東邦大学学術リポジトリ
Toho University Academic Repository

The Root of the Problem: Learning Medical Terminology

Alan Hauk

Abstract

This paper discusses the difficulty of learning medical terminology because of its heavy use of Greek and Latin terms, and introduces a standard method for learning those terms. This method consists of learning the Greek and Latin word parts, the roots, suffixes, and prefixes, which are used to construct many medical terms. How these word parts fit with each other, their functions, and their rules of use are discussed, along with examples of common suffixes and prefixes used in medical vocabulary. The paper concludes that even though many medical terms cannot be understood by looking at their word parts alone, knowing the meanings of these parts can still help the learner remember medical terms by giving them more familiarity and meaning.

1. Introduction

All scientific or technical fields have their own arcane terminology that is understood only by those who study them. Linguistics, for instance, has many terms that are unknown to the average person, terms such as "diachronic analysis," which refers to the study of how words change over time. Learning specialized terminology can be a challenge for anyone coming into an area of study because the new vocabulary can number in the hundreds of words. This problem is greatly amplified in medicine, however, due to the sheer number of specialized terms that must be learned and to the complexity and unfamiliarity of these words.

Medical vocabulary is defined as "all of the specialized vocabulary that medical professionals use to identify human anatomy (structures) and physiology (functions), as well as words that indicate location, direction, planes of the body, medical status, and instructions for administering medication" (Hull 5). It amounts to thousands of terms, and many of them are derived from ancient Greek and Latin and have little connection to modern English. While it is possible to learn medical vocabulary just from memorizing words as they come up in medical texts, this method is unproductive as the same words must be relearned many times to make them stick in memory. To address this problem, more than a few textbooks have been written solely devoted to medical vocabulary. The difficulty of learning these terms can be guessed at by looking at how thick and heavy these texts are, with several being over 500 pages long and a few close to 1,000 pages.

Fortunately for the medical student (or the English teacher teaching medical students), most medical terms use a logical structure of word parts due to their Greek and Latin origins. These Greek and Latin word elements consist of word roots, suffixes, and prefixes, all with their own meanings, that are combined to form words. The number of individual word elements is quite large, but not nearly as large as the number of medical terms. However, just learning the word parts alone does not guarantee that the student will understand a new word because some medical terms can be vague as to their exact meaning just from their word elements alone. Thus, they still need to be learned in context to be understood. Even with this caveat, however, the task of learning medical vocabulary can be made much easier if the meanings of the various word elements are learned first because that gives the learner a mental hook to hang new medical terms on as they are encountered during study.

2. Medical Terminology Structure

The standard method for learning medical vocabulary that is recommended in most medical vocabulary textbooks is to break the words up into their component parts, understand what the parts mean, and recognize how they are put together to create new words. This is because while it is a huge task to learn all medical terms individually, it is relatively easier to learn the individual elements that make up these terms and then use the knowledge of those elements to understand and remember the meanings of new words as they come up.

Most medical terms are constructed using two or more of the three basic word elements: roots, suffixes, and prefixes. Not all medical words use all three of the word elements, and many medical words just have two (Davies 2). For example, the word "meningitis" is constructed using two word parts: the word root "mening," which means "meninges," the membrane covering the brain and spinal cord, and the suffix "-itis," which means "inflammation," thus giving the meaning of "inflammation of the membrane covering the brain and spinal cord." Breaking the word up into its component parts looks like this:

Word part:	root	suffix
Term:	mening	-itis
Meaning:	meninges	inflammation of

This way of examining words works not just for medical vocabulary but also for any words that come down from Greek and Latin. The word "diachronic" mentioned at the beginning of this paper, while not a medical term, can be examined the same way:

Word part:	prefix	root	suffix
Term:	dia-	chron	-ic
Meaning:	through	time	pertaining to (adjective)

Thus, this word element analysis gives us the meaning of "pertaining to (changes) through time."

Most textbooks on medical vocabulary give similar advice on what to do when encountering new words for the first time. The general rule is to establish the meaning of the suffix first and the root last. Then the meaning of the whole word can be determined by putting the elements together (Chabner 4, Davies 2, Jones 39). This may seem like a (literally) backwards way of examining a word, but there is a good reason for it. The suffix tells what is happening in the word, while the root tells where it is happening (Jones 9). For example, the word "colitis" means that there is inflammation, and that it is happening in the colon. The inflammation is the essential information of the word because it is what is happening to the patient.

