PRAXIS®
Electronic Medical Records

THE THEORY OF PRAXIS
Concept Processing White Paper

April 29, 2015

PLEASE REVIEW THE PRAXIS DEMO BEFORE READING THIS DOCUMENT

www.praxisemr.com/demo

The following White Paper explains the theory of the PRAXIS Concept Processor and its unique approach to charting and practicing medicine. This is a must read for new users, and it is also an excellent review for those who wish to learn about our unique approach to electronic medical records.

If you have not seen our Praxis demo, please do so prior to reading this paper.

www.praxisemr.com/demo

This paper is dedicated to our wonderful clients, the men and women in healthcare who are the true protagonists of this story. Even if we were much smarter, we could not have dreamt of this breakthrough technology without your constant guidance. This is most definitely your work as well as ours. You have been our eyes and ears for the Concept Processor and Praxis, and we are your grateful students.

We would also like to thank Jerry Karabelas, PhD and the wonderful folks at GlaxoSmithKline Corporation, who underwrote the initial development back in the early 90s. Jerry shared the vision that kick-started this wonderful solution. We also want to thank William Stuppy MD, who was the only investor this project ever had.

Richard M. Low MD

Founder and CEO

Praxis Electronic Medical Records

Doctor Low received his BS degree from UCLA in Independent Studies (Molecular Biology and History) and graduated from Yale Medical School. He did an internship in surgery at the Los Angeles USC Medical Center, and practiced emergency medicine, directing three independent emergency departments in Northern California. Later, he completed a residency in Internal Medicine at UCLA-VA Program and became board certified. Doctor Low then established a successful Locum Tenens Medical Group in California, visiting dozens of different clinics of colleagues who were either sick on or vacation. It was in these two roles—Emergency Medicine and Locums in Primary Care—that Doctor Low became most sensitive to the importance of effective medical documentation, as he reviewed the medical records of his many diverse client physicians. At the same time, Doctor Low continued graduate studies in philosophy at the University of California Santa Cruz (History of Consciousness Program, with Professor Hayden White).In 1989, Doctor Low became interested in computers, and established Infor*Med Medical Information Systems Inc. in California, developing the first version of Praxis EMR in 1992 with an initial funding from SmithKline Beecham Pharmaceuticals. Today, Infor*Med (Praxis) is the oldest ongoing EMR company in the country. Doctor Low's passion is to assist his colleagues via this revolutionary medical information technology. He spends hundreds of hours a year learning from his many client physicians who are, as he puts it, "my eyes and ears into the software".

Usus efficacissimus rerum omnium magister. -[Habit: Ever the most effective teacher] Plinio

Insanity: doing the same thing over and over and expecting different results. –Albert Einstein

Praxis: The process of putting theoretical knowledge into practice; an activity engaged in by free men, to which the end goal is action. –Aristotle.

Table of Contents

I - Introduction

Praxis Electronic Medical Records presents a solution that benefits providers in all specialties of medicine and allied health professions, except for Radiology and Dentistry.

The artificial intelligence inside the Concept Processor is unique in the world of EHR's. Praxis does three things not found in other Electronic Medical Records systems:

1. Instant charting - even faster than dictation

2. Accurate medical writing - more accurate than longhand

3. Improved medical quality - reducing clinical errors and human stress

The Concept Processor within Praxis shakes the basic tenet of medical charting: A provider using the Concept Processor in Praxis does not start charting from the history, continue with the medical exam, and then come to a diagnosis. Medicine in Praxis is charted backwards. At first it seems improbable that charting could start from any other area than the history, and less probable that this could produce accurate reports or enable the practice of good medicine with ease. Yet, this is exactly what the Praxis Concept Processor does, and it does it dramatically faster than any other EMR, especially template-based ones.

For those of you who are not medical providers, but are interested in public health or quality of care, you will find that the Concept Processor generates medical data that may be used for clinical studies and for effective transmission of evidence-based medicine. Most importantly, it does this accurately without generating information overload or extending encounter times.

These are all areas where template-based EMRs fall short. As we demonstrate in this paper, the reason for the failure of most EHRs has nothing to do with how they are constructed or with errors of "usability"—the latest buzzword used to explain EMR dissatisfaction—but rather with the templates themselves. We will show why templates are incompatible with the practice of medicine, no matter how much or how hard they are improved.

Understanding concept processing technology requires some knowledge of medicine and a bit of concentration. At first glance, it appears that the Concept Processor is simply "charting by exception," or is made of "templates that save." As we will show in this paper, Praxis could not be further from those failed approaches. You will see how, unlike templates that get in the way of your charting, the Concept Processor resolves the problem by using the computer to help you write at the speed of your mind.

This white paper is meant for three types of readers:

- First-time Praxis users uncertain on how to use this technology (it provides you with the "big picture" view)
- Healthcare professionals reviewing different Electronic Medical Record solutions for a practice
- Professionals in Public Health, Education, Government, and Health IT looking to resolve the problems caused by EMRs in Healthcare

If you are experienced in the practice of medicine in any specialty or subspecialty, you will have no problem following the ideas presented here. On the other hand, if you are in Health IT, a bit of open-mindedness may be needed at first, as some of the concepts we discuss may run counter to what you have learned. As you continue reading the latter part of the paper, this unique approach to charting will make logical sense.

We often use the word "you" to address providers, so as to make these concepts easier to understand. If you are not a provider, know that we do not mean to exclude you.

This document is not a substitute for reading the Praxis manuals and going through your formal training. It is, however, an excellent start for this training, as you will get the high-level overview that will help you better distinguish the forest from the trees. You may ask for specific help on the hands-on use of any feature you read about here. As you begin to use Praxis, you will find that many features may appear strange and quite different than those of any other EHR. Some may even appear counterintuitive. Here you get the broad picture so you may reach your *Eureka moment*—your *Ahh!* moment—sooner. As you gain an understanding of this technology, we hope you will assist us in continuing to improve it so that Praxis becomes more useful for you and your colleagues in the future. That's how Praxis has evolved over the decades. Our clients' brilliant ideas have directed this unique paradigm, and paved the way for us to create this unique technology.

The first part of this paper covers the basic functioning of the Concept Processor and its unique approach to charting. In the second part we review the serious issue of information overload and how the Concept Processor reverses its engine to receive disparate data and give it meaning, stopping information overload and personal stress. In the third part we show you how the concept processing technology goes way beyond the charting and filtering of incoming data. You will see that it performs many other critical tasks on your behalf, only faster and more effectively than you could do them yourself, and with fewer mistakes. The computer becomes your smart assistant in the practice of medicine instead of getting in the way. We know you will enjoy the whole process of learning and using Praxis.

Finally, the fourth and last section is meant for those in the Health IT industry who don't think like physicians and who do not share our charting experience, and for providers who may wish to get more background information on the whys of the insanity in which we seem to be immersed. Please understand that people in the Health IT industry may not understand things we doctors may not articulate because we take many of them for

granted. How we think of medicine is one of them. In this last section, we discuss the frequent doubts and objections raised by non-providers when learning about this unique technology for the first time. So if you still have questions after reading the first four sections, then this last section will probably address them.

Please understand that this is NOT about changing the way you practice medicine as a provider. The way you practice medicine, handle disease, and see your patients remains exactly the same as it has always been. What changes is the speed and quality of your charting process, which enables you to dramatically improve your practice and ease the pain. As you will see, Praxis works on free text so you can really write whatever you wish, except it will help you do so dramatically faster and better than you ever imagined.

The Concept Processor is not a Theory

What will show in this paper is not a theory; it is a practical technology developed over 25 years, and it is being used today in hundreds of clinics, with excellent results. As the world, particularly the government, places an ever greater burden on providers to interact "meaningfully," templates are just getting in the way and turning these requirements into a veritable nightmare for providers, and will undoubtedly get worse; whereas the Concept Processor is progressively getting better.

We will show that the Concept Processor is far different than silly templates that save cases or "chart by exception." This is a medical tool that will assist you in completing your cases faster and better, and thus help you practice better medicine with greater ease. True, you are charting backwards, and this approach takes some getting used to at first. However, you make up for it with enormous savings in time, quality of writing, and the improved medicine you practice, as well as reduction in emotional stress and increased revenues. The Concept Processor will help you breeze through all the new requirements from Meaningful Use by remembering how the complexity was handled in the past, and by use of the Knowledge Exchanger, Dynamic Fields, and Clinical Parameters required in your area of work, and via the Practice Advisories.

Most of the features that you will read here were discovered thanks to our wonderful clients, who have been using this unique technology in their clinical practices for years. They have been our eyes and ears into the software and have taught us the limitations and the solutions to the problems they have encountered. We never could have been that smart. The joint collaboration with brilliant medical clients is how this system has been developed into what it is today.

In short, it is my pleasure as a medical doctor, founder, and CEO of Praxis EMR to present an alternative solution to the generation and use of Electronic Medical Records, one that will hopefully turn your current documentation woes into a pleasurable experience. If this happens, our work has been more than worthwhile!

EMR/EHR?

Notice that in this white paper we purposely use the old "EMR" (Electronic Medical Records) term rather than the more recent "EHR" (Electronic Healthcare Record) terminology. Praxis is technically a full Electronic Healthcare Record (EHR) as defined and certified by the Office of the National Coordinator of Health Information Technology (ONC), but we will use the term EMR throughout.

The new EHR term arose around 10 years ago for marketing reasons, when the new vendors tried to dislodge established EMR companies from the major search engines by creating this new category. The argument was made then that the Electronic Healthcare Record is somehow more complete than the older Electronic Medical Record because the EHR serves not only the medical professionals who use it daily, but also all the other "stakeholders", i.e., patients, third parties, and government agencies.

We respectfully disagree with that argument. We firmly believe that a computer software program cannot be all things to all people. We believe that the purpose of an EMR is to assist its users—the medical providers and their hardworking staff—to practice better and easier medicine. The EMR is fundamentally a clinical tool for clinicians and their team. However, there should be no problem with this more focused approach. The many other stakeholders of the healthcare community may use their own technology meant to assist them with their unique needs. Insurance companies certainly have powerful programs they use daily, and so do hospitals. The government and patients are being barraged with ever new applications. The beauty of computers is that they allow all applications to readily interface with each other to obtain what each stakeholder needs. Therefore, an EMR company must be quite clear about who it serves, and at Praxis, we serve the healthcare providers and their staff. So even though Praxis is technically considered a full EHR, we will use the more modest term "EMR" because we are focused on the critical segment of the healthcare universe directly responsible for taking care of patients.

Our whole argument in this paper is that if the software does not empower providers and their assistants, then all else is for naught. Since Praxis EMR chooses to focus on the practitioner, it allows you to do things that EHRs who want to please everyone (but aren't focused on the physicians and their staff) could never achieve.

II - How does the Concept Processor Work?

Three fascinating aspects to charting:

- We as physicians chart based on instant personal concepts or sudden Gestalt patterns which then our subconscious mind "translates" into written text or speech on a dictation microphone. The first part of our mental process—that of making a diagnosis and deciding on a course of action—is uniquely personal and often happens instantly. It may often take you less than a second to figure out what your patient has and what to do. Then comes the second part of your mental process: the translation of all these immediate thoughts into litany—a semi-automatic sequence of phrases or expressions you generate in response to your own concepts. These are phrases, sentences, or even paragraphs that you have repeated hundreds if not thousands of times in the past when faced with similar situations. It is this second semi-automatic and semi-conscious process that is often riddled with omissions and errors. And it is precisely here that the Concept Processor blasts off like a Ferrari when putting your foot on the gas pedal. You are always in control of this mental vehicle, but you will go much faster than longhand writing. Charting is like practicing medicine; it is based on experience and habit. Most often these habits are helpful, but sometimes they are harmful, especially when the practice of medicine changes, but your habits can't keep up. After all, you're only human. You will see that the Concept Processor helps you instantly adapt to new changes, immediately adjusting your write ups as they happen.

- A computer can assist in the practice of medicine when we chart from intuition rather than from the theoretical "inductive reasoning" approach taught in medical schools but never really used. Not only does our charting get much faster then— approaching the speed of the mind—but it progressively becomes more effective as our documentation improves with every patient.

- Our cases do repeat themselves, some appearing much more frequently than others. Indeed, the practice of medicine would be impossible if it weren't for this repetition. Just ask any third-year medical student attempting to read the Harrison's Textbook of Internal Medicine cover-to-cover while seeing patients for the first time. History reveals that when cases become too frequent in a specific area of medicine, a new medical specialty emerges to deal with its subtleties.

If you can get these three concepts down, the rest of the technology will make perfect sense, and learning it will be straightforward. This sounds easy to do, but as you will see, it goes against what we learned in medical school. To change our approach, you need to focus on what you really do every day and how you really do it. This takes a conceptual leap.

At a superficial level, the Concept Processor is an artificial intelligence engine that instantly retrieves the text from the closest encounter to the case you are currently evaluating. It displays the previous text for re-use, preventing the need to re-chart from

scratch. Changes made in your current encounter will be learned for the future. Thus, the more you use the program, the fewer changes required, and the faster you will chart.

Practicing medicine is an art, which means it's personal: no two providers chart or practice medicine the same way. Over the years, you have developed a unique approach to the way you practice your art, from how you treat your patients to the way you regard disease. However, no matter what type of practice you have, what specialty, what environment, or what part of the world you live in, a bell-shaped frequency distribution curve of cases appears as represented by the following diagram:
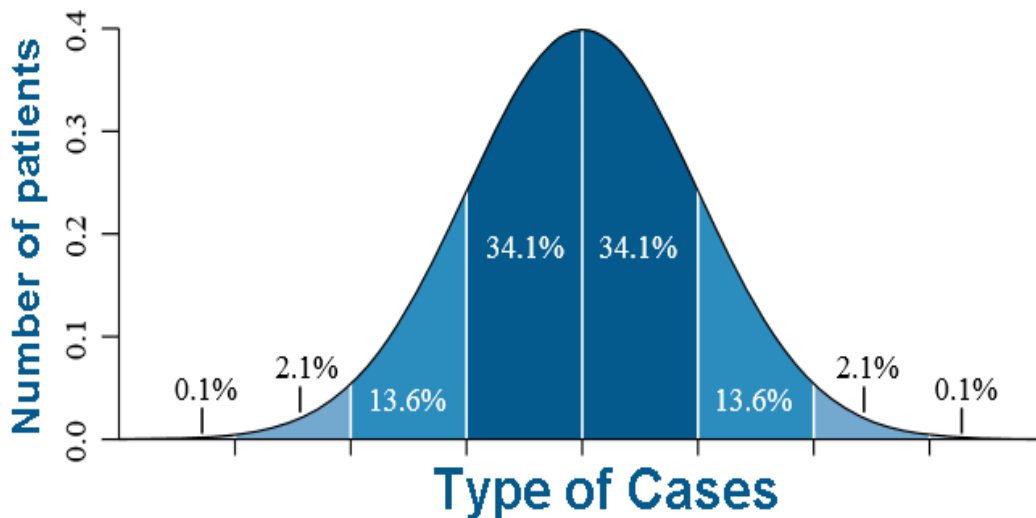
Figure 1.   Bell-Shaped Curve representing case presentation frequency. Some cases you may see are quite rare, whereas others are more common.

Some cases come up so rarely that you might never see them in a lifetime. Others are so frequent that they arise several times a day.

You chart but you also write prescriptions, generate orders of all sorts, give instructions to your patients, enter notes, excuses, authorization requests, admit orders, letters to referring providers, procedure reports, reminders... The list seems endless. Each of these documentations is linked to the progress note that you are generating. Yet each follows a separate and distinct bell-shaped curve of its own. For example, you prescribe some medications more frequently than others, and the same can be said for your laboratory orders, your instructions to patients, your procedures, your admitting orders, even your related routing slips for the encounter. Each one of those sections has a bell-shaped curve of its own, and it is independent from the bell-curve of the entire case. Yes, cases in medicine repeat themselves, and this makes medicine manageable, given its enormous complexity. You often learn by experience, by having handled similar cases in the past, and your experience is what makes you ever more competent. This repetitive

nature of medicine explains why medical writing becomes so tedious and boring over time. If you have ever felt silly while charting a complex but repetitive longwinded note at 2 o'clock in the morning—one you have written many times before— and you wonder why it is that this insanity must be repeated over and over, something should have clicked inside your mind: Computers cannot do smart or creative things like we humans can, but they can certainly do automated, repetitive things (even if they are complex) better and faster than we can, and with no errors. They must be programmed to do so. Concept processing is that program.

Now let's examine the bell-shaped curve a bit more carefully.

Logical Possibilities of the Bell-Shaped Curve

If you are a provider, all cases you handle can be separated into three separate categories:

- An encounter identical to one you've done before.

- An encounter similar to a previous encounter but not identical to it (Most encounters at the center of the bell-shaped curve fall in this category by definition).

- An encounter that is very different from any you've done before: i.e., the "interesting cases" found at the extremes of the curve.

There are no other possibilities. Your encounter must fall within the curve. Let's analyze each category separately.

The Identical Encounter

Medical schools tell us there are no two identical cases in medicine because there are no two identical patients. But how many times have you found yourself charting exactly the same thing in exactly the same way using pen and paper? We are not talking computers here. We are referring to the way you have normally written longhand or dictated into a transcription microphone. Often, you have written exactly the same note in exactly the same way. We are not even claiming that you do this frequently; only that it has happened to you, and often more than once.

Identical charting happens because a medical note is truly a projection of your mind, and in a way, the text is found inside your mind before it is put onto paper. Therefore, you already have a pre-written mental framework for generating all your clinical writing, even before you see your patient. You use this textual script you have developed unconsciously over the years. We are sure you'll readily agree that you don't think of every letter you put on paper, but, you don't even think of every word! During your semi-automatic charting process, words simply emerge from your subconscious mind in

response to a conscious mental command triggered by your own concept. One might argue that you have always had a biological concept processor inside your mind. The charting process is therefore semi-conscious and semi-automatic. That is the strength of experience, but it is also its very weakness. One clear example of this is this collection of bloopers from medical transcriptionists shown below.

Figure 2. This website displays an example of funny bloopers made by automatic subconscious charting. Transcriptionists also have great fun with these gaffes: "An 84 year-old-judge was admitted with acute penal failure...", "while looking through the joint three loose ladies were removed...."!!!!

If the closest encounter you've seen in the past happens to be identical to the one you need at the moment, your documentation will appear instantly on the screen in your own words. The Concept Processor finds that closest note (in a way we will explain later), and then displays it using your own words and your own logic. But the Concept Processor does not stop at the progress note. It also generates all your prescriptions, procedures, orders, instructions, excuses, referrals, admitting orders, and the related routing slip—all together with the note. It's that simple!

Assessment	Acute Pharyngitis, allergic [462] (Starting date: 3 Years ago)[None] [Infobutton]
	Asthma, #2 cyanosis [493.02] (Starting date: 0 Days ago)[None] [Infobutton]
Level of Service	LoS with problems... [New Visit] [Specialty] Optimal 99205
Plan	
Rx.	Cepacol [2mg] [oral] [as needed for discomfort] #[40 (forty) tabs] Refill X [0] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: None)[None] [Infobutton]

Cepacol [2mg] [oral] [as needed for discomfort] #[40 (forty) tabs] Refill X [0] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: None)[None] [Infobutton]

Erythromycin [250mg] [oral] [1 Tablet bid] #[40 Tablets] Refill X [0] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: None)[None] [Infobutton]

Tylenol [325mg] [oral] [Sig Take 1 Q 4 hs. prn fever] #[1 Bottle] Refill X [0] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: None)[None] [Infobutton]

Lasix (Furosemide) [20 MG] [PO] [BID] #[60 tabs] Refill X [2] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: None)[None] [Infobutton]

Procardia [10 MG] [oral] [1 Capsule qd] #[30 Capsules] Refill X [0] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: None)[None] [Infobutton]

Prednisone tabs. [20 mg] [Oral Tablet] [-] #[12 Tablets] Refill X [0] [Substitution Allowed] - Send to Smart Pharmacy - (RxNorm: 206997)[None] [Infobutton]
    Take as follows:
    Day 1 - 6 tablets in am
    Day 2 - 3 tablets
    Day 3, day 4, day 5 only 1 tablet in am
    Then STOP

Figure 2.   Sending medications via e-prescribing is not the problem. The problem lies in knowing 1. what drugs to e-prescribe for this case, 2 what dosage to enter in each field and 3. setting up all these fields with all these numbers. The Concept Processor recalls all this based on your past usage. Once you find the closest encounter, the full note is instantly assembled. The medications are then instantly e-prescribed to this patient's pharmacy after you accept them, without micromanaging each one of the steps.

The Similar Encounter

The more common situation is that your current encounter may not be identical to a previous encounter you have experienced, but it comes quite close.
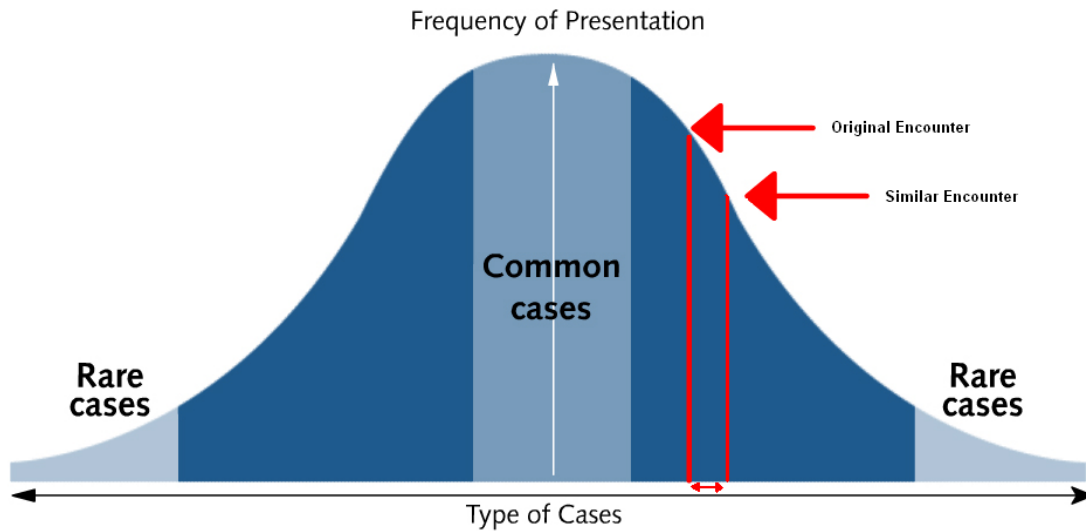
Figure 3.   The Similar Encounter. The difference between two closest encounters decreases the closer your current encounter comes to the center of the curve. This is because there are more similar cases to draw from the more frequent these cases are.

The area between the two red vertical lines in the above diagram represents the textual

differences between your closest previously charted note and your current encounter. How the Concept Processor finds your closest encounter every time and does so within a few seconds (We will show you how it does this. For now, please take our word that it can do so).

Your work is then limited to editing the text of this closest encounter by making the small but appropriate corrections to adapt it to the reality of your current patient. You may do this in a number of ways— edit the previous text by simply retyping or using voice recognition, or relying on the Concept Processor. Each note is made up of a combination of SOAP Elements (see "SOAP" on page 168), and each one of those SOAP elements has a bell-shaped curve of its own. The Concept Processor encapsulates units of thought at any level of abstraction and links them through a neural network to generate your final note.
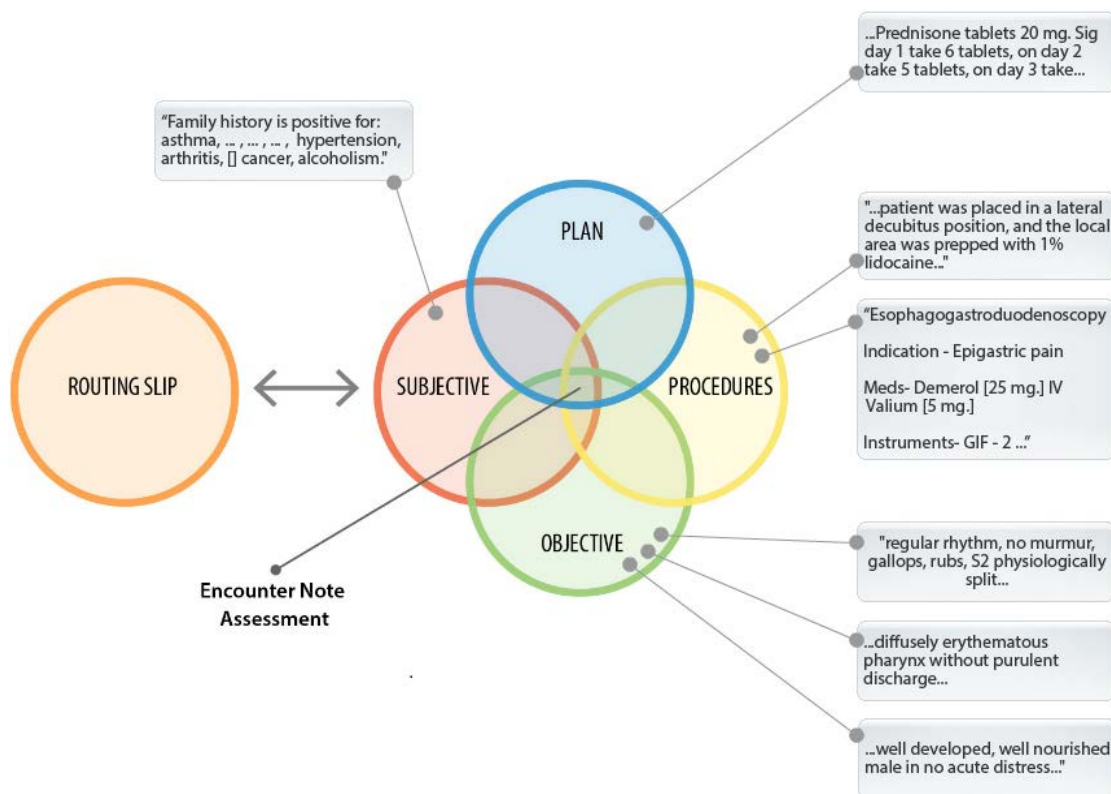
Figure 4.   *Venn Diagrams of the SOAP Note displaying units of thought within each SOAP Element.*

As humans, we are not conscious of every individual word we say, just like we don't think of every individual letter we write. We consciously think at a conceptual level, which then our subconscious mind turns into an automatic litany of words representing our concepts. It is those words that end up on paper or in dictation. So, if we have used a similar concept in the past, the Concept Processor will instantly retrieve its words and insert them for use in different cases by learning from our experience. Our encounter note

"intersects" at the level of the Assessment, a crucial concept we discuss a bit later.

You may quickly switch one SOAP Element for another while keeping the rest of the case unchanged. For example, you may select a prescription you've used before for a very different case. If you have used this drug in the past—even if the other case was quite different—you will still have it available for instant re-use at this time. The drug will come with the strength, dosage, and instructions that you most frequently use, but you can easily change any details on the fly. Of course, once you re-link the elements, the system learns the new pattern, and you won't need to repeat this again on future patients.

This means you don't need to type or use speech recognition every time or for everything. The same is true for laboratory orders, fever instructions, and descriptions of abnormal physical findings. Upon making any changes, you automatically generate new logical links through the concept processing neural network. These links are memorized for future re-use, and this means that the next time you will not have to re-write them. The Concept Processor recalls all the new linkages through its neural network, and makes it so the more you use it, the less editing you have to do either at the progress note level, or at its related documentation.

All changes to the closest possible encounter that you have just completed are saved, not just in the patient record, but also within your own independent knowledge base so you may then use this text again with your other patients. The Concept Processor is working on two databases at once: the patient record and your independent medical knowledge, which keeps getting richer with each new case you do.

The Concept Processor Keeps Learning

Now, if you see a case that falls between these two new closest encounters in the future, the editing for that case is reduced by half, then by a quarter for the next case, and then by an eighth for the case after that, until soon you will find yourself generating your entire text at the speed of your mind.

Frequency of Presentation

The editing of the next encounter falls off by half...

