while moving the medical field forward. A specific example of this can be found in the description of Philiscus' week-long illness in Hippocrates' book *Of the Epidemics*. He describes the illness in excruciating detail to the point where modern physicians are almost certain which strain of malaria was inflicting the man. First of all, it is important to acknowledge that these patterns of prognosis appear in other writings by Hippocrates confirming that *On Airs, Waters, and Places* is not an anomaly in his style, rather it contains some of the best samples of his prognostic writing. Hippocrates explains the disease day by day until the subject's death in his typical chronological fashion, but there is uncertainty in translating some of the terms he uses. According to medical scholars described in Grmek, the list of symptoms, when taken most literally, match the milder malarial disease, blackwater fever (295). The observation that points to this strain is the lack of vomiting, a prominent symptom of malaria that does not present in this milder strain. The clarity in the description of symptoms

presenting in the patient highlights Hippocrates' systematic thinking and moving towards the idea of medicine as a scientific venture. Though this is still not an example of diagnosis, Hippocrates provided a model for diagnosis in his proto-medical fashion, and he began to truly alter traditional thinking and studies of infectious disease.

Finally, Hippocrates is careful to tie this abundance of information for prognosis back to the cause, focusing much of his work on prevention and effectively reducing the need for exhaustive diagnosis. An example of this relates back to prediction of disease incidence in addition to what causes them (2):

εἰδὼς γὰρ τῶν ὥρέων τὰς μεταβολὰς καὶ τῶν ἄστρον τὰς ἐπιτολάς τε καὶ δύσιας, καθότι ἕκαστον τούτων γίνεται, προειδείη ἂν τὸ ἔτος ὁκοῖόν τι μέλλει γίνεσθαι. οὕτως ἂν τις ἐννοεῦμενος καὶ προγινώσκων τοὺς καιροὺς μάλιστ' ἂν εἰδείη περὶ ἐκάστου καὶ τὰ πλεῖστα τυγχάνοι τῆς ὑγείης καὶ κατορθοῖη οὐκ ἐλάχιστα ἐν τῇ τέχνῃ. εἰ δὲ δοκεῖι τις ταῦτα μετεωρολόγια εἶναι, εἰ μετασταίη τῆς γνώμης, μάθοι ἂν, ὅτι οὐκ ἐλάχιστον μέρος συμβάλλεται ἀστρονομίῃ ἐς ἰητρικὴν, ἀλλὰ πάνυ πλεῖστον. ἅμα γὰρ τῆσιν ὥρησι καὶ αἰ νοῦσοι καὶ αἰ κοιλίαι μεταβάλλουσιν τοῖσιν ἀνθρώποισιν.

For if one knows the seasons' changes and both the rising and setting of the stars, in what manner every one of these things happens, he would know in advance of what sort the year was going to be. Someone seeking and learning of the proper times in this way would know particularly about each one, and succeed most in health, and not achieve least in skill. And if someone thinks that these things are meteorological, if he should change his opinion, he would understand that astronomy contributes not the smallest part to the practice of medicine, but entirely the largest. For altogether with the seasons both the diseases and the bellies [digestion] change for people.

The fact that proper skill in predicting disease prevalence and the correlations I discussed in the first section are closely intertwined with prevention indicates Hippocrates understood the significance of disease deterrence and that it was possible. Ensuring all of these links are considered in healthcare increases awareness for prevention and the ability to reduce outbreaks or the extent to which endemic illnesses overtake a population. After several sections of *On Airs, Waters, and Places*, Hippocrates stresses preparedness and increased possibility for prevention once again (11):