Three basic patterns are used to form words from word elements. These are:

    root   + suffix
    prefix   + root   + suffix
    root   + root   + suffix

                                                                   (Jones 8)

For a word that includes a prefix, the rule for understanding the word is to examine the suffix first, then the prefix, and then the root. For example, look at the word "hyperthyroidism:"

Word part:	prefix	root	suffix
Term:	hyper-	thyroid	-ism
Meaning:	excessive	thyroid	condition

The suffix "-ism" means that it is a medical condition, the prefix "hyper-" means that there is an excessive or above normal amount, and the root "thyroid" means that it is in the thyroid gland, giving us the final definition of "condition of excessive activity of the thyroid gland." Notice that the order in which the word elements are analyzed, suffix, prefix, and root, is the same order that is naturally used when defining the meaning of the word in English.

If the medical term has several root elements for body parts, then they are usually written in the same order that they are studied or used (Jones 9). For example, the term for the study of the stomach (gastr) and intestines (enter) is gastroenterology and not enterogastrology because food going through the digestive system goes into the stomach first (Chabner 5). Thus, the order of roots in the word also follows a logical pattern.

3. Word Roots and Combining Forms

The most important and numerous word element in medical terminology is the root, which is also sometimes called the word stem.   Word roots give the basic meaning of the word and usually stand for a body part or an action (Hull 7).   With a few exceptions, all medical terms are built using at least one root element (Jones 3).   The meaning of the root can be modified by adding prefixes or suffixes.   Roots can usually be identified because they are nouns and are found in the middle of the word.   Also, they are the only word element that can also function as separate words.   Insulin and thyroid are examples of roots that are also words.   Some roots, called master roots, cannot be used as words on their own but can only function as the basic building blocks of other words (Hull 6–7).   "Derm" (skin) and "enter" (intestines) are examples of master roots.   They need at least a suffix to have useful meaning.

It often happens when combining a root with a suffix or another root that the two parts cannot be pronounced smoothly together because many medical roots end with a consonant and many medical suffixes begin with a consonant.   In these cases, a combining vowel, usually "o" but sometimes "i," is added to the root to make the pronunciation easier.   A word root plus a combining vowel together are referred to as a combining form.   For example, the word "nephrology," the study of the kidneys and kidney diseases, needs an "o" after the root "nephr" to make pronunciation flow better. It is written out like this:

Word part:	combining form	suffix
Term:	nephr/o	-logy
Meaning:	kidney	study of

It would be much more difficult to pronounce this word if it were spelled as "nephrlogy," without the "o."   The combining vowel "o" does not add any meaning to the word; its purpose is simply to make the word elements join together and be pronounced more easily (Gylys 5).   Because the combining form is so common, most roots are written in their combining form with the root and vowel separated with a slash (Davies 5).   Thus, the root for kidney is generally written as "nephr/o."

Whether or not a word root needs to use a combining vowel depends on what comes after the root.   If the element after the root is a suffix, the combining form is only needed if the suffix begins with a consonant.   If the suffix after the root begins with a vowel, the combining form is not needed (Jones 6).   For example, if the root "nephr" is combined with the suffix "-itis," the word is "nephritis," and the combining form is not needed.

Sometimes, two word roots are used together to form a medical term, and, in this

case, the first root always uses its combining form whether the second root begins with a vowel or not (Gylys 10). For example, look at the word for a record of electrical activity in the brain, "electroencephalogram:"

Word part:	combining form	combining form	suffix
Term:	electr/o	encephal/o	-gram
Meaning:	electricity	brain	image

Even though the second root "encephalo" begins with a vowel, the use of the combining form makes the word much easier to pronounce than if the "o" had been left out.

4. Suffixes

While the word root comes at the beginning or in the middle of the word, the suffix comes at the end of the word and modifies the meaning of the word. Suffixes when written on their own are usually spelled with a hyphen (-) at the beginning to indicate that they must be connected to a root to have any meaning. As a general rule, all medical words end in a suffix unless the word is just a root that is also a complete word (Jones 5).

Suffixes are used to indicate what is happening to the root of the word. Suffixes make the word either a noun or an adjective. The suffixes "-ac, -iac, -al, -ar, -ary, -eal, -genic, -ic, -ical, -ose, -ous," and "-tic" all have the meaning of "pertaining to," which changes the root to the adjective form. Thus, the root "cerebell/o" can be a noun by adding the suffix "-um," meaning "structure," to form the word "cerebellum," the lower back part of the brain, or it can be changed to an adjective by adding "-ar" to form the word "cerebellar" meaning "pertaining to the cerebellum." In their noun forms, suffixes can be used to signify a medical condition, disease, or medical procedure (what is happening to the body), or can be used to indicate medical specialties and specialists (Jones 39).