Type of Cases
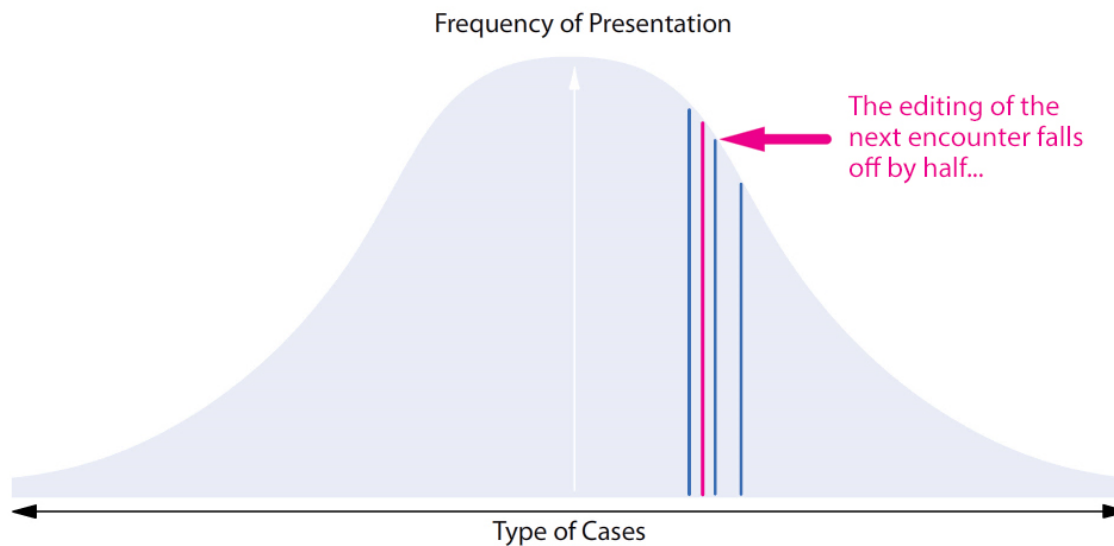
Fig. 5 If an encounter falls between two closest encounters, the text takes half as much time to edit as it did before, then by a quarter for the case between those two closest cases, and then by an eighth... The more cases you do, the less you have to write and the faster it generates the writing, as the Concept Processor learns how you express yourself.

As soon as your case is unraveled within your mind, its written counterpart appears almost exactly the way you wish to see it. You then make a few changes—if any—and you're done. The entire case and all its related documentation, including all the prescriptions you need and all your orders, are automatically generated on your behalf, with the medications ready to be e-prescribed or printed on your own prescription blank, without any further work on your part. You're seeing your next patient.

You will be writing at the speed that you read, and reading your own writing is much faster than reading someone else's and dramatically faster than speaking or writing longhand. This has to do with the way that we read text, something we describe in more detail on page 98.

Typing, of course, is usually much slower than writing longhand, unless you are a professional typist. As a result, your text generation will be many times faster than typing, but it is even faster than reading because your own chart recommends the diagnostic and therapeutic approaches learned from you before you realize you need them. All you do is agree with yourself and you're done!

Rare Cases

You would think that the Concept Processor would not work for rare cases. After all, there is no similar note to use as a reference.

Not so!

As we mentioned, not only is each encounter part of your bell-shaped curve, so is each individual SOAP Element. Therefore, editing a rare encounter may simply require reshuffling one or more SOAP Elements already existing in your knowledge base, used in different cases, and adding or changing a few lines of text. In other words, a "rare case" may simply be a rare combination of SOAP Elements, which in and of themselves are often not rare at all, and which you have probably used for other cases many times in the past.

This last point is critical, because it is what separates Praxis from the inflexible template systems.

Perhaps an element of your rare encounter might be quite different—the medical history for example— but then your objective findings, labs, medications, and procedures may not be that different from ones you have entered for more common cases. Often, your clinical history is similar to one you have done in the past for a similar but less rare condition. And of course, we are referring here specifically to the History of Present Illness, because the Review of Systems, Social History, and Surgical History litanies are available from previous visits.

The ability of concept processing software to work at the level of the individual SOAP Element makes typing less important. In terms of programming, your current note is simply a link of these disparate mental descriptors, or units of thought, that are joined together via an electronic neural network or artificial intelligence engine we have named "the Concept Processor." A word processor moves words around electronically. The Concept Processor works with your own concepts, encapsulating text representing your thoughts that you re-link to your other thoughts at any level of abstraction.

How does Praxis find your closest encounter every time?

How does Praxis know what is the closest possible text you need at the moment and then bring it instantly for review? After all, you do not treat every patient with a given diagnosis exactly the same way every time. A case may differ markedly from a similar one you've done in the past, even when the diagnoses are identical. That is why "templates that save" and "charting by exception" don't work. The Concept Processor finds, not just the same diagnosis, but the text of the closest encounter to the case in front of you, and it does so almost instantly.   How?

The logical relationship between different elements of your note can best be visualized using a simple Venn diagram, as displayed below.
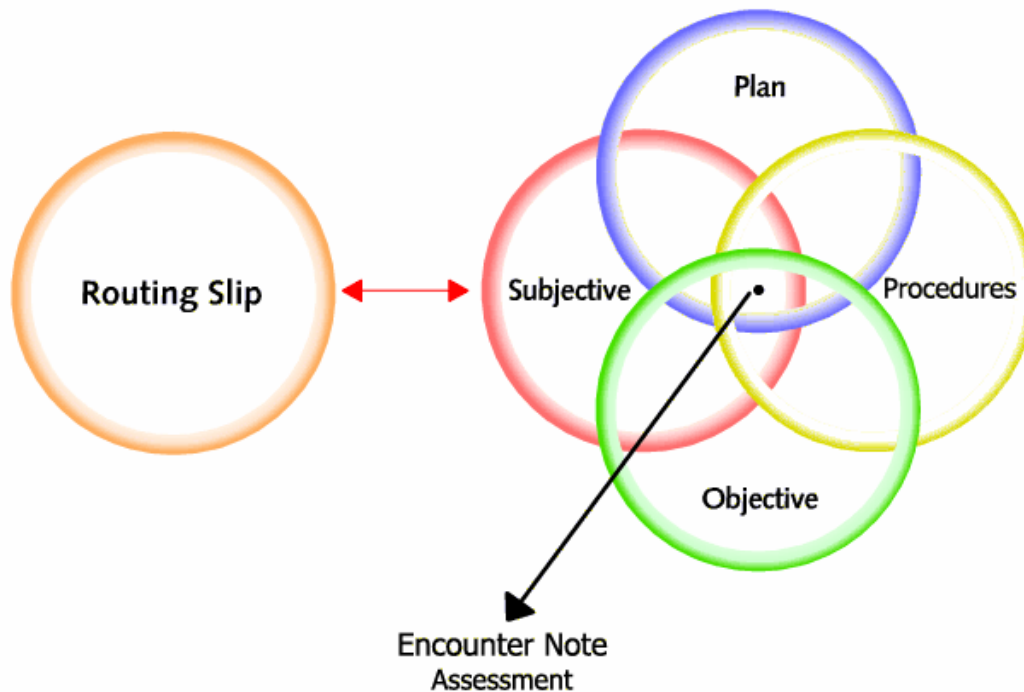
Figure 5. *This Venn Diagram is used to visualize the logic of starting a note. You can start your charting by selecting any part of any SOAP Element, and then the Concept Processor delivers the set all the related elements, starting from the point you selected.*

Let's consider the way we normally write up a case and analyze our own mental process. Here it is important to go back—not to the way you were taught to do it, but to the way you really do it in everyday life. The Concept Processor operates the way our subconscious mind does, only faster and more accurately. It is not necessary to be aware of that process, just as, in order to use a bicycle effectively, it is not necessary to understand the centrifugal force that keeps it rolling. At first this method may appear as though you are charting "bass ackwards" (as a wonderful client once put it), but as you will see, this unconventional approach makes a lot of sense.

Finding the "Index" or Closest Case

As mentioned, you may start this charting process within any part of any SOAP Element you wish. You should select something obviously different about the case if you can, such as a tell-tale finding, a specific laboratory order or result, an uncommon procedure, special orders to your staff, unique instructions to the patient, an unusual medical order, or whatever element comes to mind first. Finding something special in your case is not required, but it makes the subsequent search shorter.
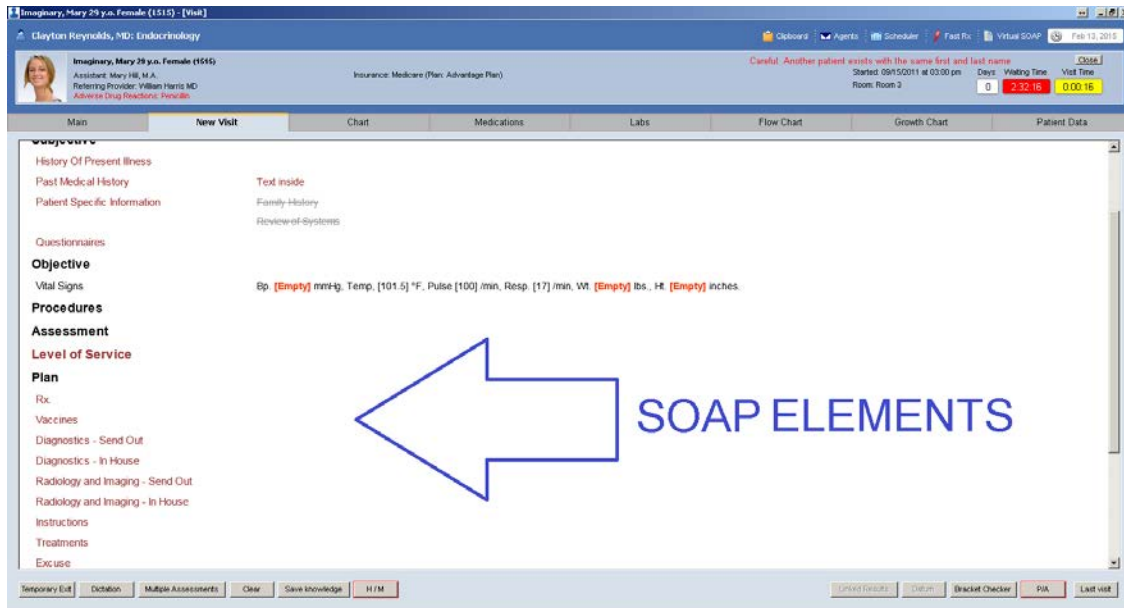
Figure 6.   SOAP (Subjective, Objective, Assessment Plan) elements on the left

As soon as you select any of the elements within the initially blank SOAP Note—by clicking on its label—the Concept Processor immediately breaks it down into its components, which are shown on a related window editor. For example, if you were to select "Plan," (by clicking on the word "Plan") you would immediately see its Plan Component Elements.
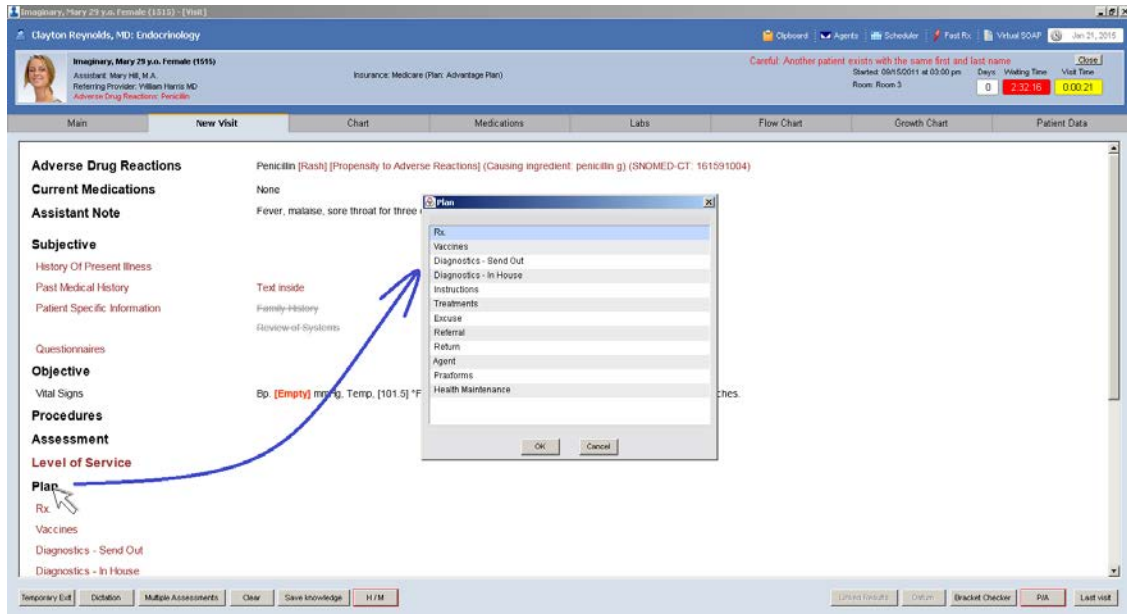
Figure 7.   Selecting "Plan" breaks it down into its Plan Component Elements. Every element of the SOAP note works in a similar way.

Then, if you select one of these components, the Concept Processor breaks it into smaller elements. For example, if you select Rx (Prescription), you immediately see **the list of drugs you have personally used in the past**, in order of frequency distribution, with the most frequently prescribed medication always at the top.
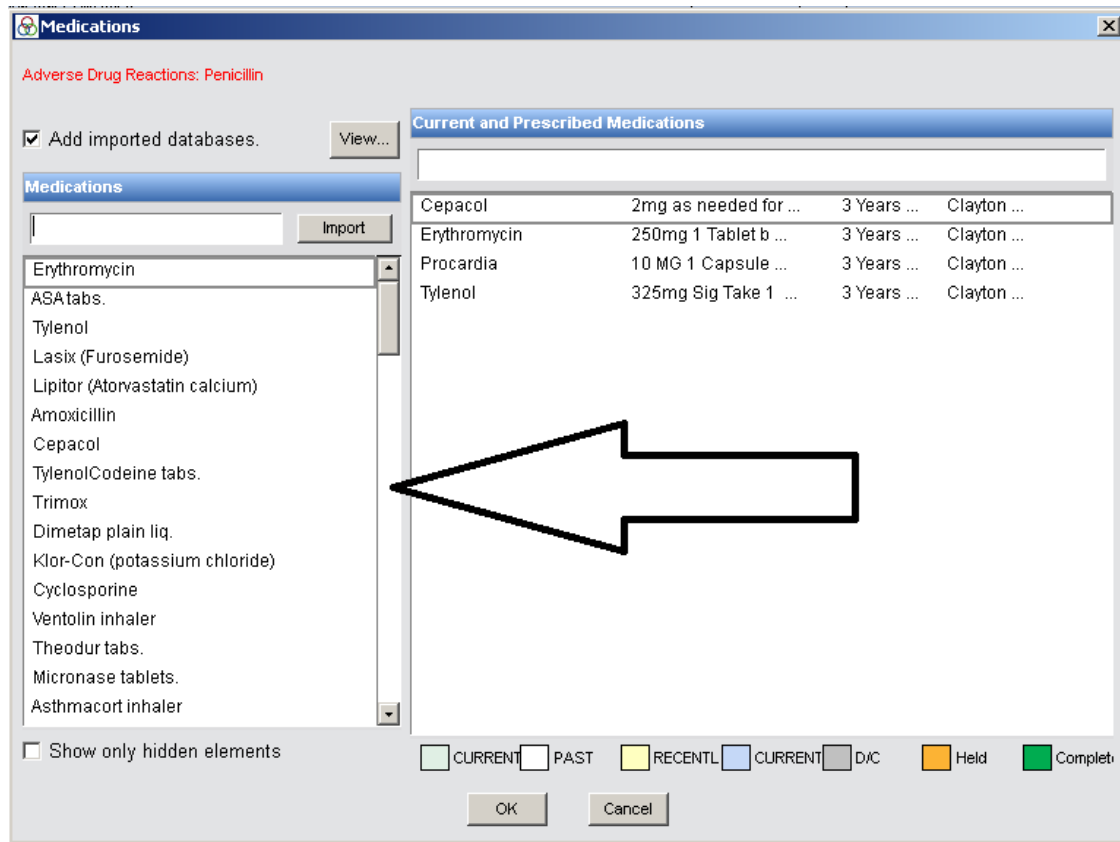
Figure 8.   Rx Subsets of the medications personally prescribe, organized by order of frequency distribution, with the most commonly used medication always appearing at the top.

The same happens with all other lists, such as laboratories, patient instructions, etc. Every entry you have created and used in the past is sorted by frequency distribution on the theory that the most common item on your list is also the one you are most likely to use today.

The Search Insert (a unique type of search)

Pharmaceutical companies know that the average physician prescribes about 13 different drugs in their practice. Even if you prescribed two standard deviations above this average, you would still not order more than a hundred different medications. So you can easily see and use the ones you have created in the past by order of frequency. However, many other lists may have thousands of different entries (e.g. all the medications in the U.S. or all CPTs). So, if items are sorted by frequency distribution and not alphabetically, how do you easily find the one you want?

The answer is the "Search Insert" engine. The idea of Search/Insert is simple. As soon as you type any letter in your search, the system keeps any entry where at least one of the words matches the letter you have typed, and it deletes all other entries from your list.

Because each letter you type eliminates 97% of the wrong choices (1/27 characters), and because each subsequent letter multiplies that by 97% once again, within just two or three keystrokes, you instantly find your desired entry if it exists in your list. If the entry does not exist, it enters what you are typing as a new entry—hence the name "Search Insert."

If you've seen how a search engine like Google finds your answer among billions of entries in cyberspace, you get an idea of the power of this simple technology. You'll never have to deal with that much material in your knowledge base, even if you live several lifetimes. And the lists display dynamically. This means that each time you type a letter, the list instantly gets shorter and adjusts the search to display the new most frequently used item at the top.

Finding the Diagnoses

No matter which element you pick, you are invariably taken to its related assessments starting with the related diagnoses; that is, you are instantly shown the short list of past diagnoses that contain the element you picked.

Let's say you have a patient with Streptococcal Pharyngitis who is allergic to Penicillin, and you prescribe them Erythromycin. As soon as you select "Erythromycin," the Concept Processor finds all the related diagnoses you have used with erythromycin in the past and displays this short list in order of frequency distribution with the most common diagnosis listed first.
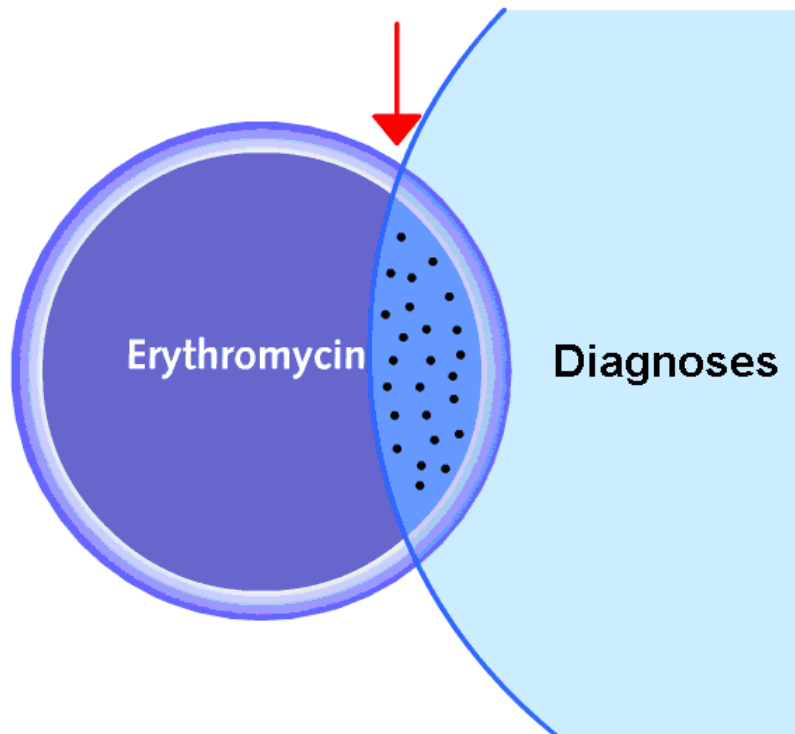
Figure 9.   Subset of all the diagnoses entered in Praxis where you have prescribed Erythromycin. These kinds of intersects are found between all the other elements of the SOAP Note and their related diagnoses. You could have started with a laboratory order, a physical finding, a procedure, instructions to the patient, etc. Invariably, the Concept Processor takes you to the related diagnoses.
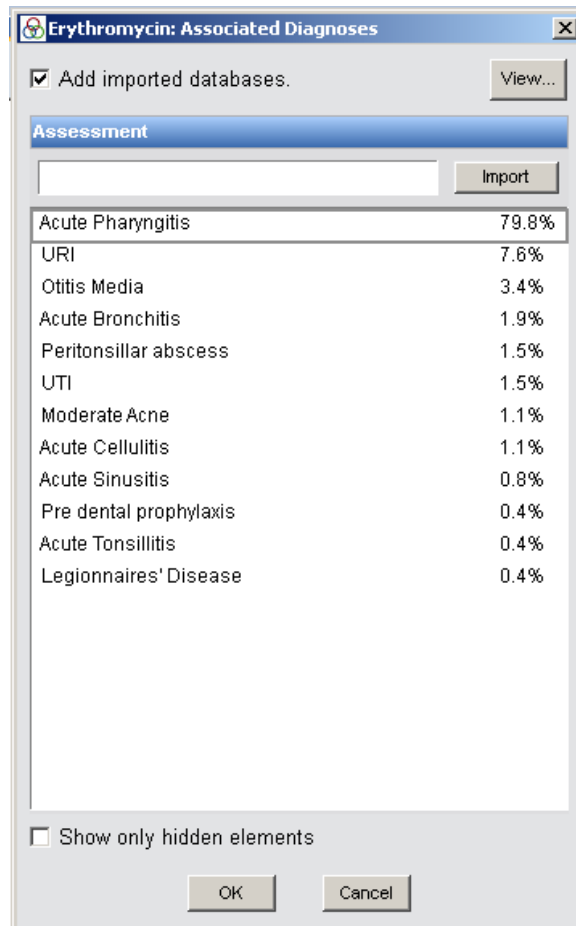
Figure 10.   A view of the window of the same related diagnostic list: As soon as you select "Erythromycin", the Concept Processor searches for every single encounter where you have used this drug before. It then shows its associated diagnoses, listing the most frequent one at the top. All of these diagnoses have used Erythromycin, with Acute Pharyngitis as the most recurring one (79.8% of the time).

The Assessment: a Central Idea

Now it gets interesting! As we mentioned, selecting a diagnosis is not the answer you want.

However, as soon as you click on the diagnosis, for example "Acute Pharyngitis", the Concept Processor searches again for every single encounter where you have treated Acute Pharyngitis with Erythromycin, and it hides all other encounters of acute Pharyngitis where you did not use Erythromycin. Remember that you can start with any other SOAP element, and the process will be similar. You will be taken first to the related Diagnosis where this item was used, and then to the subset of assessments where this

diagnosis was treated with this particular element. In this case, all the assessments where you used Penicillin, or no antibiotic at all, will not be shown.
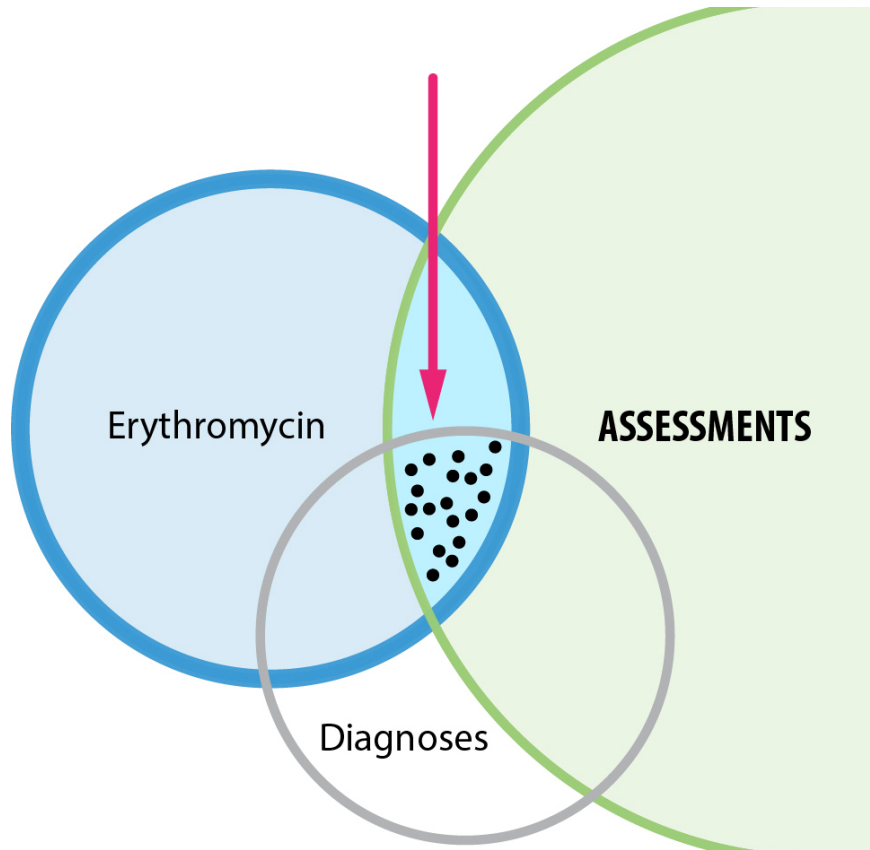
Figure 11.   We are narrowing down our options within the Acute Pharyngitis diagnosis. We are finding the closest Assessment for which we treated Acute Pharyngitis with the use of Erythromycin.

What is an Assessment in Praxis? An Assessment for Praxis is ***not*** what we learned in medical school and it is certainly not the same as a diagnosis. It is a new and different concept. Let's take a careful look!

The Classical Conception of Diagnosis

Please read this part most carefully. It is critical to your understanding of the Concept Processor

According to the classical definition:

"DIAGNOSIS is the cause and mechanism of disease."

In other words, "Diagnosis" is something happening to the patient—something found inside the patient. The Praxis "Assessment" is defined differently. It is something that happens **within your mind** as a reaction to the medical interaction. **In short, an Assessment is NOT a Diagnosis in the classical sense of the word.**

The Praxis Assessment

PRAXIS defines "Assessment" as your personal reason for diagnosing, treating, or thinking about a case the way you do.

Let's evaluate this crucial difference and its implications.

As you can see, the Concept Processor uses a precise meaning for Assessment, one that is markedly different from what we learned in Medical School. An Assessment classifies your reasons for describing a condition, labeling the patient with your given diagnosis, and treating the patient in a specific way. The two ideas—the coded ICD-9 or ICD-10 diagnosis and your personal assessment—must be unified to make this system work. In fact, you have already been doing this in your professional life. It is second nature to you, even if you never tried to define your own mental process. Let's now examine how to develop an assessment. It is the key to how the Concept Processor helps you quickly document your notes.
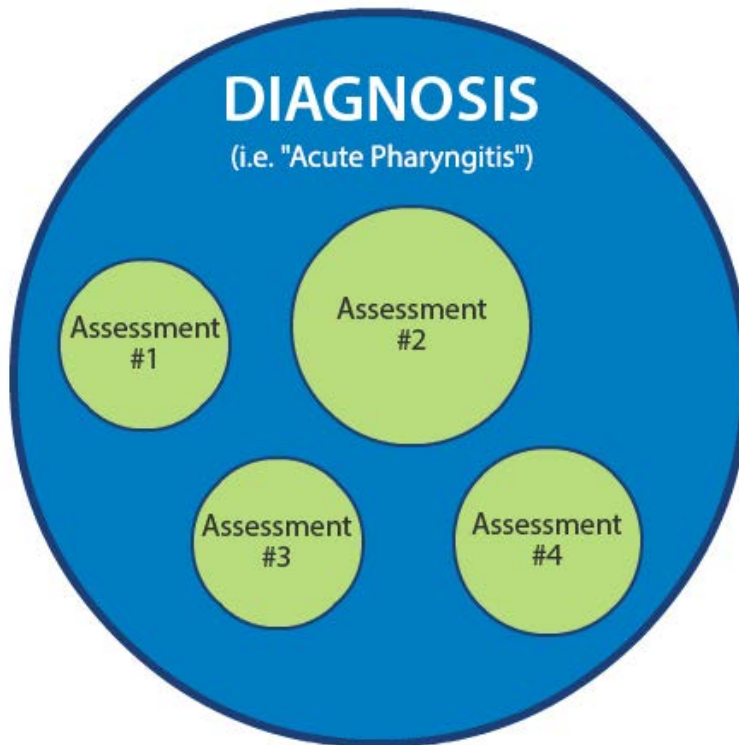
Figure 12.   Venn Diagram of the ICD-9 Diagnosis and its related personal assessments: You may have hundreds of assessments available for the way you treat Acute Pharyngitis or any other illness. Any time you change something "conceptual" about the way you diagnose or treat a specific case, you have a new personal reason, which becomes a new assessment. The Concept Processor is a way to easily find the closest assessment you've done in the past.