κατὰ ταῦτά τις ἐννοεῦμενος καὶ σκοπεύμενος προειδείη ἂν τὰ πλεῖστα τῶν μελλόντων ἔσεσθαι ἀπὸ τῶν μεταβολέων. φυλάσσεσθαι δὲ χρὴ μάλιστα τὰς μεταβολὰς τῶν ὡρέων τὰς μεγίστας καὶ μήτε φάρμακον δίδόναι ἐκόντα μήτε καίειν ὃ τι ἐς κοιλίην μήτε τάμνειν, πρὶν παρέλθωσιν ἡμέραι δέκα ἢ καὶ πλείονες: μέγιστα δὲ εἰσιν αἶδε αἱ τέσσαρες καὶ ἐπικινδυνόταται: ἡλίου τροπαὶ ἀμφοτέραι καὶ μᾶλλον αἱ θεριναὶ καὶ αἱ ἰσημερίαὶ νομιζόμεναι εἶναι ἀμφοτέραι, μᾶλλον δὲ αἱ μετοπωριναί: δεῖ δὲ καὶ τῶν ἄστρον τὰς ἐπιτολὰς φυλάσσεσθαι καὶ μάλιστα τοῦ κυνός, ἔπειτα ἀρκτούρου, καὶ ἔτι πληϊάδων δύσιν. τὰ τε γὰρ νοσεύματα μάλιστα ἐν ταύτησι τῆσιν ἡμέρησιν κρίνεται. καὶ τὰ μὲν ἀποφθίνει, τὰ δὲ λήγει, τὰ δὲ ἄλλα πάντα μεθίσταται ἐς ἕτερον εἶδος καὶ ἐτέρην κατάστασιν.

By reflecting and observing according to these things one may know in advance most of the things about to be from the changing of the seasons. And it is necessary to keep watch especially for the greatest changes [of seasons], and neither willingly giving medicine, nor to cauterize anything which is around the belly, nor to cut, before ten days or more pass: but the following four [changes] are the greatest and most dangerous, each of the solstices and especially the summer one, and both the ones reckoned to be equinoxes, and especially the autumn one. It is necessary that the rising of the stars be watched, and especially of the dog star, then of the Arcturus star, and the cosmic setting of the constellation Pleiades: for the diseases are observable especially in these days. Some are fatal, others cease, and all others change to another form and another constitution.

This section brings all of the information he has presented as the most significant over the past ten sections together to remind the readers to use their knowledge to anticipate and deter illness as well as use his work to improve overall healthcare practices. He does not say to observe the changes in season for the uprising of a particular infection, but for the two groups he has already addressed. These excerpts provide evidence that Hippocrates was using his observations to educate others for the betterment of healthcare in a society restricting the expansion of the field from diagnosis. Though the core ideals seem more clear based on the content within his manuals, it becomes even more apparent in the organization of his texts and particular word usage.

Hippocrates Section III: Proto-medical Organization.

Directly reflecting the themes I have covered in the past two sections, the works of Hippocrates expand ideas of thinking of medicine beyond simply attributing pestilence to godly will. He does by writing in a uniquely systematic format similar to modern medical texts,

distinctly mapping out the physical causes of diseases and how to prevent them. Hippocrates begins his *On Airs, Waters, and Places* by addressing his main audience: ἡτρικὴν ὅστις βούλεται ὀρθῶς ζητεῖν (“Whoever wishes to seek medicine properly” 1), or future doctors. Hippocrates focuses on a particular audience and what they need to know to give the prognosis of certain illnesses, just as current medical writings are targeted for a specific audience, using this simple phrase. His work is shown to be proto-medical because of its strong resemblance to modern medical texts; this can be seen in three main features of his writing style. First, I will discuss how he orders the text to reinforce the main points I have already analyzed in the other sections of this thesis. Next I will analyze his use of key words to clarify his text in conjunction with his organization. Finally, Hippocrates signposts the entire text to ensure the reader understands what he is talking about and how it relates to what he has already explained or what he will explain. These central and consistent features are the final aspect of Hippocrates’ work that create a truly proto-medical text.

Hippocrates’ focus on the order of his text supports the main points he is attempting to relay to physicians, just as contemporary texts are required to do. He specifically says τάδε χρῆ ποιεῖν (“it is necessary to do the following things” *Hp. Aer.* 1), delving directly into the information critical to studying medicine properly. He repeatedly uses the phrase χρῆ (“it is necessary...”) or similar phrases throughout his works to stress the importance of every detail he includes. The details are not superfluous but ordered for efficiency. Hippocrates organizes them by beginning sections with the main purpose followed by a list of parallel statements (1):

...τάδε χρῆ ποιεῖν: πρῶτον μὲν ἐνθυμεῖσθαι τὰς ὥρας τοῦ ἔτους, ὃ τι δύναται ἀπεργάζεσθαι ἐκάστη: οὐ γὰρ εἰκόσιν ἀλλήλοισιν οὐδέν, ἀλλὰ πολὺ διαφέρουσιν αὐταί τε ἐφ’ ἑωυτέων καὶ ἐν τῆσι μεταβολῆσιν: ἔπειτα δὲ τὰ πνεύματα τὰ θερμά τε καὶ τὰ ψυχρά, μάλιστα μὲν τὰ κοινὰ πᾶσιν ἀνθρώποισιν, ἔπειτα δὲ καὶ τὰ ἐν ἐκάστη χώρῃ ἐπιχώρια ἐόντα.