Because there are not nearly as many suffixes as roots, it is easier to remember the more commonly used ones. A list of the categories of suffixes with some common examples of each is as follows:

Suffixes for surgical procedures:

suffix	meaning
-centesis	surgical puncture to remove fluid
-ectomy	surgical removal
-lysis	breakdown or destruction
-pexy	fixation

-plasty	surgical repair
-stomy	opening to form a mouth
-rrahpy	suture
-tomy	incision or cutting
-tripsy	crushing

(Gylys 17-18)

Suffixes for medical conditions:

suffix	meaning
-algia,	pain
-cele	hernia
-dysnia	pain
-ectasis	dilation
-edema	swelling
-emia	condition of blood
-emesis	vomiting
-iasis	abnormal condition
-itis	inflammation
-lith	stone
-malacia	softening
-megaly	enlargement
-oma	tumor
-osis	abnormal condition
-pathy	disease
-penia	insufficiency
-plegia	paralysis
-oma	tumor
-rrhage	bursting
-rrhea	discharge, flow
-stenosis	narrowing
-trophy	nourishment, development

(Gylys 19-21)

Suffixes for diagnostic procedures:

suffix	meaning
-metry	measuring
-scopy	visual examination
-graphy	recording

(Gylys 18-19)

Suffixes for medical specialties and specialists:

suffix	meaning
-ician	related to a field of study

-iatrics	relating to medical treatment
-iatry	medical profession
-ian	specialist in a field
-ist	practitioner
-logist	one who specializes in the treatment of
-logy	the study of

(Jones 43)

Since these suffixes are used over and over again in many different medical terms, it is very useful to memorize the most common ones. Learning just a few dozen suffixes can cover many medical terms.

5. Prefixes

Prefixes are the word elements that attach to the beginning of words, before the word root. While all medical words use roots and suffixes, not all medical terms use prefixes (Jones 7). Their purpose is to change the meaning of the medical term by reporting what is happening to the word. Prefixes are usually used to describe the size, shape, color, or status of whatever is being described. While prefixes have meaning on their own, they cannot be used as separate words (Hull 11). They are usually written with a hyphen at the end to show that they are not complete words. Because prefixes can often change the meaning of the root word drastically, it is vitally important to use them accurately (Hull 13). For example, the prefixes "a-" and "an-" change the meaning of the root to "not" or the opposite of whatever it was before, so that, for example, "symptomatic" becomes "asymptomatic." These prefixes that change words to an opposite meaning are fairly common. Here are some examples of other ways that prefixes can change words:

To show size

prefix	meaning
micro-	small
macro-	large

To show quantity

prefix	meaning
hemi-	half
semi-	half
poly-	many

To show direction or location

ec-	outside

ex-   outside
intra-   within

To show time
  ante-   before (in time)
  post-   after (in time)

To show relationship
  a-/an-   no, not
  anti-   against
  syn-   with

To show characteristics
  hyper-   excessive
  hypo-   decreased

                                                            (Hull 12)

To show numbers
  uni-   one
  bi-   two

                                                            (Hull 53)

To show color
  alb-   white
  leuk/o   white
  rubr-   red
  erythr/o-   red

                                                            (Jones 24 5)

   Prefixes for color represent an unusual case because some of them are true prefixes while others are combining forms (roots) that are used as if they were prefixes (Jones 24). For example, the prefix for white is "alb-" as in the term "albinism," while the root combining form for white is "leuk/o," as in "leukocyte," the medical term for white blood cells. Even though leuk/o is a root, it is used like a prefix. As a result, many medical vocabulary textbooks put the root elements for color in the prefix section (Hull 11, 52, Jones 24). To make color prefixes even more interesting, as in the above example, both Latin and Greek color prefixes are used in medicine. "Alb-" comes from Latin while "leuk/o" comes from Greek. This use of both Greek and Latin words for the same thing can also be found in some roots such as the Latin "thorac/o" and the Greek "steth/o," both of which refer to the area of the upper chest.
   Identifying the correct meanings of prefixes requires great care because some pre-

fixes have very similar spellings or pronunciations to their opposite counterparts. "Hyper-" and "hypo-" look and sound almost the same, but their meanings are opposite, being "excessive" and "decreased" respectively. Likewise, "inter-" (between) and "intra-" (within) are often confused because they sound so much alike. Some examples of similar but different prefix pairs are:

Prefix	Meaning
hyper-	Above, excessive
hypo-	Below normal
ab-	Away from
ad-	Towards
sub-	Below
supra-	Above

Even native speakers have trouble with the meanings of some of these prefixes, especially "intra-" and "inter-," and will sometimes use them incorrectly.