Let's now review what we have done up to now: We selected an antibiotic (Erythromycin) for a patient who had Acute Pharyngitis and was allergic to Penicillin (as you know, the actual diagnosis and treatment plan usually takes an experienced provider a millisecond to make!)

Then we selected "Acute Pharyngitis" and now we see:
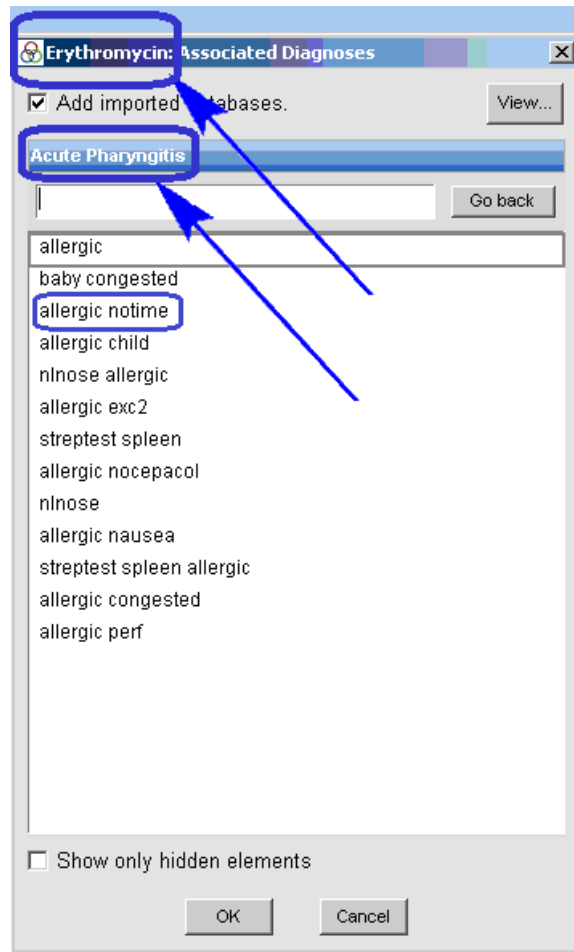
Figure 13. When you select "Erythromycin" in the first step, and then "Acute Pharyngitis" as the related diagnosis, strange keywords appear. Each represents a different assessment of Acute Pharyngitis in which you have previously used Erythromycin. Note the assessment "allergic notime", which appears third from the top (explanation below).

Each one of the keyword entries you see above represents your personal reason for deviating from a "typical" case of Acute Pharyngitis. The word "typical" is, of course, an abstraction. A typical case may be defined as a case that you think of as "typical," and no one else has to agree with you. Think of it as an imaginary typical case.

The assessment is defined by an invisible keyword—invisible to everyone but you—that you create as a mnemonic, so you can easily find it in the future. These keywords may not mean anything to anyone but you. For example, in the list of assessments above, there is an item entry labeled "notime". It was used for a patient when this provider had *no time* to fully examine her. With that patient, the exam was limited to the throat, excluding the ears, nose, and chest, which this provider usually evaluates in her "typical" Pharyngitis case. The next time this provider finds she has "no time" to evaluate another patient with Acute Pharyngitis, the "notime" keyword will generate the same short

description of a limited exam. This method allows you to be accurate and honest about the description of what you actually examined, but it may also relate to your treatment or any other part of your SOAP note.

Keep in mind that your assessment does not have any constraints to it. In other words, you are not limited to creating assessments solely based on the clinical aspects of the case. A different social circumstance—such as the patient's insurance, ability to pay, geography, or any other clinical or non-clinical condition—may cause you to write and treat the case differently than you "typically" do. Yet you are still the same provider that generated all those other cases. In other words, if another patient presented with the same clinical and non-clinical conditions in the future, you would still diagnose and treat them the same way. One might say you have a "method to your madness," which represents your own assessment of each case you treat and the unique way you practice your art.

Please keep in mind that when you select a diagnosis, the neural network engine behind the Concept Processor **does not** then select all of its related assessments. **Instead, it limits the search to the subset of related assessments that also include the initial element you selected**, which should be a much more narrow listing (e.g., find only the Acute Pharyngitis cases where I used Erythromycin). This is why it is best to start with a specific or unique element to start the search whenever you can. The more focused your first choice is, the shorter your final list of assessments becomes.

What happens after you select your closest assessment?

After you select the closest assessment, you're practically finished with your note. The entire note is instantly charted the way you created it last time.
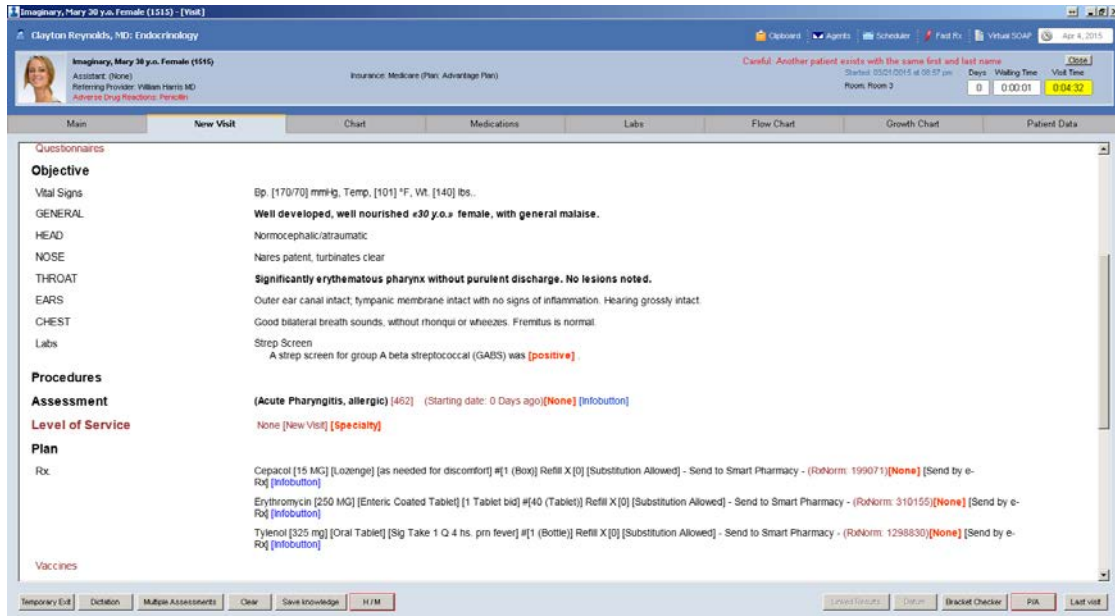
Figure 14.   Your entire note is generated only seconds after you start the charting process! This is a note written for a closest case of Acute Pharyngitis that was handled in the past. Now all we need to do is read it and edit it to adapt it to our current case. Of course, you will see your own writing and your own logic instead of what is found on this page.

By the way, although it may have taken you a few minutes to read the last few pages, with a bit of experience you can reach the last window within a couple of seconds without much effort. Your complete text comes together automatically: Subjective, Objective, Procedures (if any), the selected Assessment with its Discussion (if any), a full Plan with all its parts, including the full Prescription list and the correctly formulated Routing Slip also instantly appear. Please note that, not only has your progress note been instantly generated, but so have all your related prescriptions, procedure reports to be printed separately, and any other documentation that is described by the note. You have even created the related routing slip with all the ICDs and CPTs in the background. You are seeing your next patient!

In addition, a number of other items will be generated that are not part of the note but that will help you practice medicine. Later on, we will show how the Concept Processor does much more than complete your medical report your way, but actually helps you practice medicine by acting on your behalf (see page 125).

Now comes the editing of your closest encounter. This is the fun part!

First you browse your entire document—you know it perfectly because you wrote it all yourself. Here you simply edit what does not fit your current case—if there is anything to change at all. You may need to delete items or add to them. You may need to rewrite some text. You check with your patient and change anything that does not accurately

describe what you perceive and what you wish to do. This process is much easier and faster than remembering what to do next with your patient, choosing what to write, then writing your entire note from scratch.

And because any changes you make now are saved for the future, the more cases you do, the fewer differences will exist between your current case and the one that is the most similar to it, until the differences become quite subtle indeed.

Powerful Meaning of the Word "Assessment"

The statement "select the closest assessment" might sound strange. Perhaps this appears to be too simplistic. Is it possible to expect a program to provide you with a complete current encounter note based solely on a previous assessment—particularly when you did not start from the history?

With that thought in mind, let's analyze the precise meaning of the Praxis Assessment.

First Premise of Concept Processing

> "Cases repeat themselves following a bell-shaped curve."

Second Premise of Concept Processing

> Whenever you make a significant change in the way you treat a similar previous case, you have a reason for doing so, and that reason becomes your new personal assessment.

Keep in mind, as we mentioned earlier, that your reason need not be a medical one. For example, you may treat a patient differently because of the specific insurance they have, which may pay for some treatments but not others.

> *Diagnosis X, Insurance Y*
> *Diagnosis X, Insurance Z*
> *Diagnosis X, angry (patient is upset)*
> *Diagnosis X, no time*

All of the above have the same ICD-9/ICD10 diagnosis, but each will be described and treated slightly or very differently by this provider.

Notice that the text appearing next to the comma—your personal suffixes made up of keywords similar to the list you saw in the assessment window on page 32—is kept hidden from the rest of the world. You can only see these suffix keywords in the moment of generating your note and not later in the encounter notes. The assessment keywords disappear once you save this patient's encounter. Once you generate the progress note the world will only see the label "Diagnosis X" with its appropriate ICD code, but the evaluation and/or treatment will differ with each assessment you select. You have a reason for everything you do, and that reason may change your assessment while keeping the diagnosis the same.

Third Premise of Concept Processing

> The official ICD-9/ICD10 Diagnosis is a superset of the assessment suffix keywords. Where the official Diagnosis and your personal suffix intersect, together they form an assessment that uniquely defines any case in medicine.

Therefore, understanding the meaning of the Assessment is the key to working with Praxis. You can see that the Assessment has two different meanings that have always co-existed in your mind. Now you need to put them together, so you can use this program.

As we all know, your approach to illness is much more subtle than what is encompassed by the Official ICD-9/ICD10 Diagnosis. When you read about the Virtual Assessment, you will see that sometimes you may not even have an official diagnosis in mind, but you always have an assessment (see page 74).

> Your ICD-9/ICD10 Diagnosis may include a large number of assessments, all sharing the same diagnostic name, but each generating different text.

Why not start from the History?

"Let the patient talk, Doctor, she is trying to tell you the diagnosis."
Sir William Osler (1849-1919)

It may seem strange that the Concept Processor does not follow the time-honored method of starting with the history. However, the History does exist and it does have its own keyword: The keyword of the History element is the assessment itself!
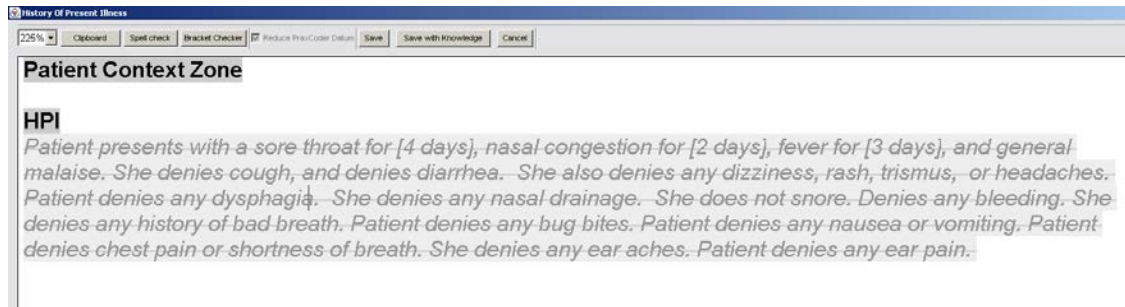
Figure 15.   Once you select your assessment—Acute Pharyngitis in a patient allergic to penicillin—the relevant history is generated immediately. Notice that the history appears fully de-highlighted (i.e., invisible to the world). You can now simply activate the phrases, sentences or paragraphs that are appropriate with a simple click of the mouse.

Osler was right when it came to listening to the patient, but it turns out that he was almost right when it came to charting[i]. The Assessment defines the History, but the History does not define the Assessment. This apparent contradiction is resolved when we consider that we are not focusing on the same point in time. As mentioned at the outset, the Concept Processor is not about making a diagnosis, which usually happens in your mind within a millisecond. (This happens after you let the patient go into free speech with a bit of help from you. You may also make a quick physical evaluation at times to clear up your suspicions.) The Concept Processor is about charting once you've made the diagnosis, or, in the absence of a diagnosis, once you've decided upon a course of action. Once the assessment is selected, the related written clinical history appears all at once, exactly the way you have written it in the past.

First Crazy Idea: A Diagnosis has nothing to do with what's wrong with the patient.

At first, the above statement appears to be quite insane. Please think about it for a moment.

Your diagnosis has nothing to do with what's wrong with your patient. Your diagnosis has everything to with <u>what you think</u> is wrong with your patient.

These are two different interpretations of reality. Unless you change your mind, or a colleague changes it for you—which is basically saying the same thing—you will take actions based on your personal interpretation of reality. This will be the patient's working diagnosis that will lead to your treatment, unless you change your mind. This may sound obvious, but it goes against everything we were taught (see page 171).

Your mind is not blank when facing a patient. The history does not come first.

The "mantra" we learned since we were medical or nursing students is that your mind is blank when facing the patient. It is the patient who relates the history. In other words, the

implication is that your mind is acting as a simple, accurate tape recorder for what the patient relates. You take what you hear and write it down exactly as you heard it. Only then do you read what you wrote and formulate a differential diagnosis from which you rule out possible alternative conditions by using inductive reasoning. This new "differential" in turn leads you to perform an appropriate physical exam and order relevant studies that further rule out incorrect diagnoses. In the end, you are left by default with a single diagnosis—**your** diagnosis. This is the bible of medical thinking, developed at a time when there were no computers to assist us and when we did not have to spend two hours a day on this insane documentation process.

In the real world, we providers never really start with the history, although we may believe we do. If you truly started with the history, you could be there all day. The exception to this rule is medical/nursing students who are there all day![ii]

Please concentrate on the precise moment that you "get it", the moment you diagnose your patient's condition, or in the absence of a specific diagnosis, the moment you decide your diagnostic and therapeutic plan—the precise moment when you are ready to document all or part of your case. You do use your mind to write the history, of course, but not like a tape recorder. Instead, you use intuition or Gestalt, which is another way of saying that you use your experience and learning to guide your interpretation of the clinical history you elicited. You prompt your patient in order to uncover the clinical history, which is certainly far from what an automatic tape recorder would do. That is why your clinical write-up as an expert clinician takes you so much less time than it did when you were a medical student. This is why a non-provider cannot take a relevant clinical history, no matter how hard they try or how much time they spend with the patient. Your clinical history is ultimately a projection of your own mind as a clinician, and a reaction to what you are experiencing with your patient. In other words, the clinical history is inside your mind.

Your history may vary in three ways

First Variation: Your clinical history is basically made up of symptoms. Symptoms are phrases, or sets of words marked by commas, semicolons, or periods, and it may also contain a "randomness factor"—something as yet undefined in medicine but that every clinician experiences on a daily basis.
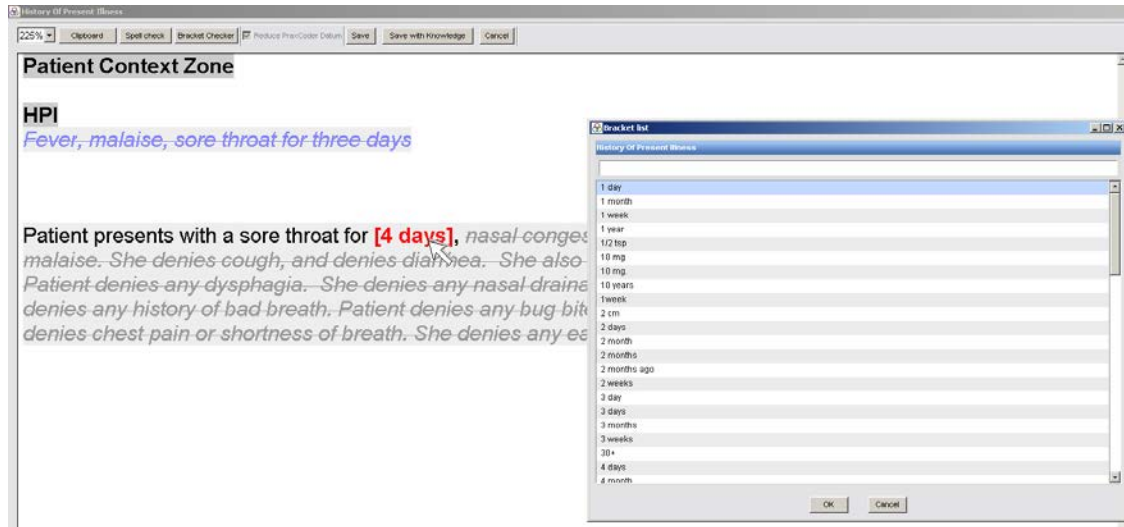
Figure 16.   The Randomness Factor: After clicking on a phrase it is highlighted. Any bracketed information ("4 days") appears in red. Clicking inside provides you separate terms you have used in the past for this and many other similar brackets that describe random information.

The beauty of the randomness bracket is that you know exactly, intuitively, what is random from what is conceptual, and therefore where you should insert brackets within your own free text the first time you write it.

Second Variation: Keep in mind that you took this history by examining many other patients with this same condition. Therefore many of the symptoms that you may have elicited on previous patients may not be relevant to the present patient. If you do not highlight it, the symptom is simply not recorded. It will not appear in the final record of this visit or be printed on the chart for the encounter.
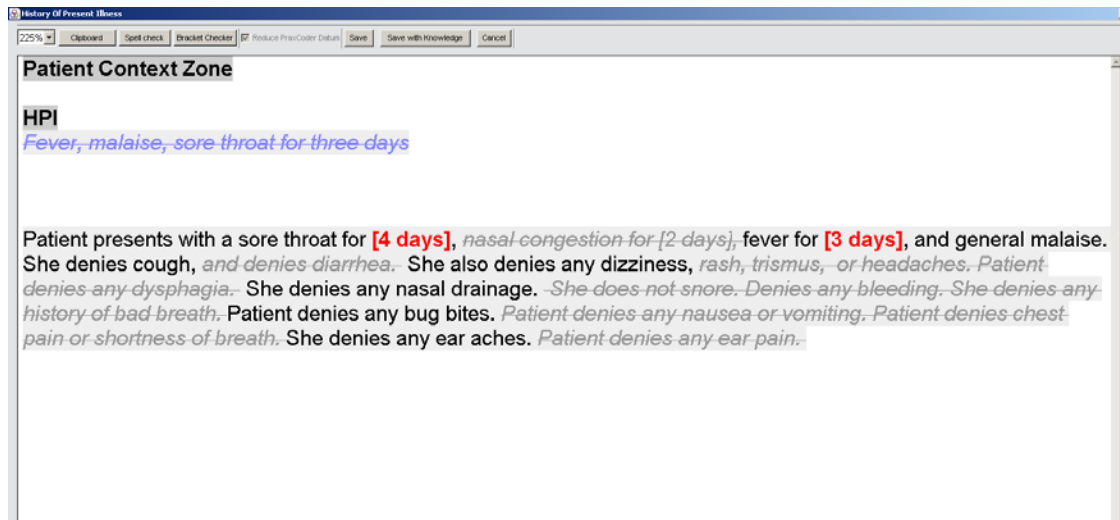
Figure 17.   You activate relevant symptoms by clicking on each phrase. Only the highlighted text will be part of this patient's record. The other text will not be published today. It does not exist for this encounter, **but** *you never forget to consider it anyway!*

Yet, as you review your case, you never forget to think about the other symptoms that are relevant to the condition but may not be relevant for the present patient. The symptoms you think are relevant are staring you in the face. Note that you could have mutually exclusive phrases that you can select from. You are using your own chart to ensure you are asking all the right questions, by learning from the best teacher in the world—YOU.

Third Variation: Your patient may present with a symptom that you have never thought of eliciting on any previous patient with this condition. If you think of this new symptom for the first time with this patient—maybe because you read about its importance, because a colleague told you that you should elicit it, or simply because it came to your mind as you were examining your patient today—and you then enter it into the editor, you will never forget to elicit this new symptom in the future. Thus, the more you use Praxis, the more relevant and accurate your histories are. Also, it does not matter how tired you might be or how many hours you have been working. The new relevant symptom you thought about today will be displayed precisely when needed. In this manner, your charting continuously improves!
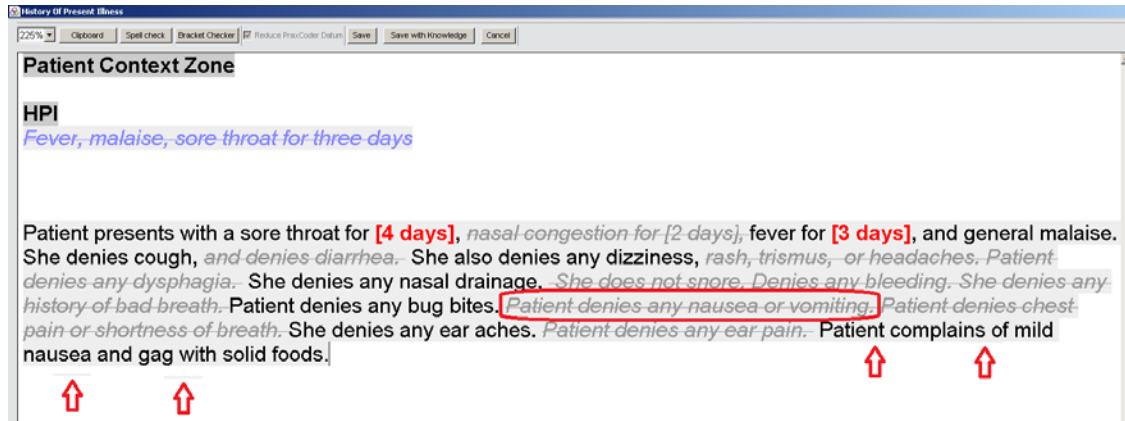
Figure 18.   If a symptom is needed and not available, you can simply add it by typing or using speech recognition software so it will be available for future patients. A new symptom may be mutually exclusive with one you have entered for a previous patient. In the future, both mutually exclusive symptoms will be de-highlighted, and you simply click the one you wish to use at that point.

Here is an interesting story. During a three-day meeting at the American Academy of Otolaryngology, hundreds of specialists were invited to "improve" the text you see above by adding relevant symptoms for a sore throat. After about a day of additions, the list of symptoms grew by another inch (which we have hence deleted). However, beyond that point for the next two days it did not increase at all, even though dozens of specialists were challenged to add to the list. As you can guess, there is only so much one can say about a sore throat!

The important thing is that you do not forget to ask all the right questions. Yes, Osler was right, the history makes the diagnosis, but your assessment makes the history!
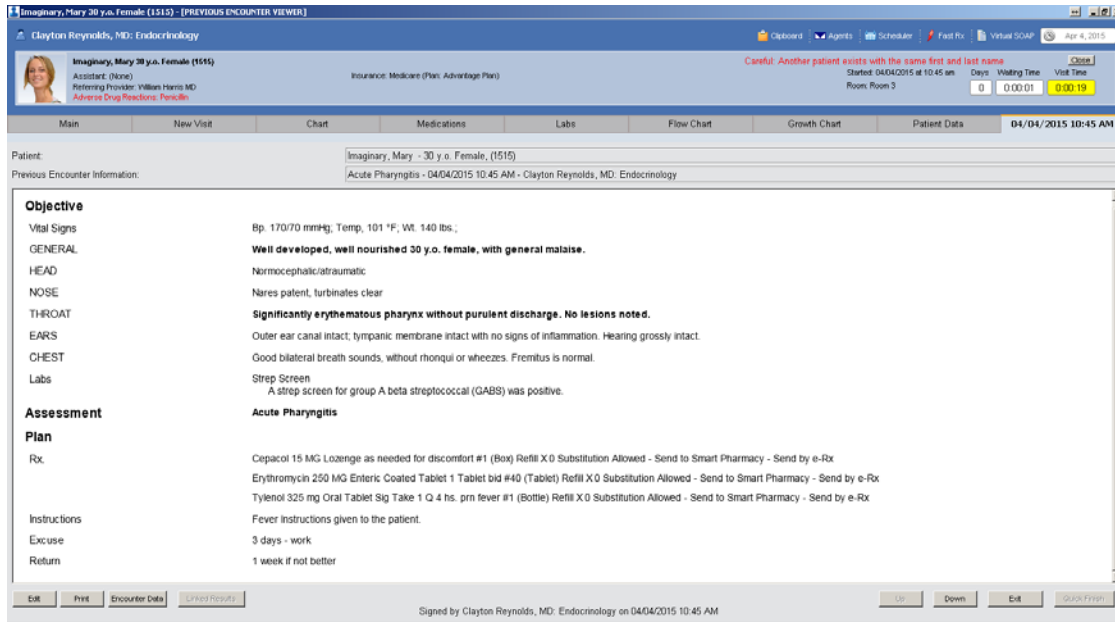
Figure 19. ...And once the note is saved in the patient's record all superfluous words and brackets disappear, leaving clean text.

Multiple Providers

As mentioned at the outset, your medical knowledge is unique to you. If a clinic had ten providers, each of them would produce their own individual medical knowledge if they looked at the same patient record.

PRAXIS CONCEPT PROCESSOR
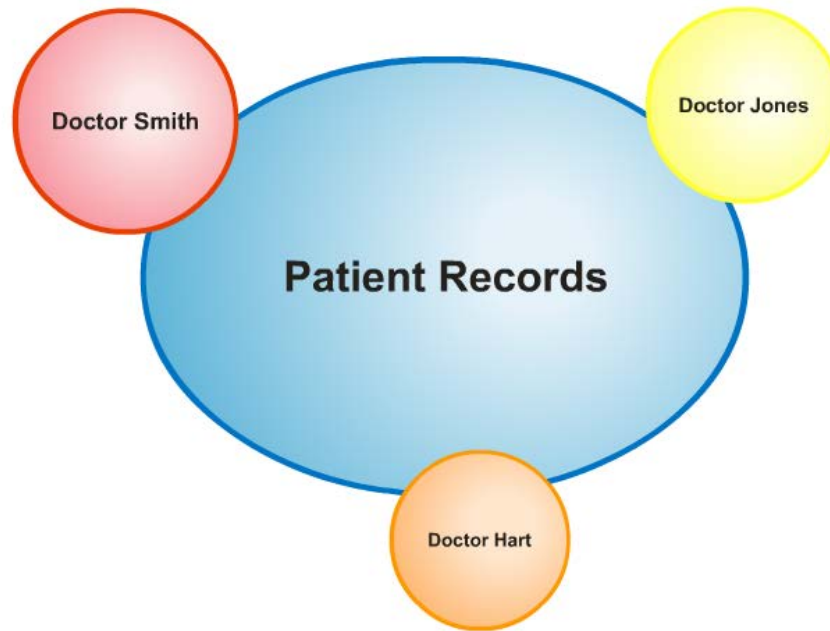
Figure 20.   There are n +1 databases in Praxis, where n is the number of providers. Each provider has his or her own medical knowledge database totally independent from any of the others, which interacts with the shared patient record database in real time.