...it is necessary to do the following things: first to consider the seasons of the year, whatever each season is able to produce: for they are not the same one to the other in any way, and they themselves differ by much from themselves and in their changes: next it is necessary to consider the winds both hot and cold: especially those being common to all people, and next those in each place being local.

Beginning with *πρῶτον μὲν ἐνθυμεῖσθαι τὰς ὥρας τοῦ ἔτους* introduces the central point for this introductory section, and, by considering it first, Hippocrates is reinforcing the main idea that seasons changing is a main determinate in the return of endemic illnesses. He repeats the central concepts in several of the following sections and adds correlations to the original argument of *On Airs, Waters, and Places*. This allows him to continue reinforcing his ideas as well as build a more complex and detailed manual for prevention; an example of this lies in section two where he says *εἰδὼς γὰρ τῶν ὥρέων τὰς μεταβολὰς καὶ τῶν ἄστρον τὰς ἐπιτολάς τε καὶ δύσιας, καθότι ἕκαστον τούτων γίνεται, προειδείη ἂν τὸ ἔτος ὁκοῖόν τι μέλλει γίνεσθαι* (“For if one knows in advance the seasons’ changes and both the rising and setting of the stars, in what manner every one of these things happens, he would know of what sort the year was going to be”). This quote restates the first assertion from section one and combines the newly introduced practice of prediction.

This ordering and repetition is congruent with the arrangement of a medical text where a central dogma is introduced and referenced several times to tie each related concept to the larger picture the author is attempting to convey. For example, the National Institutes of Health (NIH) published an article that explains what should be included when writing a medical book chapter, a great honor and responsibility for a medical scientist. Most importantly, the topic must be clearly stated in conjunction with an outline containing strong evidence for each sub-topic before the scientist is allowed to start work on the chapter (Kendirci 2013; 39). Additionally, the NIH article explains to prospective authors of medical textbook chapters that “[d]ependent both on

your experiences, and accumulation of knowledge in the literature, you will be expected to make some predictions about the future” (Kendirici 2013; 39). Hippocrates, like these texts, uses the order of information to eventually explain why prediction is necessary in the medical profession, which goes beyond just mentioning it as in the previous quote (2):

τοῦ δὲ χρόνου προϊόντος καὶ τοῦ ἐνιαυτοῦ λέγοι ἄν, ὁκόσα τε νοσήματα μέλλει πάγκοινα τὴν πόλιν κατασχῆ σειν ἢ θέρεος ἢ χειμῶνος, ὁκόσα τε ἴδια ἐκάστῳ κίνδυνος γίνεσθαι ἐκ μεταβολῆς τῆς διαίτης.

As the time and the year advances, he could say, how many epidemic diseases are about to occupy the cities either in summer or in winter, and how many particular to each individual become a danger from changing the way of living.

This comparison in particular distinguishes him from previous writings regarding disease in the ancient world where prevention was spiritual atonement. This also indicates his writing is organized to reflect his core ideals of prognosis and preventative medicine. The close comparison to modern texts supports the assertion that Hippocrates was moving toward logical thinking and the fact that his text is proto-medical.