A final interesting point about prefixes is that, unlike medical suffixes, which are often confusing to ordinary English-speakers, most prefixes used in medicine are also used in ordinary English and so in that sense are easier for native speakers to learn than the other word parts.

6. How to Study Medical Vocabulary

Further rules for learning medical vocabulary by studying word parts were laid out by Davi-Ellen Chabner in her book *The Language of Medicine*. These general rules are to: 1) break down words into their word elements 2) connect the words to the part of the body or the function they are describing, and 3) be careful of the word's pronunciation and spelling (2). The second point is especially important because some words are not clear without the context they are found in.

Some medical terms are easy to understand by looking at their word parts, but a lot of terms are ambiguous as to their real meaning even when of all the elements are known. For example, the word "atelectasis" when broken down looks like this:

Word part:	prefix	root	suffix
Term:	a-	tel	-ectasis
Meaning:	not	complete	dilation

Thus, the final meaning is "incomplete dilation," but without the context we do not know where this incomplete dilation is taking place. However, if we understand that we will encounter this word when reading texts about the lungs, we can realize that it stands for incomplete dilation of the lung or collapsed lung. Another example is the

word "anemia," which means literally "no blood" from its word parts alone. In usage, anemia does not mean that there is no blood but that the number of red blood cells or the amount of hemoglobin in the blood has been diminished (Chabner 84). As an interesting side note, "anemia" is one of several medical words that break the normal construction rule and is made up of a prefix and a suffix without a root (Jones 8).

7. Plural Forms

Another aspect that can make learning medical terms difficult is that they do not follow the simple English grammar rule of adding "s" or "es" to the ends of words to make them plural but instead use Latin plural forms. This can be confusing both for native and non-native speakers of English alike. The spelling of the plural suffix depends on the ending of its singular noun form. For example, the word "alveolus" meaning an air sac in the lungs looks like this when broken down:

Word part:	root	suffix
Term:	alveol	-us
Meaning:	air sac	structure (singular form)

To make the plural noun, the "-us" is replaced with "-i" to become "alveoli."

Word part:	root	suffix
Term:	alveol	-i
Meaning:	air sac	plural form

Other examples of singular to plural forms are:

singular	plural	plural example
-a	-ae	vertabrae
-is	-es	diagnoses
-ix	-ices	varices
-on	-a	ganglia
-um	-a	bacteria

(Chabner 975)

With some exposure and practice, however, these plural forms can be memorized fairly quickly.

8. Conclusion

Medical vocabulary is almost a separate field of study on its own. The heavy use of Latin and Greek words in medicine means that even native speakers of English have some difficulty learning these terms. While learning medical terminology is difficult, this

difficulty can be reduced somewhat by recognizing and understanding its rules. The linguistic construction of medical terms follows fairly consistent patterns, and learning these patterns will make the logic and structure of the words clear. While it might be tempting to just learn words as they appear in context, learning the basic roots, suffixes, and prefixes will help the learner remember words that use those elements when they are encountered because the learner will recognize what the elements of the new word mean even before learning the word's official definition. Even when the meaning of a medical term cannot be determined by looking at the word parts alone, knowledge of these elements will still help the learner remember the words more easily by giving the learner mental hooks to which to attach the definition of the word.

Works Cited

Chabner, Davi-Ellen. *The Language of Medicine, ninth edition*. Saint Louis: Saunders Elsevier, 2011.

Davies, Juanita J. *Illustrated Guide to Medical Terminology Second Edition*. Boston: Cengage, 2007.

Gylys, Barbara A. and Regina M. Masters. *Medical Terminology Simplified, Fourth Edition*. Philadelphia: F.A. Davis Company, 2010.

Hull, Melodie. *Medical Language: Terminology in Context*, Philadephia: F.A. Davis Company, 2013.

Jones, Betty Davis. *Comprehensive Medical Terminology, Third Edition*. Dallas: Thomson, 2008.