Later we describe the Knowledge Exchanger as a fascinating way to share knowledge among providers using this technology (page 92).

Certain information is shared by all providers. Examples may include the Vital Signs and Clinical Parameters. We certainly don't want one doctor in the clinic to call the blood pressure "Bp" while another calls it "BP." To a human, this may appear to be a trivial difference, but to a computer they are worlds apart. Using different discrete data terms, even though they "look similar (to a human)", would create a mess with flow charts, practice advisories, and queries as it would duplicate the entries (see full discussion on discrete data on page 104). The same may be said for medication names that would destroy the commonly used flowcharts, laboratories, and other clinically related fields.

The Concept Processor automatically merges all this shared clinical information with your personal knowledge base to create your final note.

Limits to the Bell-Shaped Curve - the "fuzziness" of reality

Even the marvelous bell-shaped curve has its limits. There is no such thing as absolutely identical encounters. There are often adjustments you need to make to even the best knowledge-based generated note. In essence, you can think of your write up of the clinical encounter as being composed of three different categories of logic:

- **Conceptual Text:** As shown thus far, this is the clinically relevant text and a projection of your own thought process.

- **Random Information:** In order to be precise, and in order to document the fact that you have listened to and examined your patient, you must include information derived from the interview itself. This random information is interwoven within your conceptual text. We introduced this type of text in our brief discussion on brackets on page 39. It is explained in more detail below.

- **"Touchy Feely" Text:** Yet another form of random text not used by all physicians. It usually has little clinical relevance, but for many colleagues it is an important part of their note. ("Mary came in with her husband Jim and her dog Fido")

Let's review each in more detail.

Random Information

We described part of it with the use of brackets. If a patient presents with a fever for three days instead of four days, are these grounds for changing our assessment? Of course not! This variation is a constant occurrence in every medical practice.

If, instead of prescribing 250 mg of penicillin, you prescribe 125 mg, is this ground for changing your Assessment? The answer depends on the particular case. Most frequently you would change to a lower dose because your patient is of lower weight, but your Assessment remains the same.

PRAXIS recognizes the existence of these exceptions or random data points in 7 different ways:

> ➤ Automatic gender change
> ➤ The use of brackets
> ➤ The use of option brackets
> ➤ The use of de-highlighted text
> ➤ The use of deactivated text
> ➤ The use of "Save" rather than "Save with Knowledge"
> ➤ The use of Datum
> ➤ The use of Patient-Related knowledge

These options give you full control over your text, yet allow you to chart it faster with more accuracy. Think of your note as a checklist prompting you to focus on details you think are relevant, and helping you practice better medicine.

Automatic Gender Change

If your first patient was male and your next identical encounter was female, would this be a reason to change the assessment? Probably not! The Concept Processor automatically changes any "he" to "she", any "male" to "female", any "gentleman" to "lady", and any "boy" to "girl."

Brackets do not change keywords
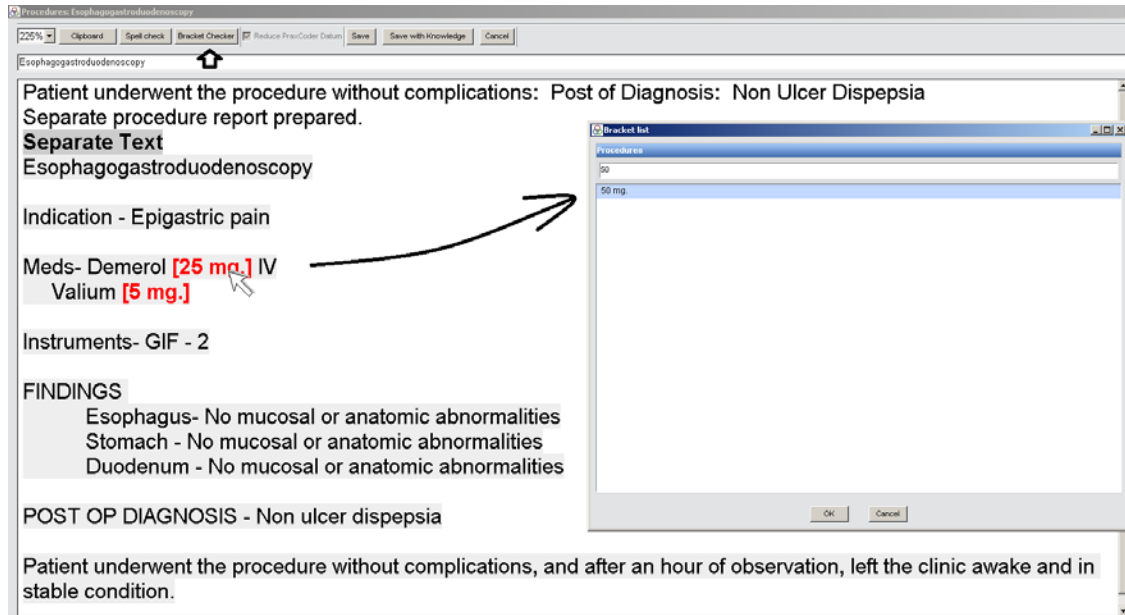
Figure 21.   Bracket List found by double clicking inside [25 mg] as also shown previously. Note the red color, indicating that this bracket has not yet been reviewed. The bracket-checker (small arrow above) will automatically check all brackets in red to ensure that the items have been reviewed and changed accordingly.

Most EMRs use fixed pick-lists, some with hundreds of options to choose from, except that they are set by the template makers and are therefore not truly random. Here you simply enter square brackets wherever you wish to enter your own optional list. The Concept Processor recognizes the material you enter as random, saving it in a separate database. You may then re-use these random phrases in other brackets of the same element editor as they tend to recur. Numbers are not saved because it is easier to type them in than to search for them, example [121.7] will probably not be used very often, but *"his [female cousin] has Diabetes"* will).

With just a little practice you distinguish what is conceptual and generated by your assessment from what is truly random and obtained from your patient. There is no way of knowing in advance that a patient has had a sore throat for "3" days (and not 4 or 5). Yes, dates of onset of symptoms are typical random entries, but so are many other terms such as "his [mother] had dementia", which could have been his "father," "brother," or "sister." The same can be said for drug dosage—the system remembers the frequent dosage for any medication, but you can quickly change it without requiring keyword changes or new assessments. Changes within brackets do not result in assessment changes because the concepts have not changed.

Option Brackets

Option Brackets are an interesting variation of random brackets. They can be thought of as semi-random.

Lower extremity discloses [no|I+|II+|III+] pitting edema

Figure 22.   Option brackets may be used to enclose semi-random choices. Just add as many options as you like and separate them with pipes ("|"). In the future you simply click on the right option for that patient and the others instantly de-highlight. Options may be improved at any time ([|no|II+|III+|IV+])

Another semi-random text that does not result in changes in keywords or assessments is the highlightable text that we have shown in the History of Present Illness. You may add as much highlightable text as you wish, and you will not be prompted for an assessment change. At first, highlightable text may not appear random, but it is. When you first open the editor, the text within it appears completely de-highlighted. This means that if you do not activate anything by clicking on at least one de-highlighted phrase (or perform an alt-click to activate a full sentence, or do a control-click to activate an entire paragraph), then the text within the editor will not be part of the note. You may also select among mutually exclusive statements, such as:

She denies abdominal pain.

She complains of [mild|severe] abdominal pain for [3] days.

The options you see above may not be random, but the current patient's presentation could be random. Therefore, you may add phrases, sentences and entire paragraphs and you will not be prompted for a keyword or assessment changes. The next time you simply select what is applicable to that encounter and you are done.

The History of Present Illness, Past Medical History, Evolution, and Management all use highlightable text. In addition, you may use highlighted text for any other region whose text you wish to micromanage. Keep in mind that this micromanagement of text is useful depending on your medical specialty, but it does slow you down a bit. For example, a dermatologist may use highlightable text to activate skin lesions in minute detail. However, that same specialist will probably not need this level of detail to describe a heart exam or a patient instruction. In those cases, keyword changes may be used instead. The keyword brings up the abnormal findings all at once, and that may be all that is needed. In the latter case you can always use option brackets or regular brackets without a change of keyword or save the changes for this visit only, also without affecting the keyword). A cardiologist, of course, might possibly do the opposite: use highlighting for the heart examination, and keywords for skin descriptors.

Touchy Feely Text

Patient Context Zone

HPI
Fever, malaise, sore throat for three days

Mary came in today with her husband Jim and her dog Fido.

Patient presents with a sore throat for **[4 days]**, nasal congestion for **[2 days]**, fever for **[3 days]**, and general malaise. She denies cough, and denies diarrhea. She also denies any dizziness, rash, trismus, or headaches. Patient denies any dysphagia. She denies any nasal drainage. She does not snore. Denies any bleeding. She denies any history of bad breath. Patient denies any bug bites. Patient denies any nausea or vomiting. Patient d chest pain or shortness of breath. She denies any ear aches. Patient denies any ear pain.

Figure 23. *"Mary came in today with her husband Jim and her dog Fido" is a "touchy-feely" expression that clearly does not follow a bell-shaped curve. The Concept Processor allows the user to mark it in blue to use it only for today's encounter but not for future use with other patients.*

This kind of text demonstrates to third parties that you have established a rapport with your patient, and you may use it to remember things about her ("How is Fido?"). Touchy-feely text will not increase reimbursement, provide deterrence against lawsuits, protect your medical license, or lead to a more accurate diagnosis. However, it does give the note a more human touch. Not every physician uses it, but some doctors absolutely love to enter this kind of information in their notes.

Figure 24.   Clinical example of a semi clinical "touchy-feely" fragment. The circled area was entered with the aid of speech recognition software. Once combined with the incoming clinical description from the doctor's knowledge base, it gives the impression that the entire progress note, not just the area circled above, was dictated or typed (Courtesy Doctor Thomas Johans, St Louis).

These additions do not prompt a keyword or assessment change. They are marked with a blue color with a click of the mouse, so they will never be recorded for future re-use with other patients. When the note is stored or printed, all the editing colors and brackets disappear, leaving the note as a fully integrated text that flows seamlessly.

Datum: Automatic entry of discrete data into free text

This is an exciting option that is discussed in greater detail later. Many times your own database has the answer you are looking for, so why should you have to find it in the record, copy the answer manually into your note, and expose yourself to errors in the process?

The Concept Processor does all three automatically and without errors by embedding Datum into free text. Here is a simple example:
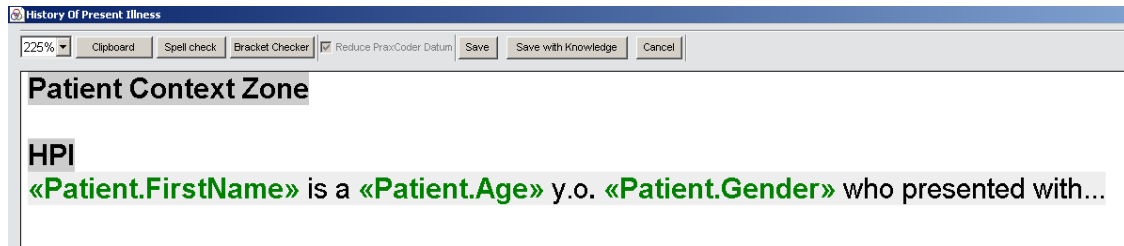
Figure 25.   Datum objects entered into the editor embedded within free text.
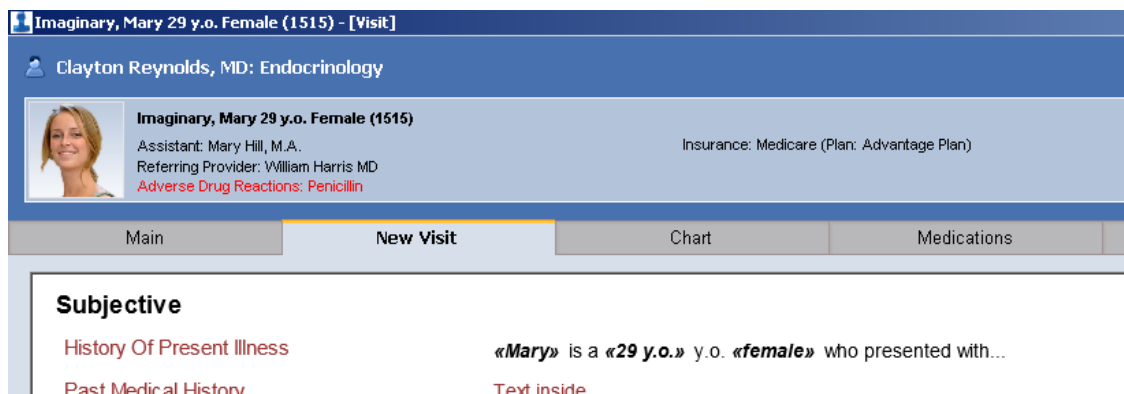
Figure 26.   Datum entries in the SOAP Generator display. The brackets displayed disappear once the note is saved. Next time it will be "John is a 53 y.o. male who presented with" and you need not rewrite it ever again.

Datum is an "object" that may be instantly embedded anywhere in your free text. It then instantly finds the appropriate information you need right where you need to see it. Of course, after the first time, it will do the same for all future encounters (see page 106).

MANAGEMENT
With a BMI of **«CP.BMI.Value»** kg/m2 and a weight differential of **«CP.Weight Differential.Value»** lbs. I *[am not too|am]* *concerned.*
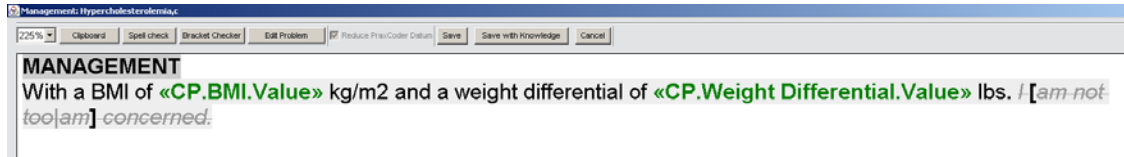
Figure 27.   Datum can be used to calculate a formula from any discrete data, such as the weight and height, and place the result in the appropriate context in your free text...
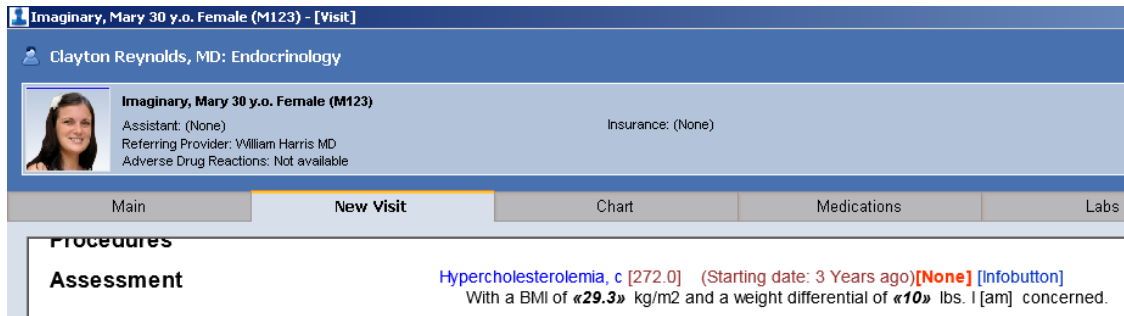
Figure 28.   ...Once created, the Datum object goes to work and starts calculating. The same is true for the Creatinine Clearance, the Anion Gap, or any other calculated value. Note that the Weight Differential calculates the latest weight taken today against the one taken last time. As in the previous example, you find that after entering Datum on your first case, it is automatic for all future cases and patients who need it.

All calculated values display automatically within your free text. After saving the note, all the brackets go away, leaving the information merged with the remaining free text.
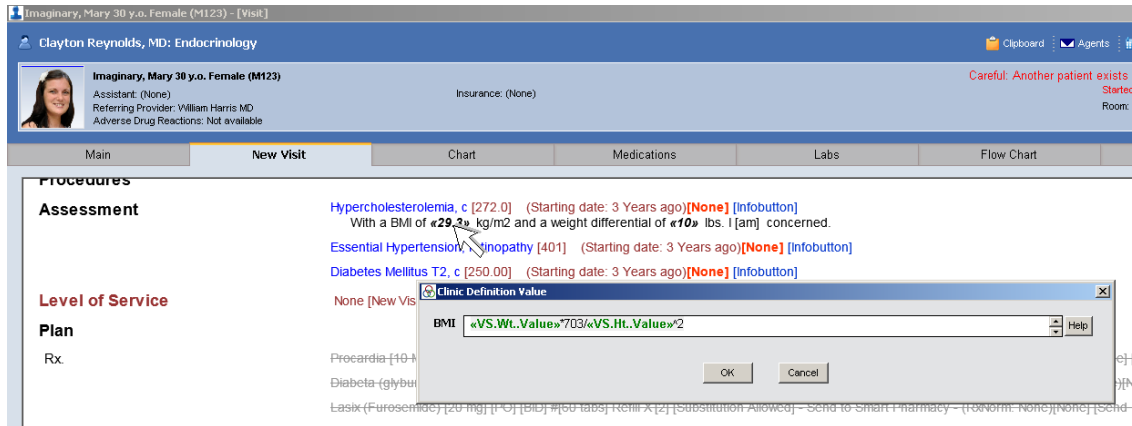
Figure 29. As in all areas of the Concept Processor, the user creates the formula once and then uses it automatically for all patients with similar conditions. You may do the same for Creatinine Clearance, Anion Gap, and any other calculated formula. You do it once, and you have it forever. You don't even need to look for it, as the assessment will find it in the future.

The same is true for incoming labs. Why have to look for them?
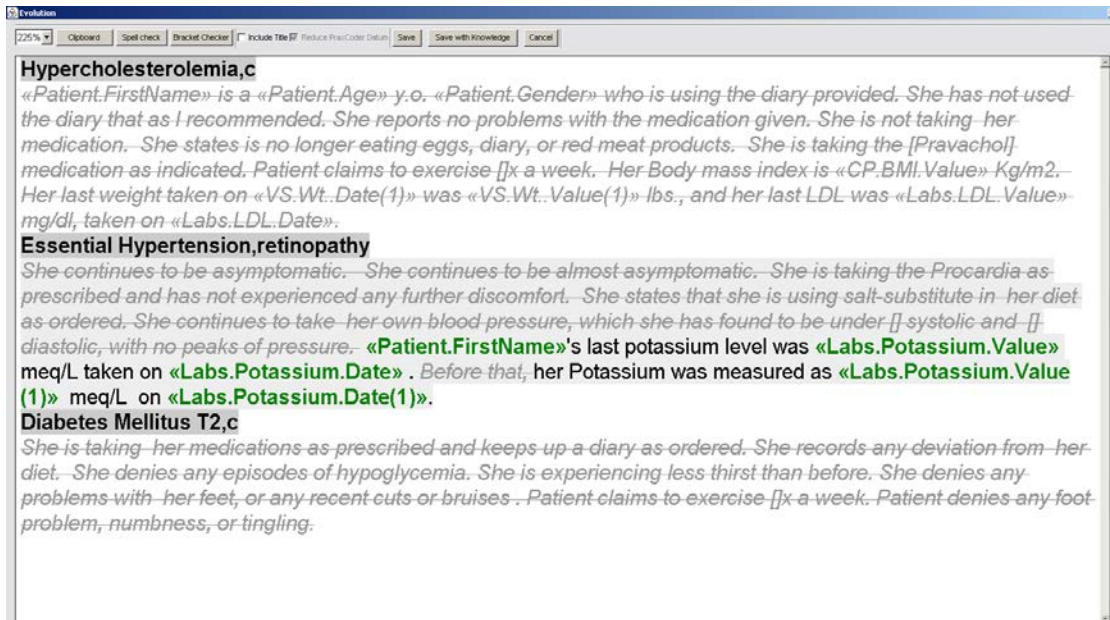
Figure 30.   The Concept Processor searches for the last potassium on record and the one prior to the last one and puts both automatically on the screen within the text. You enter the datum link once, and then the Concept Processor does it automatically for any patient that needs it.
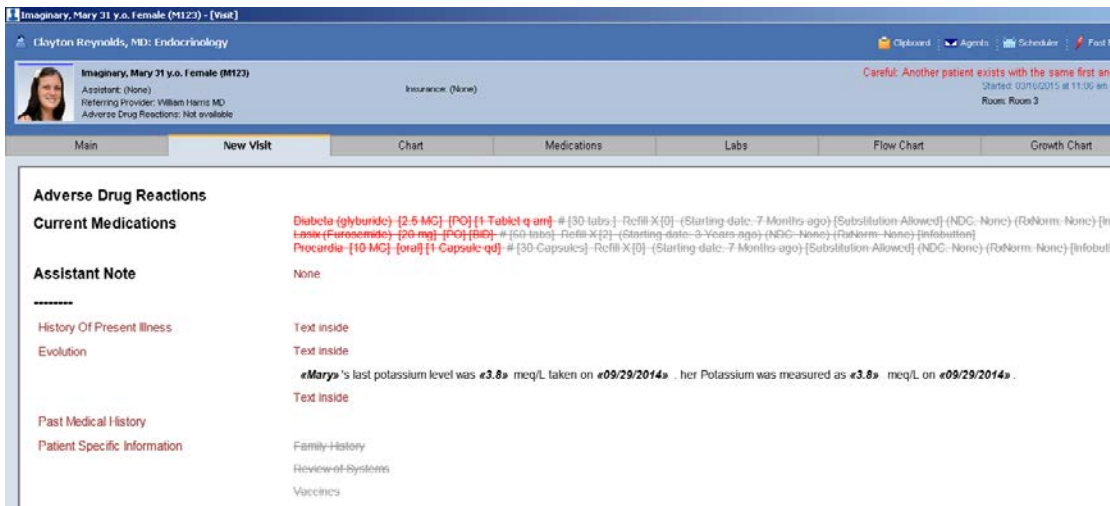
Figure 31.   ...And this is how it appears on the SOAP Note. In the final record all the brackets disappear... magic!

As you can see, Datum is embedded within your free text to automatically bring discrete data— such as the patient's latest laboratory values— and place these values exactly

where you need to see them when you wish to see them.

Datum also allows you to create your own discrete data. Your imagination is the only limiting factor. (See Dynamic Fields and Clinical Parameters on page 111).

Datum would be impossible to use without the Concept Processor (i.e., with templates, for example). You only need to generate them once, then your assessment finds and displays them exactly where you need them without having to look for them. Otherwise, finding the datum objects would be as hard as finding the values themselves!

Chronic Findings

We find another fascinating limit to the bell-shaped curve. If your patient had a "4 cm sternotomy scar" last visit, you can be sure that he or she still have a "4 cm sternotomy scar" this encounter. Why should you have to rewrite complex chronic findings, visit after visit, subjecting yourself to all the errors inherent in this manual entry? This is true for fundal exam "arteriovenous-nicking grade [I|II|III|IV]/IV)" and cardiac murmurs. Yes, a cardiac murmur might be [3]/6 on the Levine scale for visit one and [4]/6 for visit two, but it is unlikely that it will go away any time soon. How many times have you seen the following on a patient's chart?

Visit Number one "...3/6 Holosystolic murmur at the apex..."

Visit Number two "...3/6 Holosystolic murmur at the apex..."

Visit Number three "...Regular sinus rhythm. No murmurs..."

Visit Number four back to "... 3/6 Holosystolic murmur at the apex..."

What happened on visit number three? Did the patient spontaneously lose the murmur? This cannot happen with a Concept Processor! Of course, you are prompted by your pre-written findings to examine your patient and correlate what you wrote with reality, but isn't examining your patient much easier and faster than writing about it? Isn't following your own prompt a better way to practice medicine than forgetting about checking an abnormal finding because of time pressure? With the time you save writing notes, you can spend more time examining your patient. Seeing the abnormality presented on the note prompts you to examine the affected area more carefully and write down any changes.

This is not the same as cloning a note. Rather, this is intelligently bringing a specific persistent patient finding forward in time, separate from the rest of the note.

Now say that you are in a multispecialty clinic and your colleague and you both see the same patient. You estimate a "[2]/4 AV nicking of the left fundus," but your colleague describes it as a "[3] of 4". What happens when the patient returns to see you? You guessed it: You will still see the "[2]/4 AV nicking" while your colleague will still see "[3] of 4" in his/her findings. The chronic findings for purposes of note generation are saved in the database per patient but also per provider. This means that each provider will see the chronic findings the way they each individually wrote them. Do not confuse this action

with the final patient record. The previous encounters display the entries generated by all the providers, exactly as each provider entered it when they examined the patient, as with any other EMR. Here we are focusing solely on the note generation process.

In conclusion, the Concept Processor creates three types of independent data:

- The patient record that may be accessed by all users with privileges
- Your personal medical knowledge base available only to you as the provider
- A part of your personal medical knowledge that returns only with the specific patient and which is found in that patient's previous encounters

This may sound complicated to us humans, but for a computer this is all straightforward and you need not remember all this. When things happen instantly, it often makes a Praxis user feel like processes are occurring "magically."   In this paper we describe the tricks behind all the "magic", but you need not be aware of any of this to use the program with great ease, just like you don't have to understand how an internal combustion engine works in order to drive your car[iii].

Element Deactivation

One way to get around the fear of charting incorrectly is to use Element deactivation.
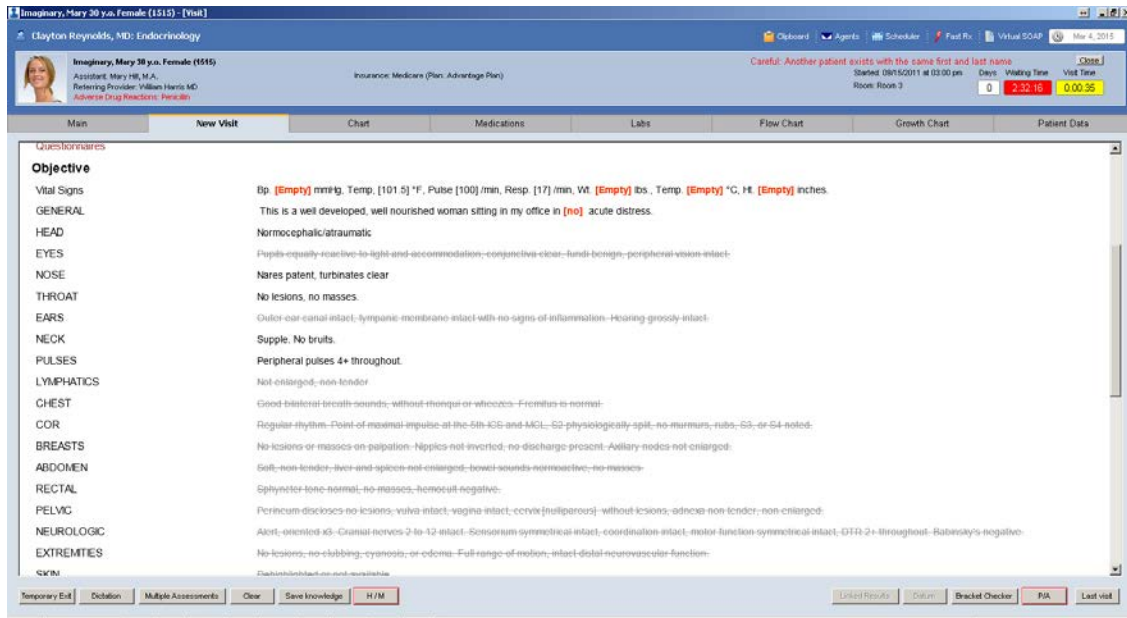
Figure 32.   Objective Finding "deactivation" for the acute Pharyngitis case we reviewed earlier. You "activate" whichever body region you evaluate by simply clicking on each item as you go. Whatever you don't click on simply is not part of today's note.