Modern medical texts are also required to list the symptoms of a disease in a logical order, similarly to the form Hippocrates utilizes to strive for clarity for his pupils. Grmek notes when observing his literary style, Hippocrates uses order of punctuation and conjunctions to definitively order the appearance of symptoms (14). The use of words such as *πρῶτον* (“first”) and *ἔπειτα* (“next”) stress this organization (*Hp. Aer.* 1). Using words such as *μάλιστα* (“especially”) also aids in highlighting important aspects of each subject he covers. This idea is analogous to the practice of including key words in bold throughout a medical text. Throughout this work and his other writings, this pattern of emphasizing clarity by organization resurfaces. He clearly defines what is first and foremost to consider and continues in order of the presenting symptoms as well as increasing intensity (3):

πρῶτον μὲν τὰς γυναῖκας νοσερὰς καὶ ῥοώδεας εἶναι: ἔπειτα πολλὰς ἀτόκους ὑπὸ νοῦσου καὶ οὐ φύσει ἐκτιτρώσκεσθαι τε πυκνά: τοῖσι τε παιδίοισιν ἐπιπίπτειν σπασμούς τε καὶ ἄσθματα καὶ ἃ νομίζουσι τὸ παιδίον ποιεῖν καὶ ἱερὴν νοῦσον εἶναι: τοῖσι δὲ ἀνδράσι δυσεντερίας καὶ διαρροίας καὶ ἠπιάλους καὶ πυρετοὺς πολυχρονίους χειμερινούς καὶ ἐπινυκτίδας πολλὰς καὶ αἰμορροΐδας ἐν τῇ ἔδρῃ.

At first the women are sickly and with strong flow; next many women are barren and miscarry often by disease not by nature; spasms and short breaths fall upon the children, which they think to cause the child's [sickness], and to be the sacred illness (epilepsy): and dysentery and diarrhea and chills and chronic winter fever and many pustules most painful at night and hemorrhoids in the rump fall upon the men.

Most diseases present mildly at first and manifest more intensely later and differently in different groups of individuals. This observation of increasing potency and distinguished symptoms here due to sex or age diversity indicate that there was an understanding of a specific set of illnesses causing the symptoms. He is very succinct, moving in a step by step fashion through his description of how the three components, airs, waters, and places that I described in the first section of this paper, are major and natural factors in the diseases a doctor may come across when visiting patients in various locations. The use of these phrases, words, and general hierarchy of information align with ideals of modern medical education and a proto-medical text that separates Hippocrates from previous authors addressing infectious diseases.

Besides these smaller organizational tools, Hippocrates increases the global cohesiveness of his text and ensures doctors are following his logic as required by medical teaching materials for practical application by the student in the future. He achieves this by landmarking the whole text, indicating what subject from the previous passage should be remembered when discussing the next section (5):

περὶ μὲν οὖν τῶν θερμῶν πνευμάτων καὶ τῶν ψυχρῶν καὶ τῶν πολίων τούτων ὧδε ἔχει ὡς προεῖρηται. ὁκόσαι δὲ κέονται πρὸς τὰ πνεύματα τὰ μεταξὺ τῶν θερινῶν ἀνατολέων τοῦ ἡλίου καὶ τῶν χειμερινῶν καὶ ὁκόσαι τὸ ἐναντίον τούτων, ὧδε ἔχει περὶ αὐτέων:

And therefore concerning the warm winds and the cold winds and these cities it is so as it has been said. Whatever cities are positioned toward the winds between the summer and

winter risings of the sun, and whatever cities lie opposite of these winds, concerning these it is so/(as follows).

Using the phrasing ὥδε ἔχει ὡς προεῖρηται (“it is so as it has been said”) to acknowledge the past writings versus ὥδε ἔχει περὶ αὐτέων (“concerning these it is so”) to point to what factual information he will present provides the landmarks present throughout the majority of *On Airs, Waters, and Places*. He often uses these phrases at the beginning of each section for this purpose and sometimes places them in the middle of a section (7):

εἰσὶ δ' ἔνιαι φύσιες καὶ νοσεύματα, ἐς ἃ ἐπιτήδεια ἔστι τὰ τοιαῦτα ὕδατα πινόμενα, περὶ ὧν φράσω αὐτίκα.
ἔχει δὲ περὶ τούτων ὥδε:

But there are some constitutions and illnesses for which such waters being drunk is suitable, concerning which I will indicate straightaway.
And concerning these it is so/(as follows):

Approximately halfway through this sections, Hippocrates uses the more direct word αὐτίκα (“straightaway”) to make the course of his instruction evident. The phrasing and use of detailed format provides a document organized to highlight the significance of symptoms for prognosis, resembling modern medical texts because they are strictly written to inform the reader and actively avoid misinterpretation. Contemporary medical chapters are also set up in this distinct pattern, using introductory paragraphs to remind the reader of the previous chapters before addressing new information. Without this cohesiveness, there will be an abundance of information within the text without any tools for deciphering what it means or how to utilize it in practice. Though Hippocrates did not have chapters, he had various sections he diligently connected via these landmarking phrases just like the longer paragraphs of today’s work. This final feature of his writing works with the other two to suggest a greater desire to clarify his observations as much as possible for effective medical practice.