You may use this approach with the objective findings. The body regions may be initially set to appear inactive, and you simply activate each one as you examine your patient. The body region items you do not "activate" will not be saved or printed with today's encounter note

This activating method is also used for cases with many equivalent medications available to treat the same condition. A typical example is the similar drugs selected to treat Parkinson's Disease or the diverse but equivalent Glaucoma medications an Ophthalmologist tries with new patients until the right one is found.

You may change a drug for a given patient because they prefer it. However, the concept of the case should not change, nor should the assessment. You activate the appropriate drug choice, but you do not delete the other possible ones from your knowledge base, which remain visible but inactive. You see redundant equivalent medications—all de-highlighted—that you select as you try each until you find the one that works best.

Should you really activate each line of Body Regions?

Some people will argue that this is the only way to do it legally. We respectfully disagree.

Let's go back to the gold standard, working on paper. Let's say that you see a patient whose physical exam is displayed similarly to the figure above, and you chart the old way, with pen and paper.

Many physicians would fully examine a patient, and after the entire visit is completed and the patient has left the room, they would document the entire objective note from memory. In many instances they would even add the patient's history and the plan of action for good measure—all from memory.

Wait a minute! How can you remember all that transpired, when it has been shown that the human mind only holds three concurrent facts within its short term memory, forgetting all the others? Of course, the reason you remember all those details at the end of a typical visit is that each of the pertinent physical findings listed above was "normal." Therefore, all they had to do was to remember "all normal except." Habits took over and wrote what was normal. In other words, they recall from habit what they normally examine for each type of problem evaluated. If a patient presents with ear pain, one may examine the head, ears, nose and throat, but probably won't examine the abdomen, unless there is a separate relevant problem in that area. So at the end of the encounter, the examiner knows 1. What was examined (because by habit the same presentation is always examined in the same way), 2. What the few expected abnormal elements were, and 3. What the unexpected abnormal elements were, if any. Of course, human errors will creep in from time to time when writing lengthy text, even using pen and paper.

What is clearly not done on pen and paper is to examine the heart, go back to the desk, write about the findings, examine the abdomen, go back to the desk and write about the findings, etc. On the other hand, the medical student does one finding at a time, consults a book, goes back to the patient, checks the next finding, etc. This is exactly what IT programmers expect you to do on the computer to justify magically making your entry legal!

With the Concept Processor, it is fast and simple: All you need to recall are the unexpected items. The expected ones—whether normal or abnormal—are written your way automatically. You never have to remember to chart your routine whether it is normal or abnormal. And of course, something is unexpected only once—the first time. The next time it joins your litany of previous descriptors. The next time you need not re-write it; you can just select it with a click of the mouse.

On the other hand, say you don't have time today to check the things you usually do for a given problem. How can you ensure that you will not write something inaccurately by mistake? As discussed on page 33, let's say for your Pharyngitis case, you usually examine the ears, nose, throat, and chest, but this morning you are busy and only choose to examine the throat. If this has happened before, you select your "notime" assessment keyword, and see the following:

Imaginary, Mary 29 y.o. Female (1515) - [Visit]

Clayton Reynolds, MD: Endocrinology

Imaginary, Mary 29 y.o. Female (1515)
Assistant: Mary Hill, M.A.
Referring Provider: William Harris MD
Adverse Drug Reactions: Penicillin

Insurance: Medicare (Plan: Advantage Plan)

Care...

Main	New Visit	Chart	Medications	Labs	Fl...

Adverse Drug Reactions Penicillin [Rash] [Propensity to Adverse Reactions] (Causing ingredient: penicillin g) (SNOMED-CT: 161591004)

Current Medications None

Assistant Note Fever, malaise, sore throat for three days

Subjective

History Of Present Illness Text inside

Past Medical History Text inside

Patient Specific Information Family History

Review of Systems

Questionnaires

Objective

Vital Signs Bp. [Empty] mmHg, Temp, [101.5] °F, Pulse [100] /min, Resp. [17] /min, Wt. [Empty] lbs., Ht. [Empty] inches.

GENERAL **Well developed, well nourished «29 y.o.» female, with general malaise.**

THROAT **Significantly erythematous pharynx without purulent discharge. No lesions noted.**

Procedures **Strep Test** (1) [5555 ()] [Low]
Strep Test was [positive]

Assessment (Acute Pharyngitis, allergic notime) [462] (Starting date: 3 Years ago)[None] [Infobutton]

Level of Service LoS with problems... [New Visit] [Specialty] Optimal 99203

Plan

Rx. ASA tabs. [-] [Dose form] [Sig one tab. Q4 hs. prn fever, pain.] #[Amount] Refill X [0] [Substitution Allowed] - Send

Temporary Exit	Dictation	Multiple Assessments	Clear	Save knowledge	H / M

Figure 33. "Notime" assessment variation of Acute Pharyngitis. Note the comma that makes the keyword terms "allergic notime" on the right invisible after you save the note. Only "Acute Pharyngitis" will continue to exist. Then you also see a General Exam, a Throat exam, and vital signs, but no other physical findings.

And if you do not yet have this "notime" assessment, then you delete each item you did not examine, like the chest and ears, by clicking on it while holding down the shift key (takes less than a second to delete). You then save your shorter case with the new "notime" assessment name for the future. There is no need to be dishonest, but also no argument to do each at a time simply because "templates that save" require it. Praxis is not a template that saves!

Yes, your habits also teach you what you will not examine under time pressure and what you document at the end of your visit. As we all know, a corrupt physician can be dishonest on pen and paper; this is no reason every honest physician should pay for it.

Yet, if it makes you feel more secure to click on every item to activate it, particularly at first, be our guest!

Saving Without Knowledge

There is a point in your use of Praxis when your knowledge base becomes so rich with close cases—after a few years of use—that you may not wish to teach the system a new keyword for insignificant changes. You simply click on the "Save" instead of the "Save With Knowledge" command, and the complete text will be part of this patient's record, but it will not be saved for use with other patients. You will not be prompted to change your keyword or overwrite your keyword.
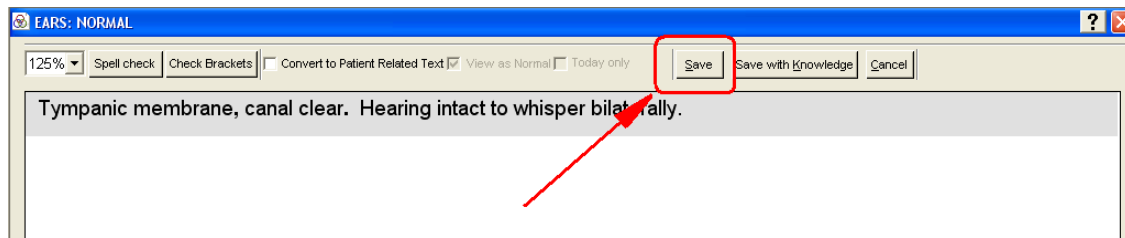
Figure 34.   Save command will not prompt you for a keyword change nor will it memorize any changes you made for use with other patients.

This feature is not recommended for new users because it disables the Concept Processor's ability to learn as you see patients. After a few years of use, however, you will find that you have almost everything you need for the vast majority of cases, particularly for all those found in the middle of your bell-shaped curve. Therefore, your additional charting becomes highly personalized. In this way, the system disconnects the engine unless you need it. You will find it works like a glider once the tow line is cut from the power plane.

Patient-Specific Information and Questionnaires

In addition to all the information derived from your knowledge, significant information is directly taken from the patient's past. Usually, this data can be entered by your assistants, and is available not only to you, but also to your fellow providers.

Figure 35.   The family history may be entered by any other provider or assistant in the clinic, although your choice to include it in your note is yours alone. The text appears in blue, signifying information that remains with the patient's record, rather than with your knowledge base. So next time you see this patient this information will once again display with a simple click of the mouse.

Unlike a template, this blue text is fully edited as free text (the inside editor is highlightable), and any changes will stay, not with your knowledge base for use with other patients, but with the patient knowledge base, available only for this patient for future visits unless changed. The Concept Processor instantly merges patient-related concepts with your knowledge-related text to generate the final progress note for that encounter.

The same method applies to Questionnaires: You create them once and have them forever. Anyone in your clinic can fill them out (see patient portal on page 159).
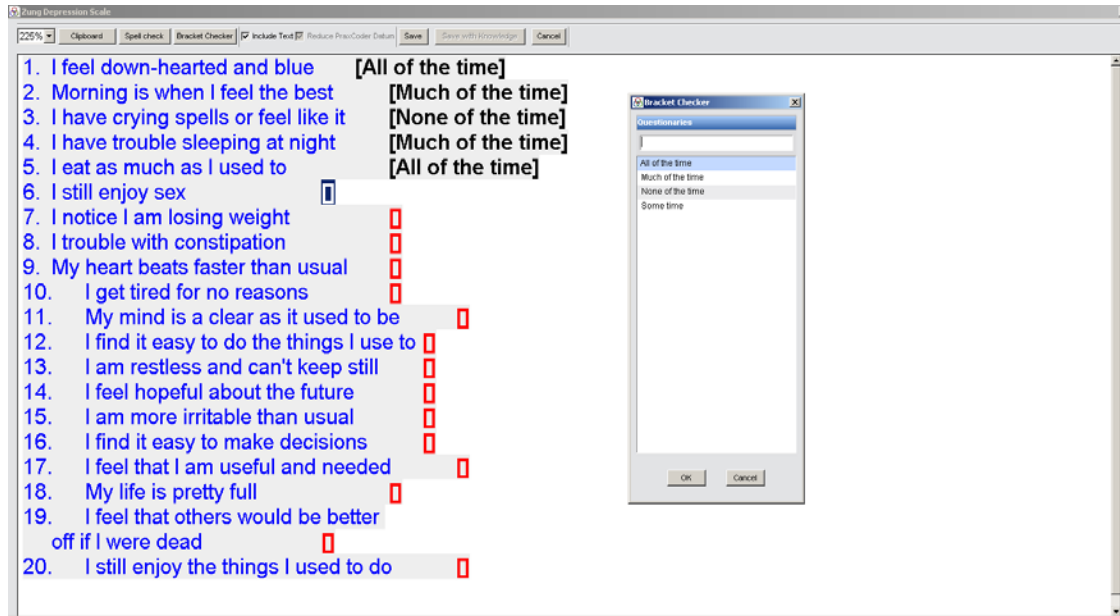
Figure 36.   Patient Questionnaires: The appropriate questionnaires are instantly brought up by your assessments appearing de-highlighted. The information itself may be filled out by anyone with the appropriate privileges in your clinic. The difference between a questionnaire like this one and the above Patient Specific Information is that the next time this patient returns, the questionnaire will again present blank and will need to be repopulated. Blue means the information is patient related and the response will not be saved for use with other patients.

The same thing can be said for vital signs and other clinical parameters, which are usually entered by your staff. This is all clinic-related information that is mixed with your incoming knowledge base text as determined by the assessment. In other words, your assessment knows how to bring this external information to life and merge it with your own. All you have to do is review the results; and if you are content, it's done!

What is the Learning Curve?

If you've gotten this far in the White Paper, your burning question must be, "How much time and effort would it take me to input my medical knowledge into Praxis?"

When we first developed the Concept Processor, 25 years ago, we thought hard about this issue and were afraid that it would take a long time to train one's knowledge to be effective. Nevertheless, we thought that if a program could help save two hours a day in charting — amounting to an average of 15 years of a provider's life— it might be worth putting in some effort to "prime the pump," so to speak.

However, when we tested Praxis for the first time, we were highly surprised: It takes remarkably little time to teach the Concept Processor your knowledge. Why this is so isn't

obvious.

Within less than a month of training for a few hours each week, you are charting fast enough that you can document at least as fast as you could write longhand. Another month of this and you are charting as fast as you could dictate, only with better quality, and a month later, you will be outstripping all forms of charting. Eventually you chart at amazing speed that then cannot get any faster—you still need to read all you write—but the quality of the documentation gets progressively better with no limits.
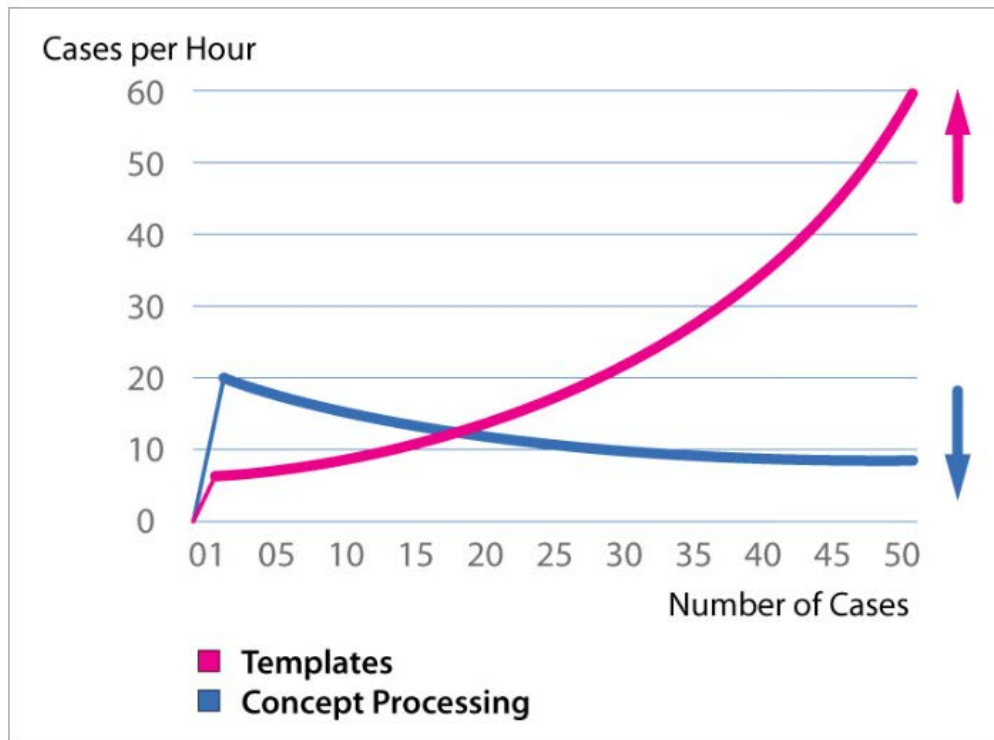
Figure 37. *Templates may appear fast at first, especially while learning, but they quickly disappoint their user. Concept Processing is experienced progressively faster and better. Quickly, the Concept Processor overtakes the template every time.*

How is rapid learning possible?

The first thing to remember is that you are not the one inputting thousands of cases inside your knowledge base; your computer is. In fact, you need not enter more than a few full cases from scratch. All the others are simple improvements on the past.

The reason is straightforward. You are not writing and editing templates, but "units of thought", which is not the same as creating an entire encounter every time.

Let's start with the words we use.
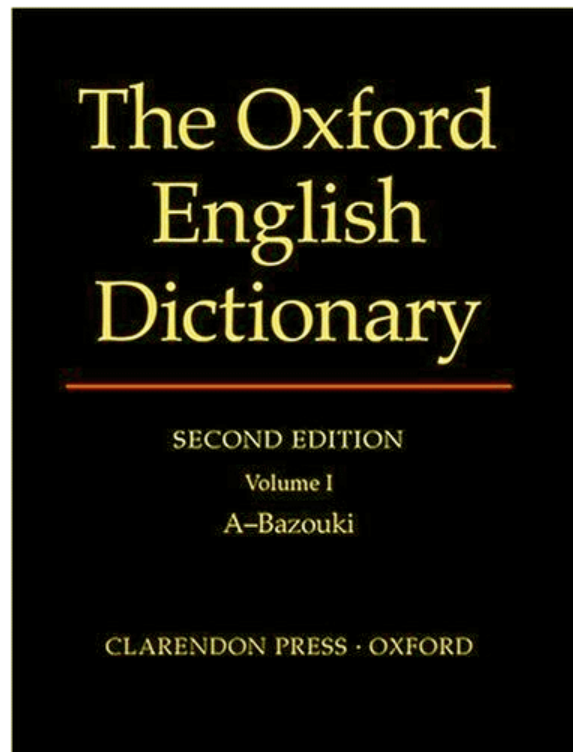
Figure 38.   The Oxford English Dictionary contains over 450,000 words, but the average college-educated adult uses only 1,500 of them!

The Oxford English Dictionary is huge—about 450,000 words long—but we use a miniscule number of those words in our daily life. Although an average college-educated adult can recognize about 17,000 words, their "productive" knowledge—words used in everyday speech—is much smaller. No two people use the same word set, but the total number of words each one of us uses in daily speech averages around 1,500—a pretty modest percentage of the total lexicon available to us. If you used 3,000 words, you would be considered very knowledgeable, even though you would be using relatively few words from your own vocabulary.

What is even stranger is that we humans do not express ourselves with words. You will no doubt agree that we do not think in letters ("w,""e,"" ","d,""o,", ""n,""o,""t", ""t","h,""i,""n,"k."....), but we don't even think in word units either. We actually think in

phrases or sets of words that our subconscious then joins together in semi-automatic patterns learned from experience. And, if we focus on clinical phrases—as opposed to all phrases—then the combination of words is even more restricted (see Venn Diagram displayed on page 18).

So when we write:

> *"Prednisone Tablets 20 mg.*
>
> *Sig*
>
> > *On day 1 take 6 tablets*
> >
> > *On day 2 take 5 tablets*
> >
> > *On day 3 take..."*

...we are not thinking about each one of these words. We are thinking, "Prednisone tapering dose", and our subconscious, which has prescribed a tapering dose of Prednisone dozens of times in the past, writes our prescription automatically. True, when you write longhand, it may take you time and effort but your hand still does it mechanically. Writing is not something we think of letter by letter or even word by word, but concept by concept.

The same holds true for a fever instruction, a laboratory order, an X-Ray request, a description of social history ("Patient does not smoke, she drinks a cup of wine during dinner..."), etc. All these are concepts that encapsulate a litany of words that you generate automatically when your subconscious is "ordered" by your conscious mind to do so.

Of course, to an observer who is not in the medical profession, what you are writing may appear very complex. In a way it is, but not for you, because you have performed the same exact dictation hundreds of times before. As many of us know from firsthand experience, it is not unusual to dictate a full complex discharge or admitting note in the middle of the night over the phone, with both eyes shut and half-asleep!

With the Concept Processor, you simply move your automatic writing from your subconscious into the computer. The computer can never beat your conscious mind, in fact, it cannot even compete, but it can surely do a better job than your subconscious, much faster and with fewer human errors.

These units of thought saved by the Concept Processor and recycled through its neural network appear on the page exactly when and where you need them. They are triggered by your own keywords—for single concepts—as well as by your assessments. As a result, after you begin entering your first complete imaginary cases—or your most

common cases—you will find yourself recycling progressively more elements from your previous entries to enter more cases, so each new case is created faster than the previous one was. Therefore, after you enter your first 5 cases, the next 50 cases take only a few minutes each to input, and the next 50 cases may take only seconds. Yes, you do have to enter hundreds of cases before the Concept Processor becomes highly effective. But you are not the one doing so; your computer is.

Take a look at the following two graphic figures.

Figure 39.   Template-based software. The faster the template works, the more inflexible it becomes and the more it gets in the way. Note the handwritten gold standard and then look at the Dictation/Transcription approach. Each option is a tradeoff of flexibility versus speed. The faster the EMR is, the more inflexible the charting. It is faster simply to type than to use pick-lists. Templates are a no-win!

Template charting also generates less accurate data for the sake of charting faster. This means that the third parties who are paying for this technology are not getting the optimal data that they have bargained for. Everyone wants to learn about best practices at the point of care, but templates are not the way.

Where is the Concept Processor in the above graph?

Comparison of the Medical Record Systems in Use Today
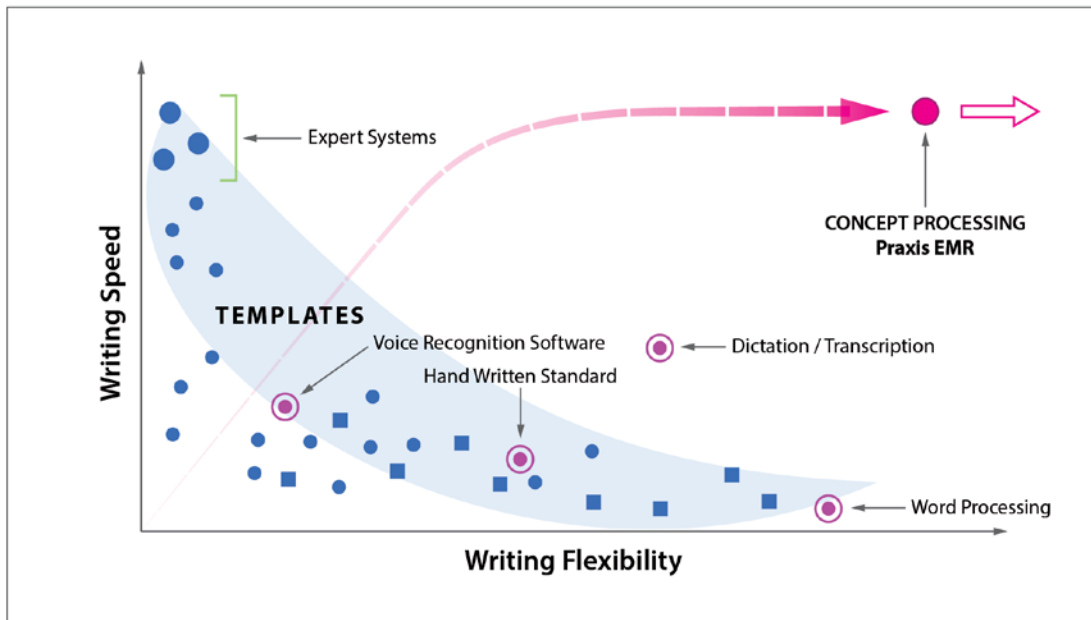
Figure 40. *The Concept Processor is slow to use at first, but quickly becomes the fastest way to chart medicine. Eventually, it stays at the same high speed, but it never stops gaining flexibility because it learns from the provider with every case.*

How do you train your Concept Processor

You start without any patients.

You start when you are relaxed, maybe sitting at home or at your desk in the office. Request that no calls be put through other than emergencies.

Then, you take a piece of paper—yes, paper still exists and is quite useful as a creative tool—and list all your common diagnoses. Try to sort them from most frequent to least frequent. You don't have to be precise at all when doing this. It works just as well when you use your imagination rather than real patients, perhaps even better.

Next, you imagine a typical patient with diagnosis number one and create an imaginary case presentation in your Praxis. Entering your first case may take a significant amount of time, maybe as much as half an hour. You can request assistance from our trainers to assist you in entering your first case. But with your second case, you will find that it takes significantly less time, even though the diagnosis may be different. This is partially due to your learning from the first case, but only partially. You will also find that starting with your second case you recycle individual concepts or "units of thought", making things

progressively faster with each case.

Figure 41.   Training is personal and done over the Internet. The trainer helps the provider "prime the pump" and teaches the use of the product at the same time.

Let's see an example. If you are an internist, hypertension might be number one on your list.

Say you write:

> *Heart: Regular rhythm, PMI 5th intercostal space and midclavicular line, no murmurs, s3 or s4..." (Please substitute this with your own description.)*

Time from start to finish: 30 seconds!

Now, say that for your second case, the imaginary patient presents with diabetes.

You go to "Heart", find the previous descriptor, and click on it. It instantly appears on the chart as before. Nothing to type. Time from start to finish: 1 second!

And the same thing can be done with fever instructions, review of systems, the prednisone tapering dosage prescription, the social history, trigger point injection procedures, etc. Each new "unit of thought" is independently saved to be reused with this

and future cases, even very different ones. This allows you to enter your cases progressively faster, until, after inputting about 50 common cases, it takes you about one and a half minutes to enter a new one. To arrive at this stage may take about 12 hours of training. But notice that the time you save is not linear, it is exponential: If you then add another hour of training, you increase by 10 cases, and with another hour you increase by 15 cases, etc.
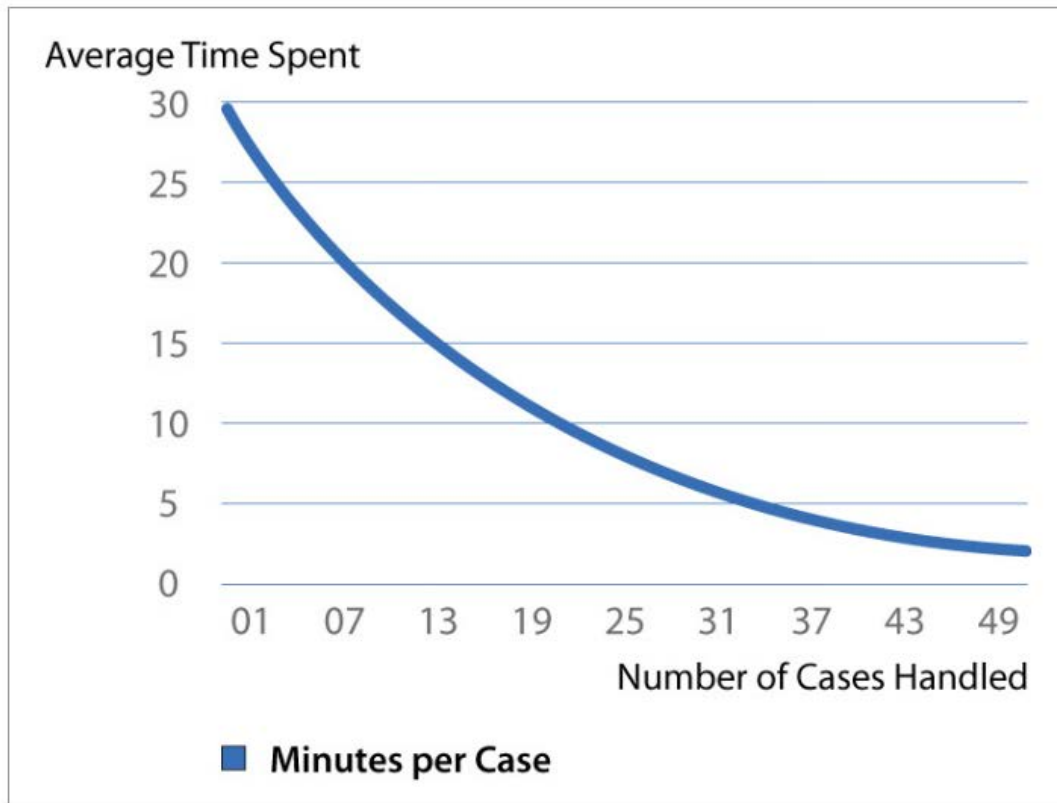
Figure 42.   Praxis learning curve, based on an average of a 5% learning increase per case, compounded.

You will see that after you enter 50 cases, you can chart in under two minutes. Then you start seeing real patients. Start with straightforward cases found on top of your bell-shaped curve first, then more complex cases, then all cases. The more cases you do, the faster and easier they get.

Is there is a limit to the speed at which you can chart?

Yes. You cannot chart faster than you can read. But as we stated earlier, you read your own writing much faster than you read anyone else's and dramatically faster than you speak, to say nothing about writing long hand—never mind typing. However, what never stops improving is the quality of your charting. You will always make minor

improvements, ask better questions, check more findings, etc. Progressively, you will begin to practice better medicine because your own writing is prompting you to think of everything for most of your cases.

And this learning process is fun—maybe even a bit addictive—because you witness your own thoughts coming back to you exactly when you need them, at the speed of your mind (see page 182).

Multiple Assessments

How does the Concept Processor combine presentations with more than one Diagnosis? More importantly, how does it parse the information for future re-use, where it is less likely that the same combination of diverse diagnoses will recur with the next patient?

So far we have been discussing cases presenting with only a single acute problem. Clearly, this is not usually the way it happens in real life. Quite the contrary; in some specialties patients often come in with a variety of separate medical problems related to more than one diagnosis. So, how does the Concept Processor handle more than one diagnosis in the same encounter?

Actually, this is an area computers handle with ease, far better than we humans do.
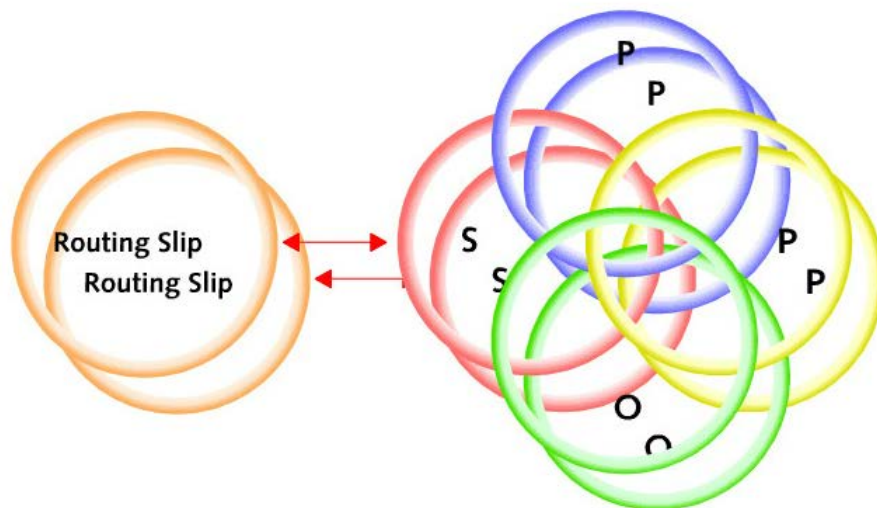
Figure 43.   *No, you are not seeing double. This is a Venn Diagram rendition of a two-assessment case. Although this may give you a headache to look at, (and this is only two diagnoses; just imagine five or six!), for computers this is easy. They love this stuff which they can handle automatically and with great ease. Indeed, computers think this way by using Venn Diagram logic (also called "Boolean logic").*

Of course, there are specific logical rules for the mixing of medical text derived from two or more different Assessments (in computer science this logic is called "the business rules"). For example, the history arriving from a new assessment is automatically brought in underneath the history arriving from the previous assessment. One text is found de-highlighted right underneath the other. The context change is usually quite obvious.
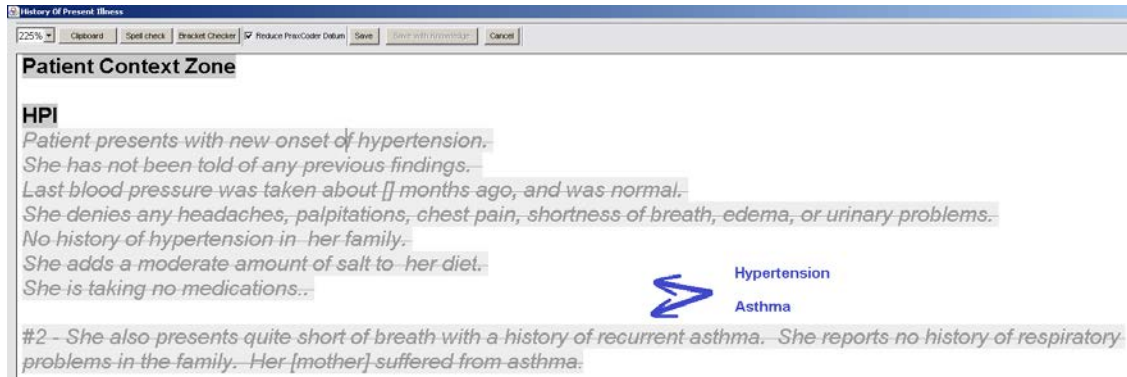
Figure 44. *"Concatenation" or addendum of history. It is derived from the second assessment and merged with the first assessment.*

The same happens with the diagnostic orders, results, procedures, and treatments. The elements are combined one underneath the other. If two or more assessments bring exactly the same element (i.e. a CBC brought in by a case of URI and another CBC brought in by a Gastroenteritis assessment), then the Concept Processor automatically keeps only one of the entries (i.e. you do not end up with two CBC orders on the chart). It works the same way for two identical drugs that repeat and for other identical orders or results.

The Body Regions present a greater logical challenge, but not one your computer cannot quickly resolve with a bit of help from you. In the case of objective findings arriving from two similar body regions, the Concept Processor actually parses identical text and, if not identical, it follows straightforward business rules: a body region from either assessment will be placed on the final note even if the other assessment does not include it; if the body region is described as normal by one assessment and abnormal by another, then the abnormal descriptor will displace the normal descriptor; and if two abnormal descriptions combine, then the Concept Processor places the identical text found within each body region text in black. Then it parses out the discrepancies between the two original texts in red, as displayed in the figure below.
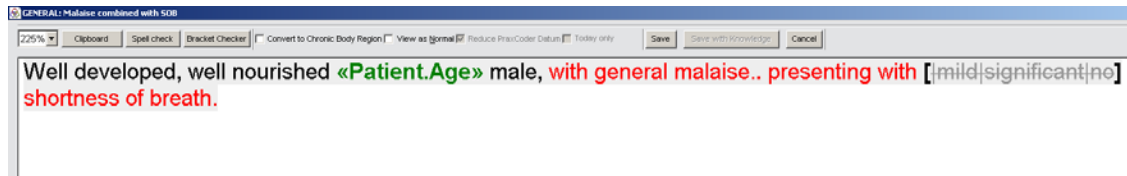
Figure 45. *The "General" body region from Acute Pharyngitis is combined with that of Acute Asthma. Note that "well developed well nourished <<34 y.o.>> male" is brought in by both assessments, whereas Pharyngitis brought along "malaise" that was not found within the Asthma assessment, and Asthma brought in the "shortness of breath" phrase not found within the Pharyngitis assessment. The provider simply reviews the resulting text and makes a minor adjustment—here all it needs is a comma fix—and it's done!*

All this may appear complex, but as mentioned, to a computer it is quite simple. It happens automatically; it is magic. And like a magic trick, you don't need to know how it works to be able to use it with ease. Just review what you have read and correct what you need to, and you are done. Computers will do the complex merging automatically, leaving the straightforward clean-up details for us humans.

Virtual SOAP Note

An interesting problem is the actual parsing of new information for use with future patients. Say you add a new element to a complex text made up of more than one assessment. How should this addition be handled so it is available in the future for use with other patients?

The answer is that the Concept Processor includes a "Virtual SOAP Note" Virtual SOAP is a separate editing window that pulls and parses the text related to any assessment of a Multiple Assessment encounter from the text derived from all the other assessments in the note.

Figure 46.   Virtual SOAP Note parsing one of the Assessments ("Asthma,#2 Cyanosis) from the multiple assessment note, so you may work on it independently, edit your knowledge, and then instantly bring it back with the rest of the note. Difficult to explain; easy to do!

Then the improved single assessment Virtual SOAP note parses back to the multiple assessment encounter window, appropriately merging with the text derived from the other assessments. Parsing this way may sound complex, but it is easy for the computer. Additionally, this method forces you to think about any patient problem separately. This follows the ideas beautifully laid out by Doctor Larry Weed in his Problem Oriented Medical Record, written 50 years ago (see page 168). It helps you think of that single problem separately from the other conditions and review what may be needed or missing today, with a single click of the mouse!

Adding a new item to multiple assessments

Finally, if you add new elements to a multiple assessment case, a linking window appears to assist you in selecting the appropriate assessment to link. This approach parses your Routing Slip automatically by presenting the correct CPT codes with the correct ICD-9/ICD10 codes at the end of the visit.

You link the appropriate ICD-9/ICD10 or CPT once, and the next time, the appropriate ICDs and CPTs appear automatically every time the assessments do.
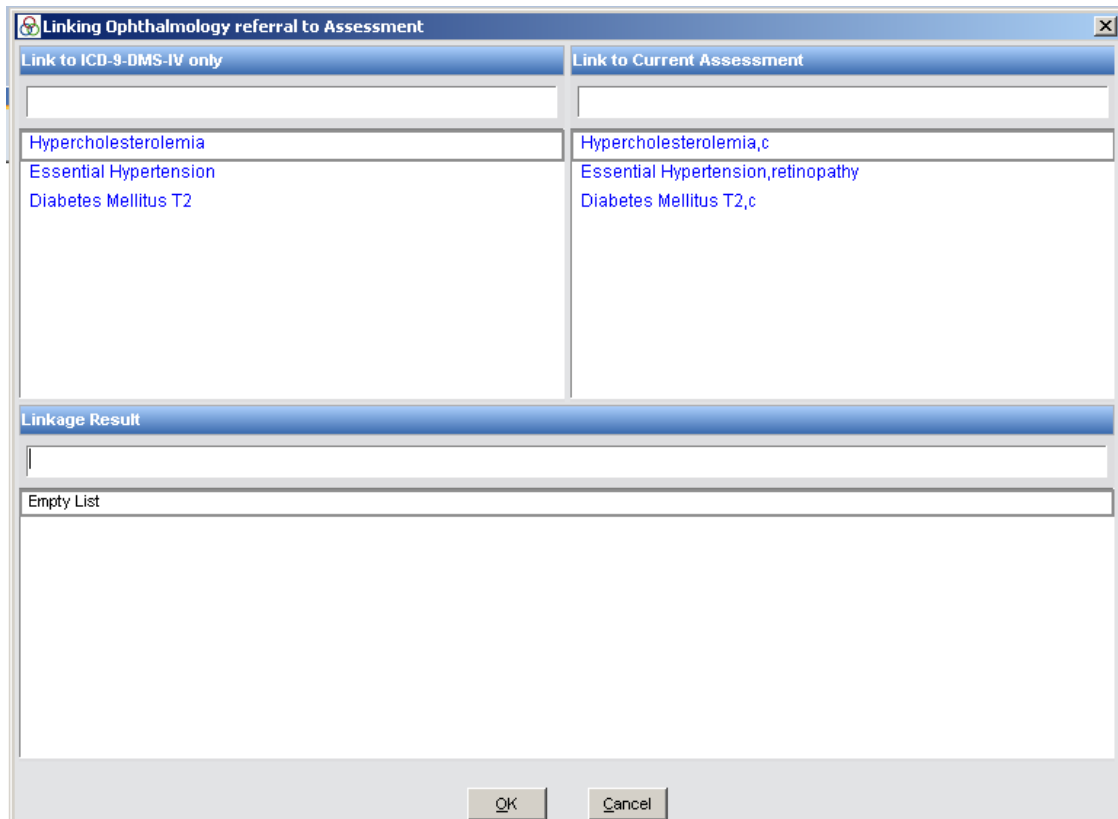
Figure 47. Here you see an Ophthalmology Referral (top line) being linked to one of the assessments on the right-hand panel.

Essentially, you are being prompted to explain why you wish to refer your patient to an ophthalmologist, by linking to the appropriate assessment. Linking the Ophthalmology referral to the Diabetes Type II assessment on the right (by clicking on the diagnosis) ensures that the next time you see another patient with this kind of assessment, the system will remember to bring along the referral as well. It also links the CPTs to the ICDs for purposes of billing this and subsequent visits.

No idea what's wrong? The Virtual Assessment

What if you have no idea what is wrong with your patient? How can you start with an assessment when you don't even have a history?

We are not referring here to cases where you simply change your mind about what may be going on with your patient. It is quick and easy to replace one assessment with another if you change your mind about what is wrong because you do not waste any time writing it. You simply switch one set of words for another by flipping the assessments. The switch is immediate, and all the new text appears instantly.

The problem here is different. What if you cannot even start? What if you don't even have a diagnosis in the first place? This is not at all uncommon. How can you possibly start with an assessment when you don't yet have a diagnosis? And if you don't have a diagnosis, how can you take a history using the Concept Processor, which works backwards? It would seem that the Concept Processor would work only for those cases where you know what's wrong from the start, but not for cases where you are stumped, where you have to do some thinking—those instances where you must take a history simply to guide yourself in the right direction.

Actually, these cases are just as easy to document. You can use the Concept Processor in all cases, even ones where you have no initial idea of what may be wrong to start with.

If we don't start with the history, what do we start with?

Remember that we defined the Praxis Assessment as "your personal reason for diagnosing, treating, or thinking about a case the way you do." An assessment is ***not*** a Diagnosis.

Praxis works with two kinds of assessments:
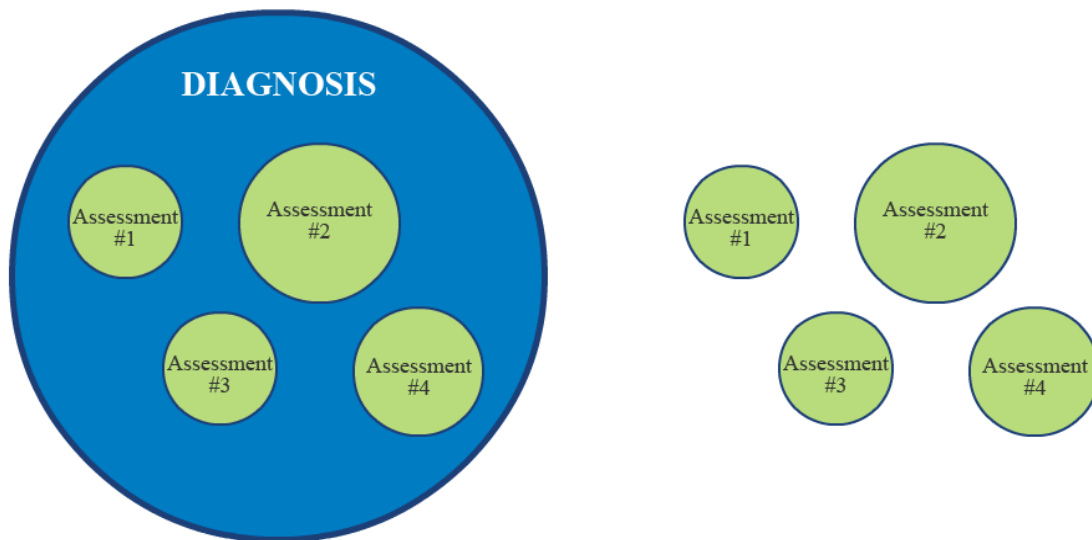
Figure 48. *Assessments come in two flavors: Those on the left are subsets of the ICD Diagnosis, and those on the right stand on their own. We call them Virtual Assessments. They do not include a diagnosis.*

Let's see an example.

A patient presents with "a cough." Yes, that's all you are told by your nurse when the patient first arrives. What's your assessment right now, before you even take a history?

Exactly! It's "Cough".

Now "Cough" is not an assessment in medical jargon—it is known as the Chief Complaint—but it is a Praxis Assessment, because it is "your reason for thinking or doing what you will do next".

So we select the "Cough" assessment from the Assessment list, and we see that it is in brown.
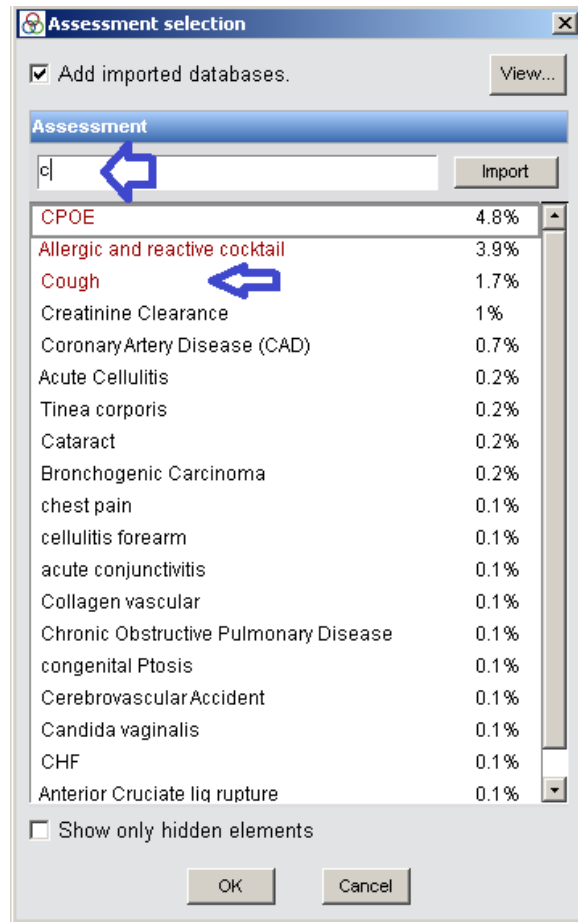
Figure 49.   Typing "c" finds our "Cough" assessment. Note that "Cough" is in brown, meaning that it is a Virtual Assessment.
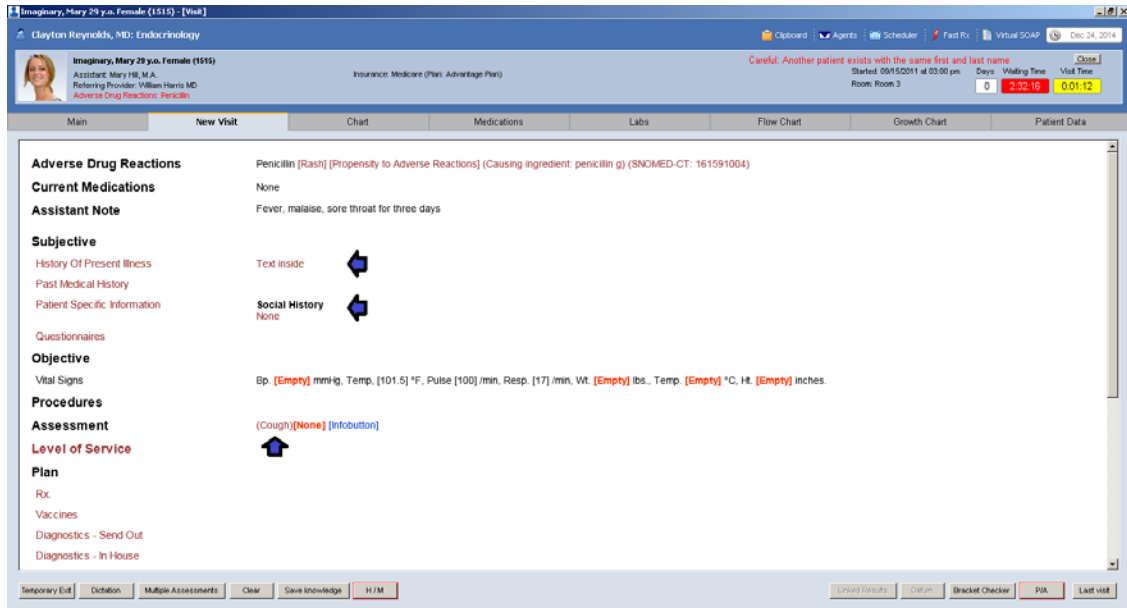
Figure 50. *"Cough" comes in brown, the "invisible" color. Note that the History of Present Illness indicates that hidden text has appeared inside it. Also note the new Social History. Neither was present before we selected the "Cough" assessment.*

By invisible, we mean that you will see the "Cough" label, but no one else will. The word "Cough" is never published in the patient's encounter or printed out. It is a Virtual Assessment for your eyes only. Nevertheless, it works like any other assessment. This virtual invisible assessment brings in the other elements of the SOAP note that you previously stored, including a full History of Present Illness related to cough, and a Social History—which covers issues like the smoking history.

Now when we click on the History of Present Illness label, we see:
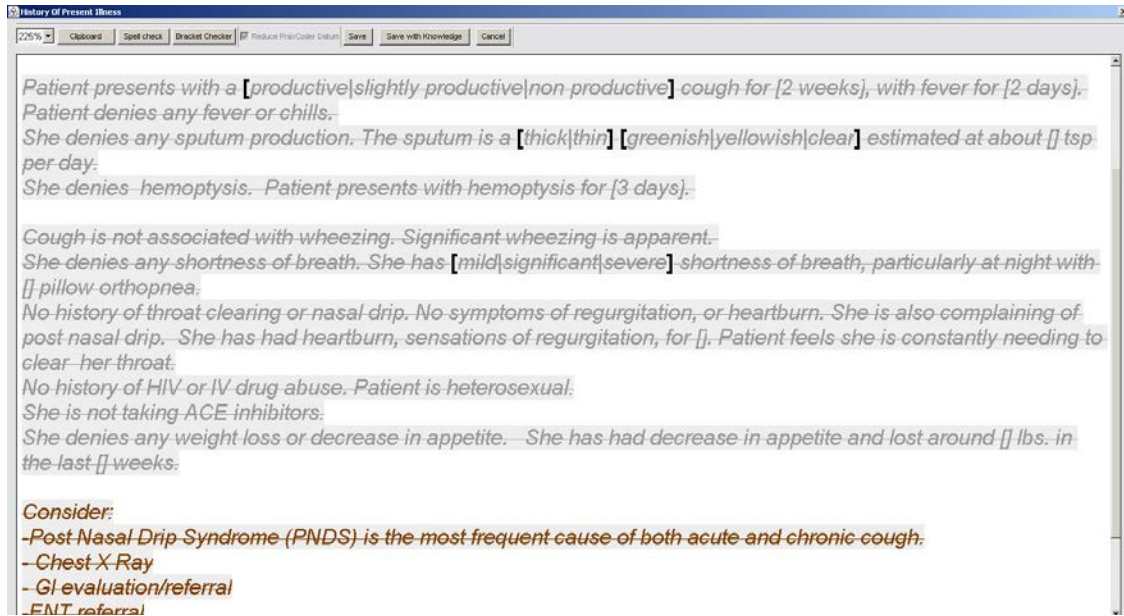
Figure 51.   History of Present Illness related to cough. Please note the mutually exclusive statements as explained earlier ("fever for [2 days]. Patient denies any fever or chills"). These you may select appropriately. And the material in brown displayed at the bottom is invisible. It is meant for your eyes only.

This is the History of Present Illness related to the "cough" Virtual Assessment. You may improve on it at any time—when you are with your patient, when you are reading about the subject, when you attend a medical conference and learn something new, or whenever you tell yourself that you should recall something about taking a history on cough. Your Praxis progressively gets better at taking your history related to cough, until you are fully satisfied with your history (maybe you are the type that is never satisfied— good for you—then you simply keep improving it for life!). As previously explained, the mutually exclusive statements **do** allow you to select the correct symptoms. Note the reminders disguised as additional symptoms, such as "...no history of HIV or IV drug abuse..." and "...She is not taking ACE Inhibitors." How often do we forget to ask these kinds of questions of patients who present with a cough?

Right below this history, you see a checklist in brown color. It is invisible from the world. It will not be published with this patient even accidentally. Yet you will always see it whenever you select "Cough" for any patient who presents with a cough of unknown etiology. It acts as a self-reminder, and you can quickly add any other ideas you wish to consider when evaluating this patient. ("...should I get a GI evaluation?...")

Let's say that our patient complains of a productive cough, without hemoptysis or shortness of breath, for 6 weeks, and that she has lost a significant amount of weight. We learn from the smoking history (Social History) that she is a heavy smoker. After taking the history above, we suspect a Bronchogenic Carcinoma. We are fortunate to have X-Ray equipment in house and order a chest X-ray which discloses a 4 cm lesion in the left bronchus. We make the presumptive diagnosis of "Lung Mass".

Now we simply add the second assessment of "Lung Mass" the way we have shown for multiple assessments. In fact, it is a multiple assessment, even though the first assessment does not include a diagnosis; the first assessment label in brown simply disappears from the note after saving. This is the rest of the related information about the lung mass. Normally, this new assessment may bring along its own history as well. For example, in a case of "Lung Mass", a thorough history of lung cancer can be added, which we may or may not wish to use on the patient the first time. Here we prefer to leave the history alone as the patient may be apprehensive, and we do not wish to bring up the "C" word.
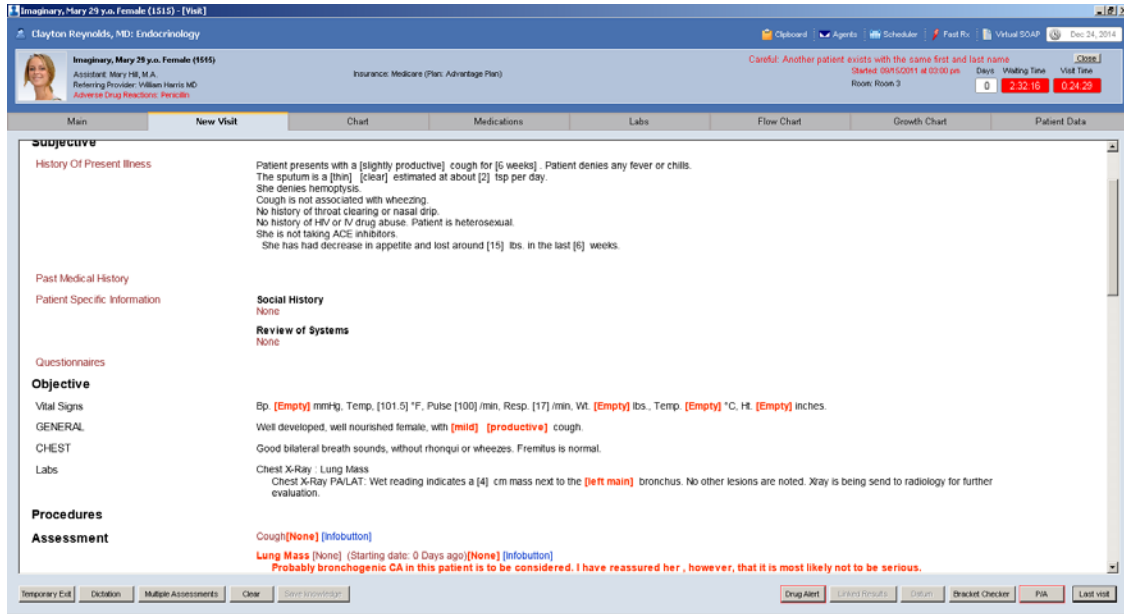
Figure 52.   Upper part of the finished note. Notice how the second assessment of "Lung Mass" appears. The assessment "cough" will simply disappear from the note. It has served its function.
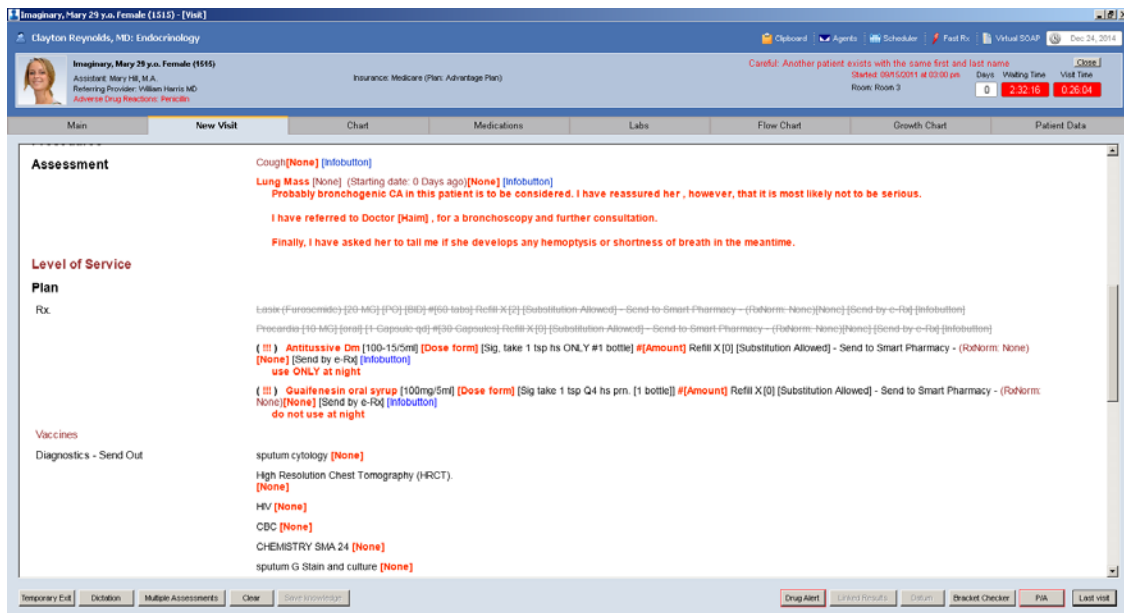

Figure 53.   Lower screen of the same note shows the initial orders, including a chest medicine referral for possible bronchoscopy. It is all generated at once.