In conclusion to these three main proto-medical themes of Hippocrates' *On Airs, Waters, and Places*, he was bound by the beliefs of ancient Greek religion but was one of the first authors to generate new paths of thought for medicine, or the studies of infectious disease. His instruction works outside of assumptions of godly influence without denying their existence, and he continues to respect Greek religion by refraining from using diagnostic techniques. Within these two parameters, his goal was to create a base of knowledge for future physicians by organizing his observations efficiently and clearly, similar to the models modern scientific writers use in their teaching. He distinctly uses word connectivity to lead the reader from one logical point to the next regarding prognosis of individuals based on a location and time of year, not religion or concrete assumptions of medical conditions. This process was specifically defined by Grmek as pathocoenosis because of its distinct style (14). Overall, the ingrained polytheistic doctrines that influenced Hippocrates' work were based largely in the propagation of myth through religious practice, but all three aspects of Hippocrates' writing I have covered thus far were also based on literary evolution in ancient Greek authorship in other disciplines.

Literary Themes of Hippocrates' Period: Sophism.

By way of conclusion, in order to understand how Hippocrates both based his work on literary ideals of his time and stretched the bounds of these ideals to create his proto-medical text, it is critical to observe the dynamics of different schools of writing around the medical literature of Ancient Greece in the late 5th century B.C.. I will be directly observing interplay between Thucydides' historical narratives, medical documents, and other factors influenced by the evolving culture while referencing some of the work written by the author Rosalind Thomas. Thomas is a professor of Ancient Greek history at Oxford as well as the author of "Thucydides' Intellectual Milieu and the Plague" in *Brill's Companion to Thucydides*. This article discusses

the general literary trends of this time period and how the different goals of historians, medical experts, and other fields influenced each other (Thomas, 2012; 87). Thomas notes that evidence based writing was becoming a literary theme of the era, as many historians such as Herodotus and Thucydides were using sophistic, or rhetoric, methods (Thomas, 2012; 87). Rhetoric is generally identified as the use of persuasive language while sophism is recognized as a small facet of this style utilized in the 5th century. The main components of this writing are investigation with a central question and evidence, focus on facts of cause and effect, and dismissal of divine influence in life. Thomas mentions that several more investigative styles of literature were forming in all disciplines including political science, history, and medicine, among others, with sophism at the forefront of medical writings. Though the word itself has a broader definition in other contexts, Thomas defines sophism as the presentation of an argument with supporting evidence, as seen especially in the “development of medicine in the latter half of the fifth century” (87). She claims “[t]hese seem to belong to the wider milieu of intellectual style that was manifested in both the ‘scientific’ work of medical writers and in the growth of the art of persuasion, and often in both” (88). Because of this tendency to find answers to the unknown, the authors write about visible cause and effect. Without causal relationships, the writers would not be able to provide the information necessary to support their investigative questions. Finally, the gods are not discussed as effecting changes and are not responsible for the actions of human beings, as seen in *On Airs, Water, and Places*.

Though Thomas stresses this fact, the medical part of the movement is only implicitly denying the existence of deities without doing so outright, fostering the transition to less religious centered healthcare. Rhetoric in the form of sophism was a necessary component of Hippocrates’ proto-medical style while enabling progression beyond its parameters; this dynamic

can be observed by reanalyzing what I previously explained in *On Airs, Waters, and Places*.