You can see that starting with a mysterious cough, the entire case unraveled "Gestaltically", or backwards, the way our minds work in real life. Of course, you need to review and edit all this text. But, as we have stated before, reviewing and completing details is much easier to do than typing the entire text and forgetting critical things along the way.

So, any time you are stumped, you search for the closest appropriate Virtual Assessment or create one on the spot. You take a thorough history and do any preliminary examinations or tests you think may be helpful to figure things out. Then, you save all the improvements with the Virtual Assessment you created or edited, then bring up your second assessment, and continue with your case as before. With each virtual assessment case—such as an undiagnosed cough, a fever, diarrhea, abdominal pain, chest pain, back pain—you generate more related symptoms, consider more possibilities, read on the subject matter, and continue to improve your history. And every time, you stop the process as soon you as you figure out what you will do today, and save this part of the knowledge base with your virtual assessment. Then you add the second or final assessment as usual and finish your case. The more you work on the virtual history and initial findings, the better the quality of your charting and the medicine you practice. This method works for pretty much any condition, symptom, or presentation, no matter how mysterious or complex it might seem at first. Psychiatrists love this approach for their patients ("Virtual Initial History - Depression").

Virtual assessments may also be used to simultaneously select disparate elements that you tend to link together most of the time. Some examples include your standard physical exam, whose normal body region findings may appear with one click for everything rather than a single click for each one of the Body Regions, a large set of medications that you review together, or your list of frequent laboratory orders. Once the elements are activated and a final diagnosis selected, they can be added to a new diagnostic related assessment. Next time, simply selecting that new diagnostic related assessment will instantly bring up the entire text once again without having to resort to your original virtual assessment.

Linking documents to your real and virtual Assessments

By the way, at the bottom of the cough assessment, we see an agent (more on agents on page 125). When we click on it we see the following window.
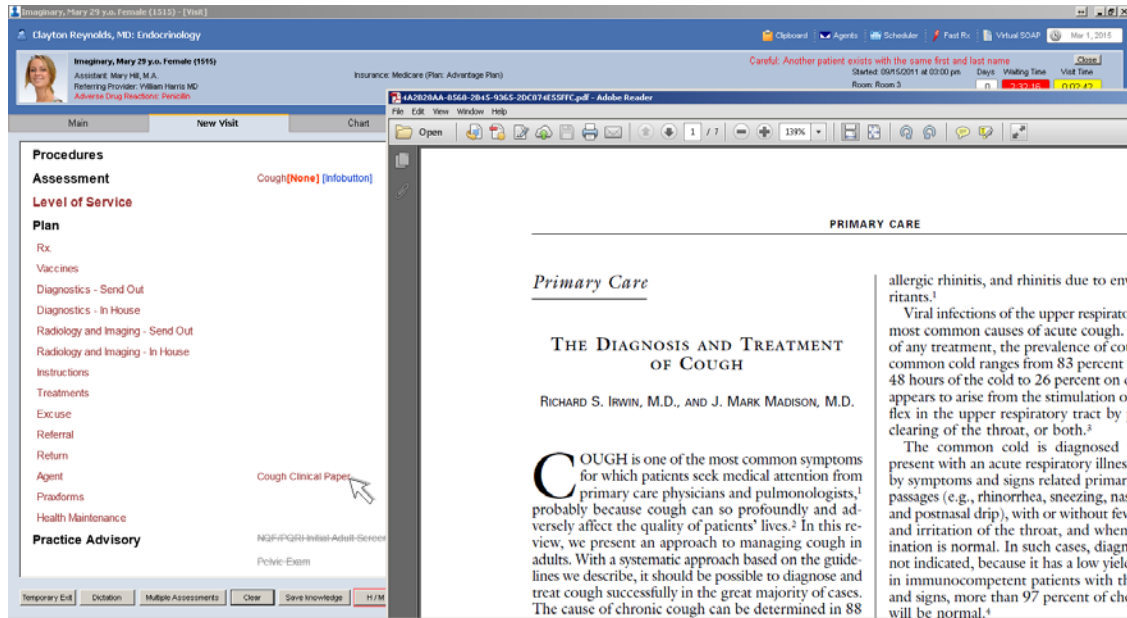
Figure 54.   Clicking on the Cough Clinical Paper Agent, opens a journal article stored with this assessment.

You may link all your medical journal articles, movies, and other files to both virtual and real assessments and then find them with ease when the occasion demands it. While waiting for the X-Ray we could have been reviewing it. Why keep these things where no one can find them later? One client links a video of himself starring in a diabetic education class. He clicks on it, and leaves the room, returning 20 minutes later to answer questions from the patient!

The Chronic Assessments

What about the patient who presents with ten medical problems?

They are the most common types of patients presenting to several specialties in medicine, such as primary care. In some primary care practices, the number of patients returning with several chronic problems for follow-up care surpasses 80%.

Although the multiple assessments resolve the problem of a patient presenting with more than one acute condition, there is a much faster and more accurate method available for the patient with a "shopping list" of medical conditions. Since the creation of a single assessment case is so quick, doing a multiple assessment case does not take much longer. You add each assessment one at a time, and then edit the whole text at once—much easier than writing the whole thing from scratch. This works well for two or three diagnoses, but what about the patient who has ten?

The mental mechanism used with the patient that presents with chronic assessments is

different than it is for acute assessments. The recurrent patient with multiple chronic conditions most often does not present with diagnostic problems. Rather, his or her care involves management issues where we must review three areas:

1. What are we supposed to ask our patient today?
2. What are we supposed to check on our patient today?
3. What are we supposed to do for our patient today?

This is exactly what the Chronic Assessments handle with ease. Medical errors are far more common when performing routine tasks than when seeing unusual cases, and thus the returning patient with several chronic problems presents significant clinical risks, particularly in the area of health maintenance.

Doctor Elisha Atkins at the Yale Medical School used to say that if a patient presented with more than three acute diagnoses, he or she would probably be dead[iv]! What he meant, of course, was that your typical recurrent patient may present with twenty problems; but of those, perhaps one or at most two may be acute, while the remaining 18 remain totally stable and unchanging.

Therefore, for note generation purposes, the Concept Processor divides the clinical chronic assessment as a Praxis chronic assessment that never changes, plus perhaps one or more acute assessments that you add to the mix as needed. The acute assessments may be added to account for exacerbations or complications of any the present chronic conditions. For example, a patient may present with a case of chronic asthma that when followed up requires checking for routine issues. And then from time to time, the patient may also present with acute exacerbations of asthma that must be dealt with separately. You add an acute assessment to the mix and handle normally.

So let's look at how the Concept Processor handles these twenty perfectly stable chronic assessments at extraordinary speed with great accuracy. Let's first look at a single chronic assessment, and see how it differs from its acute cousin.

The interesting characteristic of the Praxis Chronic Assessment is that it displays two presentations or personalities: the first time you see your patient with that chronic assessment and every subsequent time. The first time you see your patient, the Chronic Assessment behaves almost exactly the same as its Acute Assessment cousin. As soon as you select the Assessment, a full History of Present Illness, a relevant Physical Exam, Procedures, and Plan elements all appear at once, including all your prescriptions. So far, the Chronic Assessment is in no way different than its acute counterpart, except for one crucial difference. The chronic assessments save in the chart differently than its Acute Assessment cousin. Your Chronic Assessment appears in blue and orders itself to automatically return to this patient's new encounter note generator the next time you see your patient. In other words, the chronic assessment stays with the patient in future visits.
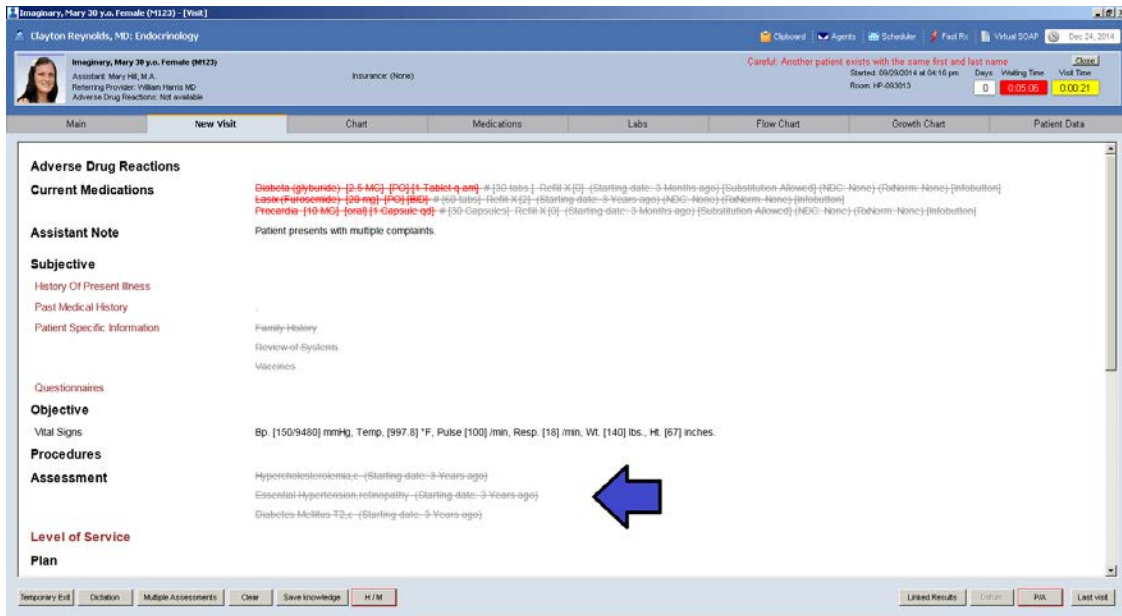
Figure 55.   The next time the patient returns to your practice, her three chronic assessments make their re-appearance at once, but they come back de-highlighted (inactive). You decide whether any of them should be addressed for this follow up visit, by simply clicking on each label to activate it. In fact, all three may be selected at once with one click, generating your complete note instantly. In this manner, a patient presenting with 20 chronic diagnoses may be charted with one click.

Secondly, all the text entered under the Body Regions becomes chronic unless you indicate otherwise. This means that any abnormalities you describe for this patient under Body Regions will be assumed to persist over time and will return with this patient in the future. So if you state that the patient presented with a mid-systolic murmur at the apex today, then your patient note will contain that exact murmur next time, unless you indicate that you do not want Praxis to save it.

Of course, your objective descriptions on acute assessments do not return. Neither does the history. This approach is definitely not the same as "cloning" or copying the previous encounter, a horrible method that some EMRs use. Interestingly, your colleagues will see their own generated chronic text, which may be quite different from yours. You will nevertheless see your own chronic findings return with your patient every visit. We showed you how the Concept processor handles chronic findings on page 54.

With the clinical history, a different process takes place in chronic assessments. The History of Present Illness (HPI) disappears altogether after the first encounter with your patient. Yes, you always see the history you took last time in the previous encounters area of the patient's record; here we are referring only to the current text generation. The HPI comes in empty. Yet, the initial history of present illness has not disappeared altogether from your knowledge base. It will return as before, but only for use with ***other new patients*** presenting with the same assessment for the first time, never for follow-

ups. This is what we mean by the Chronic Assessment having two personalities. Cloning the History of Present Illness visit after visit is not only frowned upon by third parties, Medicare in particular, but it is simply bad medicine. You certainly do not wish to clone your history of present illness over and over again once you have described it the first time. Yes, when you see other patients for the first time you will see that HPI again, but not for your follow up patient. For follow up the HPI will be totally empty.

The Evolution

Instead, a new SOAP Element makes its appearance during the second and subsequent visits. It is called "Evolution", or "Transitional History", and appears initially entirely inactive and de-highlighted. You focus on the Transitional History and highlight whatever is appropriate for that visit.
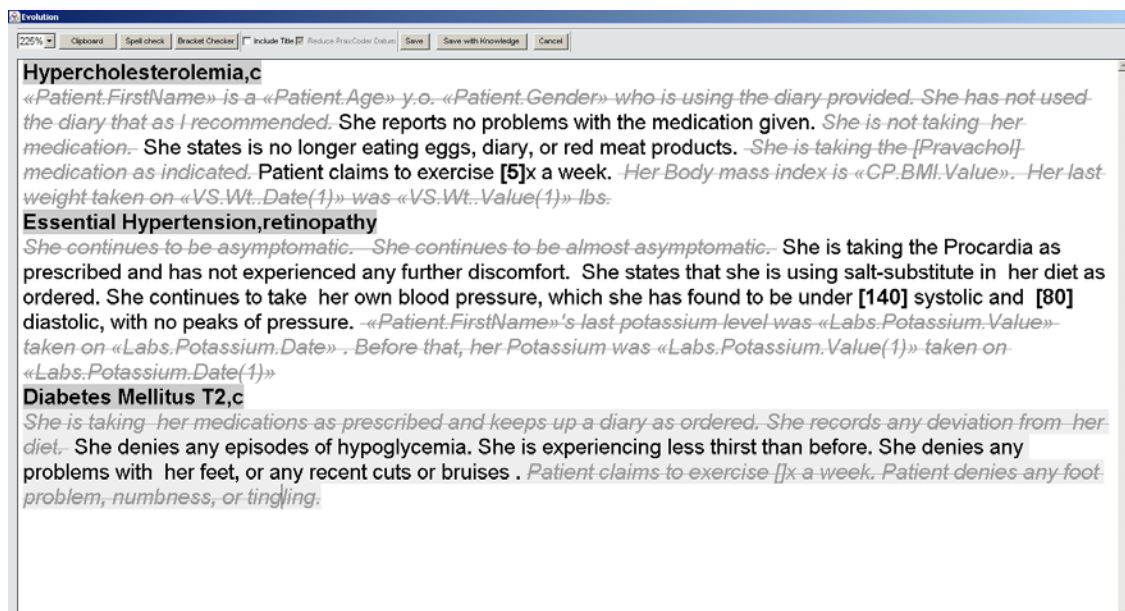
Figure 56.   The Evolution: The text seen above has been purposely shortened with this display to show how the different assessment-related symptoms combine to make up the transitional history for this patient. In real life, each section of this text could be longer than a page. Note also the "checklist" aspect of the note. As you select each appropriate item you are being reminded to ask that question.

As in the case of the HPI and other SOAP elements, this is truly a checklist in disguise. You click on the phrases that you wish to activate for this encounter, and they are immediately highlighted.

The countless possible combinations of relevant symptoms—relevant to you—make each history you take quite focused and yet unique. Yet you can never forget to ask all the important questions, which leads you to practicing better medicine. ("Mary, any problems with your feet; do you have any cuts or bruises?"). If you think of any new symptoms to ask about, you enter it here and have it for the future, and not just for this patient, but for

any patient with this condition. Because you are also improving the text as you see other patients with these same conditions, your evolution progressively improves until it becomes outstanding every time; it always gets better.

On the return visit, you will see the values you entered within brackets for this patient the last time you saw her. And if you see a different patient with this same condition, the highlighted text and the values in the brackets for that patient will be different. And a different provider seeing your patient will have a completely different text than yours in the editor. What this implies is that the Concept Processor not only stores information per patient, but also per provider. It sounds complicated, but, again, you don't need to understand how all this works to use it effectively. You simply see that the text appears magically highlighted or de-highlighted and that the bracketed information appears in red for you to review and edit if necessary.

Underneath each Assessment label you will see the Management Editor, so you may add a discussion or plan for each condition as you see fit. This editor works exactly like the one under evolution, so you may adapt your comments to each condition while reviewing what you entered last time.

Procedures

Assessment

Hypercholesterolemia, c [272.0]   (Starting date: 3 Years ago)**[None]** [Infobutton]
     With a BMI of «21.9» kg/m2 and a weight differential of «0» lbs. I [am not too] concerned. «Mary» does a great job with her nutrition. We discussed the metabolic syndrome and how it affects people over time.
Essential Hypertension, retinopathy [401]   (Starting date: 3 Years ago)**[None]** [Infobutton]
Diabetes Mellitus T2, c [250.00]   (Starting date: 3 Years ago)**[None]** [Infobutton]

Figure 57.   The Management text is shown underneath the assessment label of Hypercholesterolemia. It is highlightable in the same manner as in Evolution. You reach it simply by clicking on its title.

As complex as all this all sounds, it is not something you need to be concerned with at all. We are simply looking under the hood. During your encounter, all this is magic. You read your generated note, edit any changes by activating any relevant symptoms, type any new symptoms that didn't exist in the past, and you are done.

Health Maintenance on the Fly

Perhaps the most interesting part of the Chronic Assessment can be found under the Procedure and Plan elements. At first glance, the follow-up note may be disconcerting. Unlike the acute assessment note, you will see nothing there—no medications, no laboratory orders, no procedures, no treatments, and no referrals. The Procedure and Plan elements return totally empty.

Yet, if you were to select this same chronic assessment with a new patient, the procedure and plan elements appear once again. How strange!

Why is the follow up empty? Well, your follow-up encounter does not assume that any of those elements entered the first time you saw the patient will be necessarily repeated for this visit. It is a bit more subtle and more powerful.

Let's take a look.

Say that on a follow-up encounter you order a referral to an ophthalmologist for a patient whose chronic assessment is "Diabetes Mellitus II." As soon as you link this order to your Diabetic Assessment, the system knows that the Diabetic Assessment is chronic and instantly displays the Health Maintenance object, prompting you to establish recurrence.
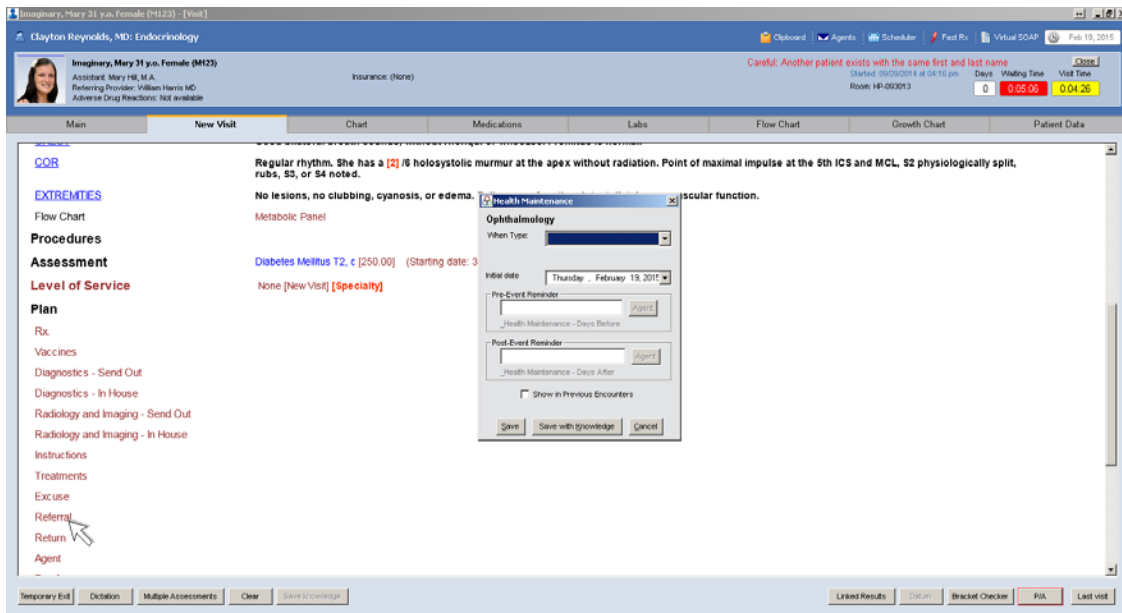
Figure 58.   This image displays the moment just after entering "Ophthalmology" under Referral. Note the sudden appearance of the Health Maintenance Object, labeled "Ophthalmology." All the Procedure and Plan elements appear empty, even though they were created for this Assessment during the first encounter.

The Health Maintenance Object prompts you to select the frequency of repetition for the ophthalmology referral you are ordering today. In this case, it is asking you to state how often you wish to repeat this referral. If you enter "once a year," your patient might be seen by you 10 times this next year and nothing at all will happen; the order will simply not appear all year long, but the ophthalmology referral will again re-appear for this patient, de-highlighted, and ready to be activated with a simple click of the mouse.

Figure 59.   In exactly one year, you will see the ophthalmology referral appear inactive (de-highlighted) on this patient's record. All you need do is click on it and it happens.

This de-highlighted entry appearing on this visit simply reminds you that the year is up and that your patient should be referred to the ophthalmologist once again per your own directions. It will also generate your entire referral order if you activate it. There is nothing for you to do except confirm your own request from before and click on the de-highlighted line. Praxis gets it done for you.
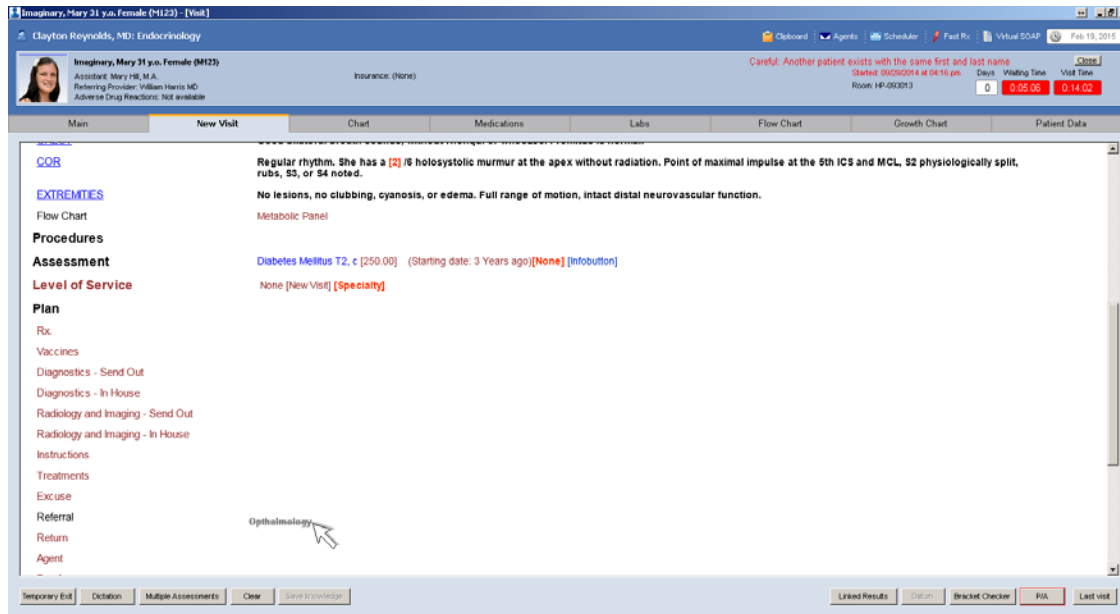
The remarkable behavior of the Chronic Assessment is that the next time you see a different patient with this assessment; the system will prompt the same referral to ophthalmology once a year as well.

You may even instruct the health maintenance editor that if the patient fails to return in a year, an agent will be automatically sent to your front office to have them call the patient (see our discussion of agents on page 125). All this, including the patient reminder, is automatically recalled for future use with other patients who present with the same assessment.

In conclusion, your Chronic Assessment does not link to your order or medication directly as Acute Assessments do, but it does so indirectly via the Health Maintenance object. It is the Health Maintenance object that schedules the presentation of a given chronic prescription, procedure, or plan element, but only at the right time. This may be every visit, every three months, or every five years; but once you set it, it creates the same reminder for every patient who shares this assessment. In other words, you are charting in three dimensions, where the third dimension is time. After a while, the system anticipates what you should be doing for your returning patient today, and, of course, it learns everything from you.

Note that the dosage found with the returning chronic patient is not your most frequent dosage— as it is with acute assessments—but *your patient's* last dosage, unless you change it.
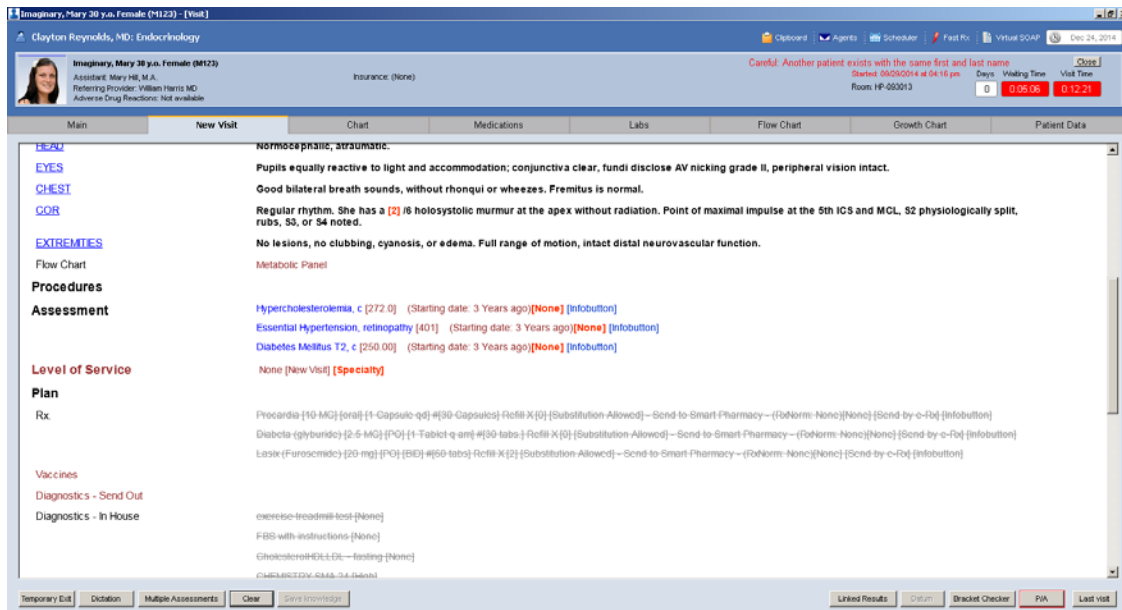
Figure 60.   For a patient with chronic problems, the encounter is generated instantly. You can use it to help you remember the history you must take, the abnormal body regions you must re-examine, and the procedures or treatments you have scheduled for today.

Essentially, your charting is often faster for the patient who appears with a shopping list of medical problems than it is for the "normal" patient who presents with a single diagnosis. You simply use your chart as a checklist, so you don't forget to ask the right questions and do all the necessary tasks.

Conclusion: The Proof of the Pudding

In this section, you have seen how the Concept Processor speeds up charting and improves documentation—something that template-based EMRs simply cannot do. You have also seen how as a result, this unique technology uses your own note as a checklist, decreases clinical errors, improves the quality of medicine you practice, and lowers your stress level. Finally, you have seen how you chart not only in the here and now, but in the future. In fact, you are using the chart for something far more useful than a dead record. You are using it as a medical tool to help you practice better medicine faster.

Concept processing is not a theory. The two graphics charts below are taken from a study of EHR physician satisfaction from the American Academy of Family Physicians (with more than 100,000 plus members). The results speak for themselves.
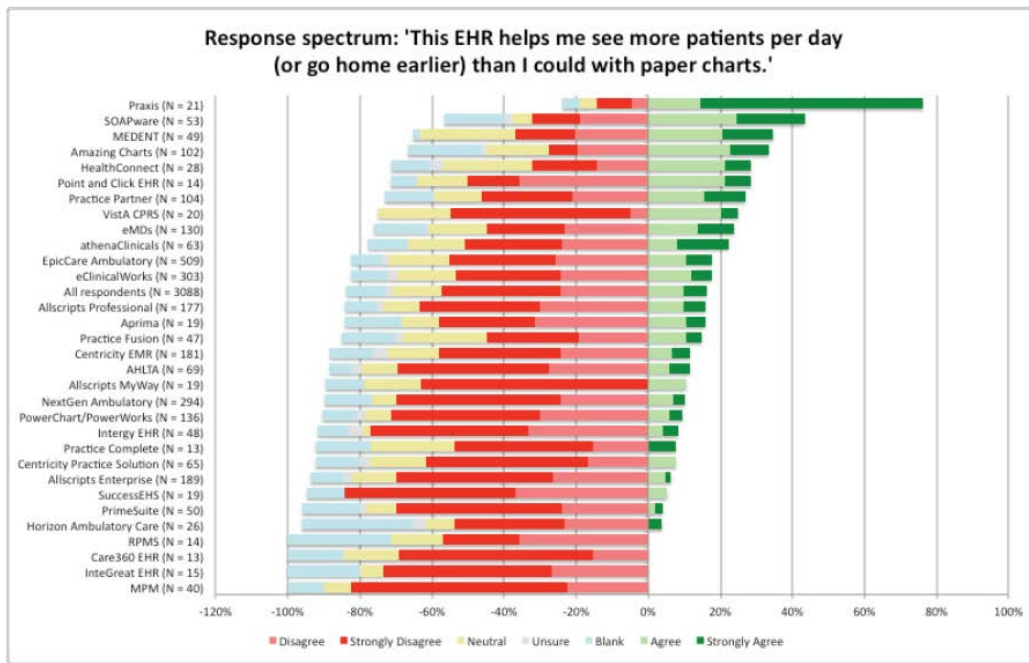
Figure 61.   Source: American Academy of Family Physicians- Family Practice Management Journal. This image shows that Praxis saves a significant amount of time. The vertical midline separates the degree of agreement with the above statement on the right, from the degree of disagreement on the left.