Sophistic work relies on what can be seen to persuade, presenting a thesis with necessary evidence, and Hippocrates follows this method seamlessly. In the very first aspect of Hippocrates' work I discussed, he presents his argument, that natural elements result in the array of illnesses he discusses. He then provides observable evidence for this statement, ignoring supernatural explanations that cannot be empirically proven, throughout *On Airs, Waters, and Places*. Within individual sections this method is visible as well (9):

περὶ μὲν οὖν ὀμβρίων ὑδάτων καὶ τῶν ἀπὸ χιόνος καὶ κρυστάλλων οὕτως ἔχει. λιθιῶσι δὲ μάλιστα ἄνθρωποι καὶ ὑπὸ νεφριτίδων καὶ στραγγουρίας ἀλίσκονται καὶ ἰσχιάδων, καὶ κῆλαι γίνονται, ὅκου ὕδατα πίνουσι παντοδαπώτατα καὶ ἀπὸ ποταμῶν μεγάλων, ἐς οὓς ποταμοὶ ἕτεροι ἐμβάλλουσι, καὶ ἀπὸ λίμνης, ἐς ἣν ῥεύματα πολλὰ καὶ παντοδαπὰ ἀφικνεῦνται, καὶ ὀκόσοι ὕδασιν ἐπακτοῖσι χρέονται διὰ μακροῦ ἀγομένοισι καὶ μὴ ἐκ βραχέος. οὐ γὰρ οἶόν τε ἕτερον ἐτέρῳ εἰκέναι ὕδωρ, ἀλλὰ τὰ μὲν γλυκεὰ εἶναι, τὰ δὲ ἀλυκὰ τε καὶ στυπτηριώδεα, τὰ δὲ ἀπὸ θερμῶν ῥεῖν.

Therefore concerning rain waters and those from snow and ice it is so. And men suffer especially from the kidney stones, by nephritis and being taken by retention of urine/[strangury] and sciatica, and tumors occur, of whatever place they drink waters of all sorts and from great rivers, into which different rivers put in water, from pools, into which many streams of all sorts come to, and they use whatever waters are imported being carried over a great distance, and not from short distances. For one water cannot be similar to another, but some waters are sweet, and others are both salty and containing alum, and some flow from hot springs.

Hippocrates states what men are suffering from, and then explains that it appears to directly relate to the variety of waters being ingested. This correlative example acts as a support for the original argument he introduces in section one as well, which stated that ταῦτα δὲ χρὴ ἐνθυμεῖσθαι ὡς κάλλιστα καὶ τῶν ὑδάτων περὶ ὡς ἔχουσι (“It is necessary to consider these things as well as possible and about how the waters are disposed”). The supporting statement in section nine, regarding the fact that not all waters can be identical, presents more detail and a sub-thesis. These ideas also relate directly to the discussion about his organization and word usage. The ordered presentation of evidence is very persuasive because it establishes a

straightforward connection between the physical elements and illness using both the overarching argument, with section one of the core text supplying the central theses, and the following sections acting as the pillars of evidence, or subsections to create smaller cases as I just discussed.

Though the sophistic movement is congruent with this initial shift in thinking, Hippocrates adds his own ideas to this, creating a more proto-medical work than the sophistic construction alone. Hippocrates takes his writing further than simply providing an argument with support, demanding the use of prognosis and prevention in healthcare which expand beyond frames of the sophistic era (10):

περὶ μὲν οὖν τούτων ὧδε ἔχει ἢ ὅτι τούτων ἐγγύτατα. περὶ δὲ τῶν ὠρέων ὧδε ἂν τις ἐνθυμεύμενος διαγινώσκει, ὁκοῖόν τι μέλλει ἔσεσθαι τὸ ἔτος, εἴτε νοσερὸν εἴτε ὑγιερὸν: ἦν μὲν γὰρ κατὰ λόγον γένηται τὰ σημεῖα ἐπὶ τοῖς ἀστροῖσι δύνουσί τε καὶ ἐπιτέλλουσιν, ἔν τε τῷ μετοπώρῳ ὕδατα γένηται, καὶ ὁ χειμῶν μέτριος καὶ μήτε λίην εὐδῖος μήτε ὑπερβάλλον τὸν καιρὸν τῷ ψύχει, ἔν τε τῷ ἡρι ὕδατα γένηται ὠραῖα καὶ ἐν τῷ θέρει, οὕτω τὸ ἔτος ὑγιεινότατον εἰκὸς εἶναι...

Then concerning these things it is so, or that it is very near these things. And concerning the seasons if one were to consider that someone would discern of what sort the year is going to be, whether ill, or healthy. For if the signs occur according to principle they set and rise upon the stars, and in autumn if there are waters, then the water is moderate and neither exceedingly mild, nor exceedingly due measure with respect to cold, and in spring there are seasonable waters, and in summer as well, in this way the year likely is the healthiest...

This text, set after establishing the argument and support in *On Airs, Waters, and Places*, highlights the factors already demonstrated to impact human health and emphasizes merging the observations of each to determine what type of year it will be. Additionally, listing the different symptoms in the other excerpts seen in this document resembles more empirical writing of modern medical scripts rather than simply a sophistic construction. These are both themes that have been addressed several times in both Hippocrates' text and this document. Together they exemplify the central goal of his manuals, however, both of these advanced features were built

upon the influence of investigative formats necessary to push Hippocrates' work to the next tier of medical expertise.

Hippocrates used an elevated form of sophism and the author Thucydides strongly integrates both the sophistic and some Hippocratic values in his descriptions of disease. Thucydides is a historian of the late 5th century B.C. I will discuss through the lens of his account of the plague in the Peloponnesian war; he uses sophistic themes of medical instruction when describing the plague while also adding intent to his work. Unlike Thucydides' other compositions, there seems to be a goal to identify characteristics of the plague and somehow prevent it, which is where the similarity to the proto-medical texts of Hippocrates lies. I will describe how he works within this form of investigative writing and how his histories are influenced both by the typical medical writings of the time as well as Hippocrates' expansion on these methods. All of these indicate the importance of considering surrounding factors on the advancement of medical science. At the beginning of the plague narrative, Thucydides immediately falls into the sophistic structure (Thuc 2.47.4):

οὔτε γὰρ ἰατροὶ ἤρκουν τὸ πρῶτον θεραπεύοντες ἀγνοία, ἀλλ' αὐτοὶ μάλιστα ἔθνησκον ὄσῳ καὶ μάλιστα προσῆσαν, οὔτε ἄλλη ἀνθρωπεΐα τέχνη οὐδεμία: ὅσα τε πρὸς ἱεροῖς ἰκέτευσαν ἢ μαντείοις καὶ τοῖς τοιοῦτοις ἐχρήσαντο, πάντα ἀνωφελῆ ἦν...

For first physicians treating patients ignorantly were not warding off the plague but they themselves died most insomuch as they were present most, nor did any one other human skill however many supplications they made in front of sanctuaries or however use they made of oracles and such, all was useless...

The sophism within the text lies in the statement of fact regardless of cultural belief and noting the gods were not able to aid human efforts either. This small portion of the narrative states that every attempt at healing was ἀνωφελῆ ("useless" Thuc. 2.47.4) and proceeds to explain the two main avenues of healing, medicine and religious practices, were among these attempts. He does

not say the gods were dismayed with the army and refused to stay the evil; he also acknowledges the faults of human methods.

The disregard for godly interference is also witnessed when he describes the transmission from animals to humans (Thuc. 2.50.1).

γενόμενον γὰρ κρεῖσσον λόγου τὸ εἶδος τῆς νόσου τὰ τε ἄλλα χαλεπωτέως ἢ κατὰ τὴν ἀνθρωπεῖαν φύσιν προσέπιπτεν ἐκάστῳ καὶ ἐν τῷδε ἐδήλωσε μάλιστα ἄλλο τι ὄν ἢ τῶν ζυντρόφων τι: τὰ γὰρ ὄρνεα καὶ τετράποδα ὅσα ἀνθρώπων ἄπτεται, πολλῶν ἀτάφων γιγνομένων ἢ οὐ προσήει ἢ γευσάμενα διεφθείρετο.
τεκμήριον δέ: τῶν μὲν τοιούτων ὀρνίθων ἐπίλειψις σαφῆς ἐγένετο, καὶ οὐχ ἑωρῶντο οὔτε ἄλλως οὔτε περὶ τοιοῦτον οὐδέν: οἱ δὲ κύνες μᾶλλον αἴσθησιν παρεῖχον τοῦ ἀποβαίνοντος διὰ τὸ ζυνδιαιτᾶσθαι.

For the appearance of plague was greater than explanation and with respect to other cases plague kept falling upon each individually with more severity than human constitution but in this it revealed itself to be very different than any of the customary diseases: for however many birds and beasts prey upon men, with many people being unburied either the birds and beasts were not approaching or if they tasted them they died. And here is a sure sign: on the one hand deficiency of these birds became clear, they were not being observed either doing something else or engaged in anything such as this: on the other hand dogs were supplying a better perception of the result because of their living with people.

This passage directly contrasts with the portion of the *Iliad* stating οὐρῆας μὲν πρῶτον ἐπόχετο καὶ κύνας ἀργούς, / αὐτὰρ ἔπειτ' αὐτοῖσι βέλος ἐχεπευκὲς ἐφειῖς (“First he attacked mules and swift dogs, / But then he kept shooting sharp arrows at the men themselves:” Hom. *Il.* 1.50-51), where the “he” is Apollo. In both cases the path of contagion is understood but addressed in two very different ways. Homer, existing at least three centuries before Hippocrates and Thucydides, was not influenced by the sophistic ideals of medical literature and strongly indicates disease as actions of the divine. Thucydides does the opposite and represents the impact of literary evolution on depiction of disease. In this passage, Thucydides also notes γενόμενον γὰρ κρεῖσσον λόγου τὸ εἶδος τῆς νόσου (“for the appearance of plague was greater than explanation” Thuc. 2.50.1). This line is alluding to the belief that the gods do not control the plague because

he eliminates their role as “the explanation.” By indirectly denying the gods, his writing is congruent with this aspect of sophism.

Another influence of medical sophism in Thucydides’ plague related writings is the use of personal experience. Thomas states in other excerpts of Thucydides, he does not refer to his own experience in order to record historical events (102). This practice, however, is prominent in both Hippocrates’ work and in other similar texts (Thomas, 2012; 102). Thucydides is very up front about the fact that he is recording personal experience (Thuc. 2.48.3).

... ἐγὼ δὲ οἶόν τε ἐγένετο λέξω, καὶ ἀφ’ ὧν ἂν τις σκοπῶν, εἴ ποτε καὶ αὔθις ἐπιπέσοι, μάλιστ’ ἂν ἔχοι τι προειδῶς μὴ ἀγνοεῖν, ταῦτα δηλώσω αὐτός τε νοσήσας καὶ αὐτὸς ἰδὼν ἄλλους πάσχοντας.

... on the one hand I will say it came into being, and the symptoms from which someone investigating it, if at some point it fell upon this place again, and someone most able not to be ignorant knowing beforehand, these things I myself will make clear since I myself was ill and I also saw others suffering these symptoms.

He states he experienced this awful illness and wants to record it literally for anyone encountering it. His personal connection suggests Thucydides’ work in infectious disease records was heavily influenced by the sophistic and medical writers of his time because this was, according to Thomas, out of character for him as well as parallel to other medical authors’ approaches (Thomas, 2012; 101). This passage is also unique compared to typical sophistic work because he includes the idea that he is providing this information to help those who may investigate it. This is very similar to the intention of Hippocrates’ proto-medical text, where he lists information for ἡτρικὴν ὅστις βούλεται ὀρθῶς ζητεῖν (“Whoever wishes to seek medicine properly” Hp. *Aer.* 1). Throughout his work, Hippocrates intends for the information to be combined for practical application and Thucydides is utilizing the same strategy, though his perspective is different than an educated medical scholar. As a historian, it is significant that Thucydides relied on the styles of medical scholars to describe disease because it indicates

parallel evolution in various literary styles. Proto-medical literature was developing into its own literary form first by growing out of a religious base, borrowing from investigative styles to demonstrate the practicality of prognosis, and, finally, by influencing the medical narratives of other authors like Thucydides.

Sophistic writing was the medical version of investigative literature dominating the late 5th century. The central scope of this method was answering a perceptible hypothesis with evidence, excluding the use of the pantheon as the default explanation. Hippocrates used this framework to initiate his work both in his overall presentation of diseases and his grammatical organization. He then used that foundation to elevate his works for practical application. The combination of strict sophism and proto-medical work is seen impacting Thucydides' account of the plague as well, even changing his characteristic writing guidelines when shifting to this topic. As the field of infectious disease medicine was expanding and changing around cultural trends, the core cultural trend of religious practice continued to affect these representations as well, impeding the swift evolution from divine resolve to a completely logical analysis of infectious diseases in the ancient world. In conclusion, it was the combination of all these dynamics that formed what we now know as the first manuals for medical practice.

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