Response spectrum: 'This EHR helps me avoid making mistakes.'
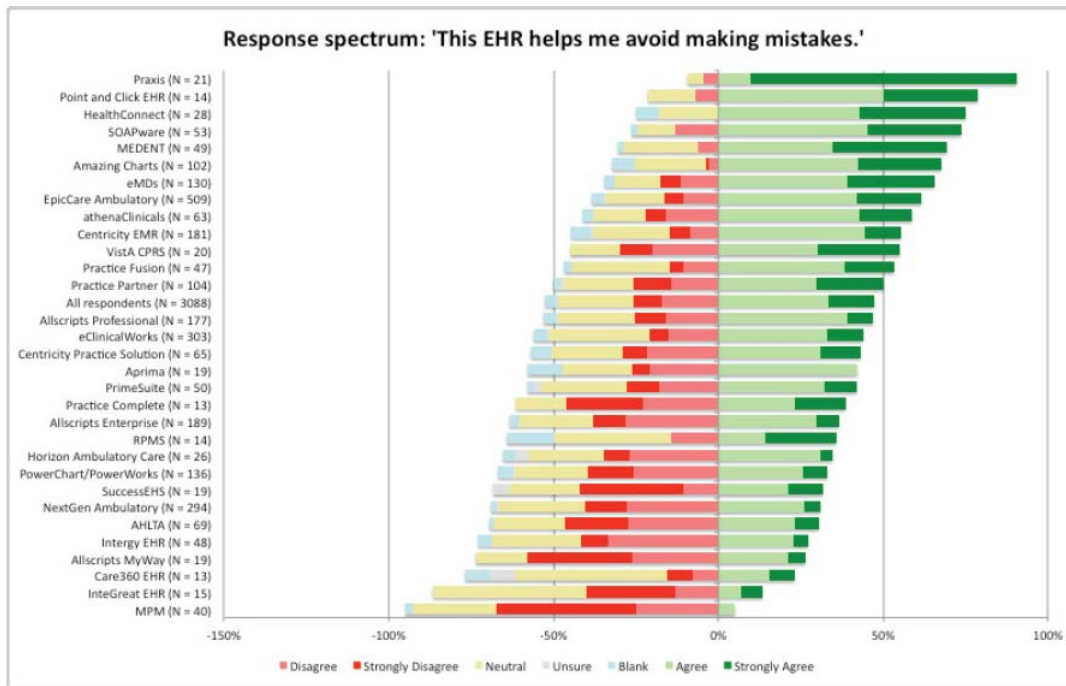
Figure 62.   Source: American Academy of Family Physicians - Family Practice Management Journal. Praxis helps avoid medical mistakes. Praxis is the only EMR that doesn't use templates.

These two reports above may seem contradictory. If the generation of the note is so much faster, one would expect it to generate more errors that slower systems. We hope you have seen why this is not the case. On the contrary; not only does document generation get faster with time, but it progressively decreases medical errors.

You haven't seen anything yet!

As we will discuss in the rest of this paper, concept processing opens many other doors in medicine—other than the effective charting—and many more are being developed with this technology for the future. Unlike templates, concept processing works with your mind; not against it.

The Knowledge Exchanger

Here is an interesting question: Is there a way to transfer the knowledge of a given provider to another provider without it being a template?

The answer is clearly *yes*, and you have already experienced this. This is what books are about. The knowledge base from another provider is something temporary, something that displays in the background. It may be perused or borrowed by you at your pleasure; it is something that teaches but does not interfere or micromanage your practice. In short; it is not a template.

Let's use Venn Diagrams to explain this unique knowledge-transfer approach.
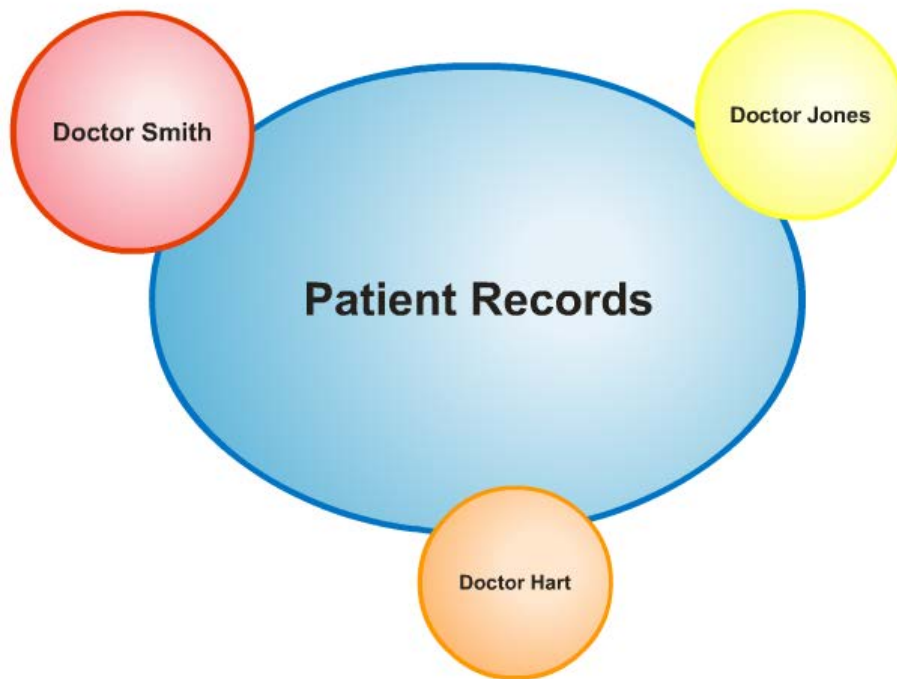
Figure 63.   Venn Diagram: The Concept Processor consists of n+1 databases where n is the total number of providers sharing the EMR.

For a clinic with three providers, four databases are created, with one general HIPAA-compliant database that stores all the patient records. This shared database interacts in real time with the different knowledge bases of each independent provider, who each have their own unique way of charting and practicing medicine.

Let's compare the above diagram with templates:
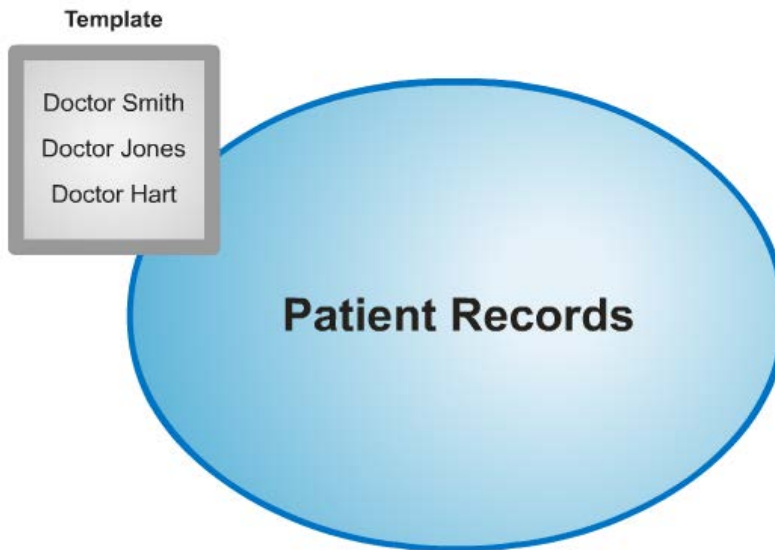
*Figure 64.   Templates consist of two databases—or at most one database per specialty—
containing identical information, forcing all providers to chart and practice the same way.*

So, how does the Concept Processor transfer knowledge from one provider to another?

Simple:
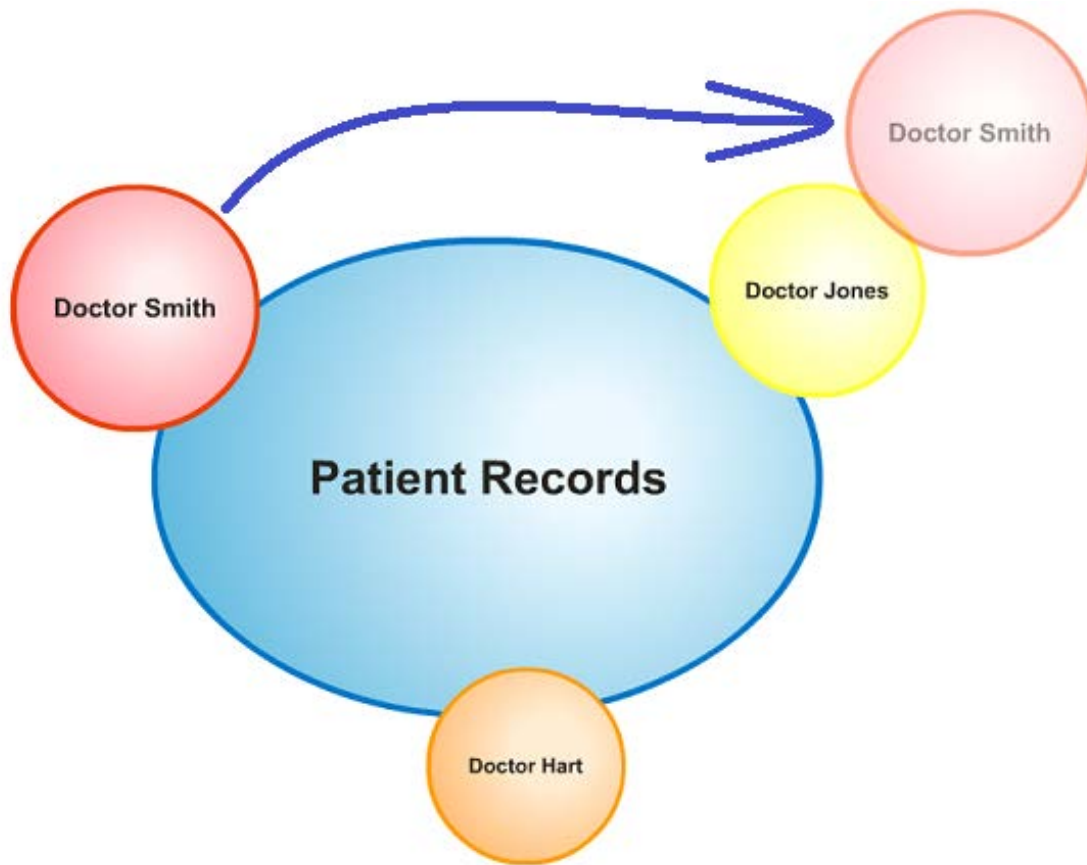
Figure 65.   Knowledge transfer from Doctor Smith to Doctor Jones. Doctor Jones may now review the material from Doctor Smith (in a different color) and approve some, edit some, ignore all, etc.

The Knowledge Exchanger allows the person who is borrowing the knowledge base (in the above example, Doctor Jones) to utilize all of the available knowledge from Doctor Smith, edit it, ignore it, or simply use it as a hands-on model to see how the expert looks at disease and uses Praxis. It is often fascinating to delve into a colleague's thinking process, even for those of us who are not in the same specialty. And of course, the author doesn't need to be a member of your clinic. Any Praxis user may borrow knowledge or lend it to any other Praxis user in the world, with mutual consent, of course.
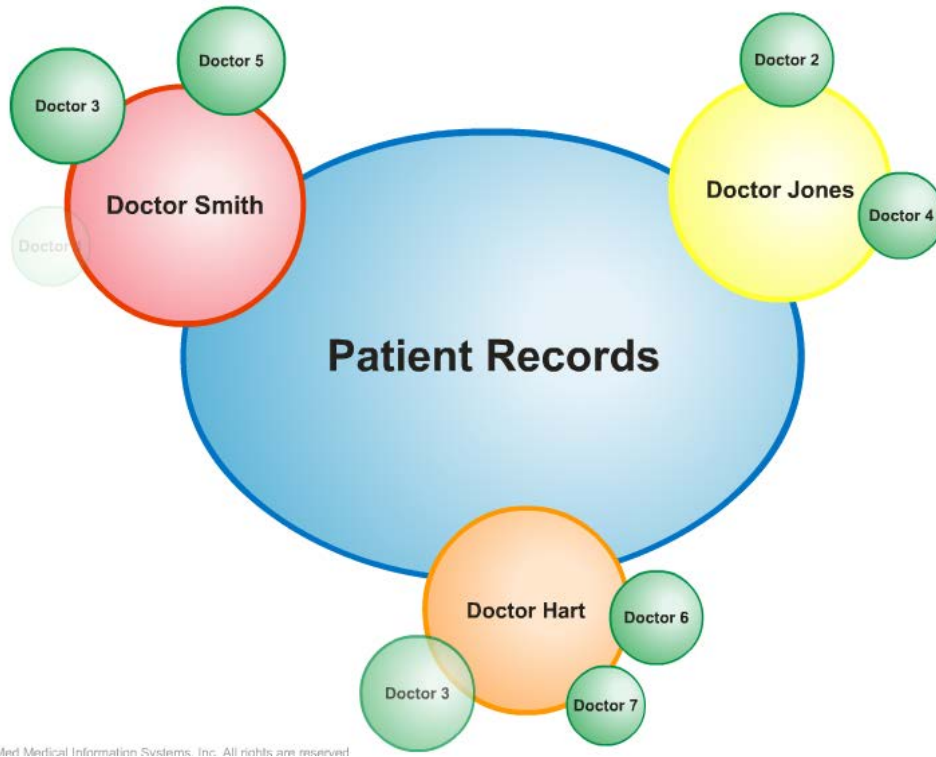
Figure 66.   The Foreign Knowledge Base of a colleague may be borrowed the way you borrow a book. Any provider may consult with as many foreign knowledge bases as available.

As you can imagine, this is particularly helpful for a new user.
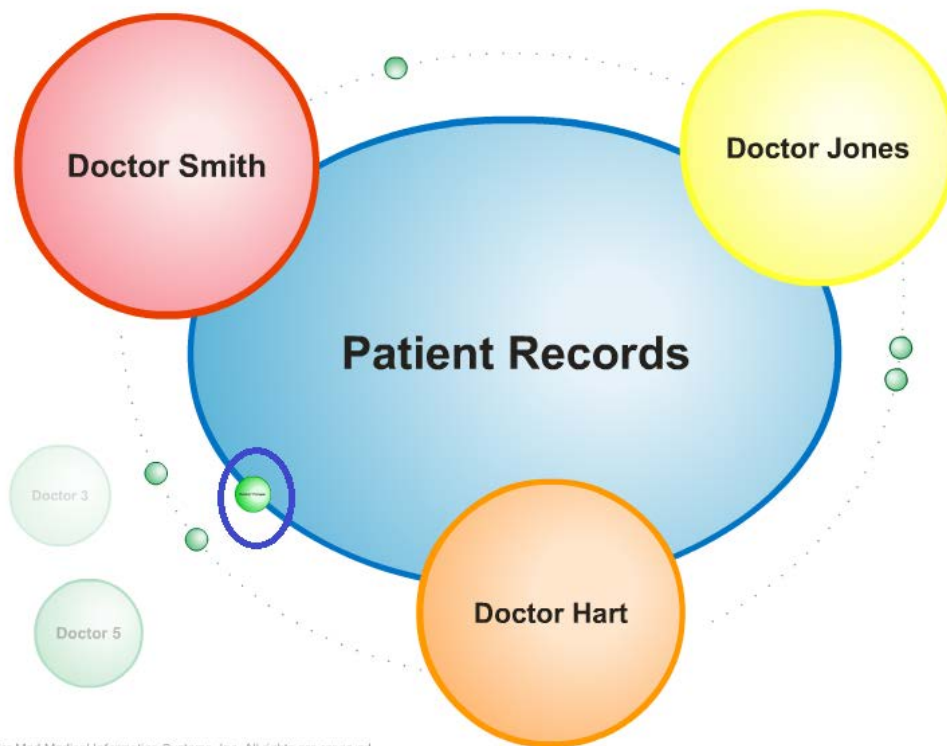
Figure 67.   This approach is useful to new users, who may use the foreign knowledge bases as examples of how an expert does things.

This approach shares the best of both features: the ability to obtain great information from other providers—for example, a superb Review of Systems, questionnaires, or physical exams—and complete independence to practice as you like. Most importantly, these foreign knowledge bases provide you with a hands-on model to learn how other Praxis expert users utilize the technology. You must approve or edit any material you **borrow** before you may use it with patients and transfer it to your knowledge base. Of interest, most providers don't end up using this engine much except at first as a model of how an expert in the same specialty uses Praxis, or perhaps to transfer something very specific, such as a Review of Systems or a lengthy neurological exam. You quickly realize that no matter how excellent a colleague's text may be, nothing can match the one you generate yourself using your own words, own syntax, and fundamentally your own ideas. Good for you! No one thinks like you better than you!

III - Resolving Information Overload

"Alert Fatigue Syndrome" is a newly recognized diagnosis affecting healthcare providers who use computers[v]. It is part of a larger issue known as "Information Overload." With Meaningful use, this problem has worsened and as you will see, the Concept Processor elegantly resolves this problem, which templates actually worsen.
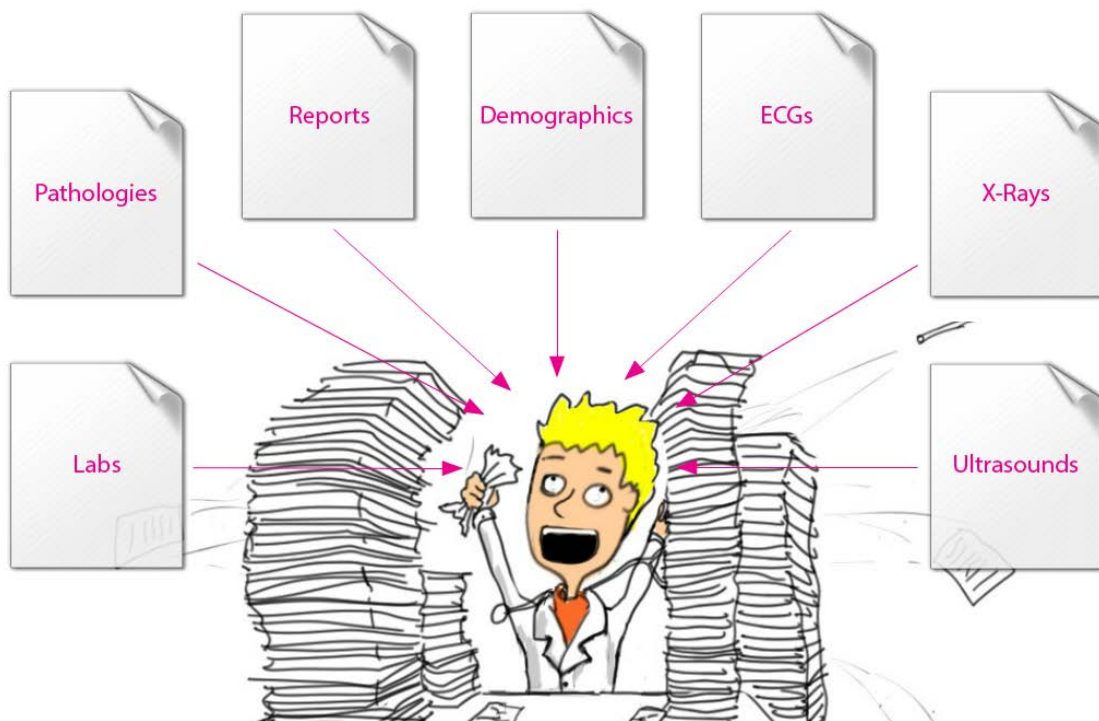
Figure 68.   Information overload. A busy practitioner is bombarded with discrete data that needs to be evaluated quickly. Here is where mistakes happen, and plenty of stress.

In truth, **Information Overload** is a misnomer. The correct term should be **Data Overload**.

If anything, most EMRs display less informational content per unit of incoming data. It is stressful to have to distinguish the important information from the incoming garbage, as any clinician who has experienced the problem at 3 o'clock in the morning will readily attest to.

Let's define our terms:

Data is everything you see on the computer screen.

Information is only that part of the data you need here and now to make a decision.

Everything else is *Noise* or garbage, and you simply should not be exposed to it.

Let's put it mathematically:

INFORMATION = DATA - NOISE

or

NOISE = DATA – INFORMATION

Let's briefly review the current theory of cognition and perception.

It turns out that we humans actually perceive only a small amount of the universe in front of us. This may sound strange to some, but it's definitely the case. We may be staring at things, but we are not consciously aware of them. We are totally oblivious. Magicians take advantage of this blindness—ours—to perform their tricks. They are masters at knowing what we don't notice, and we make their job easy. We humans are not aware of most things at most times.

Take visual perception, for example.

Our eye sees things with only the center of the fovea. This represents a tiny fraction of our entire visual universe. The rest of our eye may detect something, but it cannot interpret it; and our mind remains totally blind to it. The only solution nature provides us is to unconsciously move our eyes from small area to small area, until we recreate the visual space inside our brain. This physiologic mechanism, known as "saccading", lets us take quick snapshots with the center of our visual field and then jump a fraction of a second later to an adjoining sector to repeat the same process. We do this hundreds of times a minute without even being aware of it. The entire process is automatic and unconscious.

Figure 69.   As our eyes perceive a human face, the center of our fovea moves several times a second from small area to small area of the visual field in front of us and sends this partial visual information to our brain. Our brain then "reconstructs" the mental image and attempts to recognize it; it reconstructs "reality". We do not consciously see the places in the picture where there are no lines. The whole perception process happens subconsciously (picture source: Wikipedia).
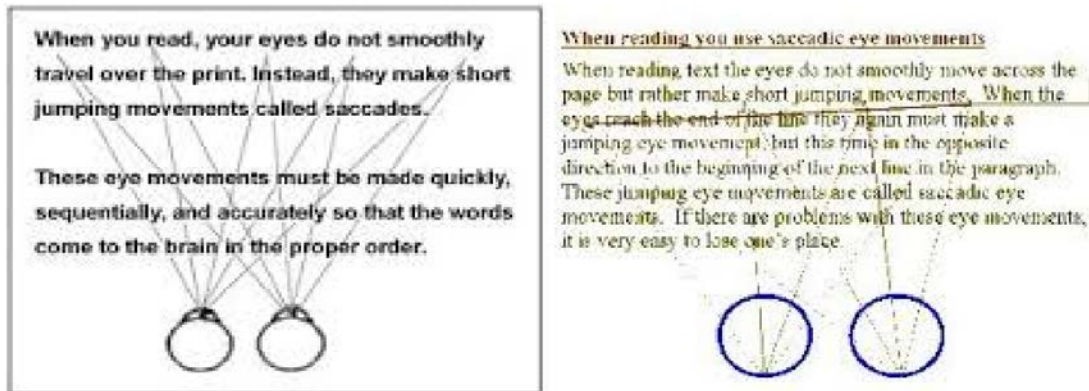
Figure 70.   Diagram of how our eyes "see". [Courtesy Alan Pearson MD, Ophthalmology]
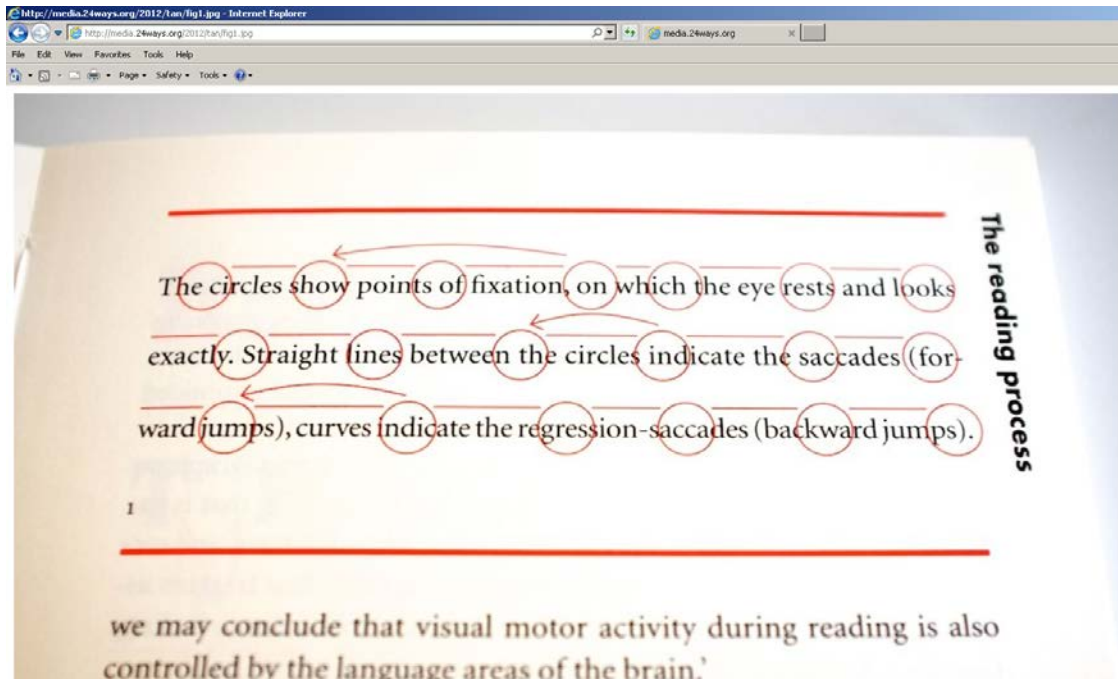
Figure 71.   Saccading through visual text. Reading is definitely not straightforward! (Source: Josh Hochuli, Details in Typography)

The fact that we are not consciously aware of this does not imply that it is not stressful for us, far from it. When we read incoming clinical data, the implications of this physiologic process are enormous. Our eyes are constantly searching the computer screen for information—"fishing for pearls" would be a more apt expression—to make sense of the partial incoming data and to try to figure out its full meaning in context with the case we are treating. In other words, our eyes and its motor function plus the brain physiology— mostly subconscious—that runs our eye muscles work triple hard to extract relevant information from the incoming data and weed out all irrelevant information—i.e. all the "noise."

When analyzed from this perspective, several kinds of noise can be recognized:

<u>Wrong Screen</u>

The information may simply not be on the screen you are working on, but you don't initially know that. Your mind realizes the problem only after your eyes spend a long time scanning the computer to try to find the data you are looking for. This visual work feels like finding a needle in a haystack. For example, you could be searching for a particular lab while writing your note. Often you stop your creative thought process, scroll down or up the page, and even leave the page you are working on altogether, find the right area of your EMR where the labs are kept, search within it, and attempt to find the one specific result you are looking for. Then you must keep the result in your short-term memory and return to exactly the spot where you were writing before the search began. You must find

the exact point on the page where you stopped writing. Then, you must remember exactly what it was you were thinking when you stopped to find the lab, and consider how this result will affect your thoughts.... and only then continue with your writing. Quite a job for a little lab value! No wonder you feel tired at the end of your long day! The saccading process just described may be subconscious, but the stress it produces is quite conscious.

Wrong area of the screen

Here the page is not moved, yet, the problem is the same. First your eyes instinctively look for the information where your subconscious indicates it should be found. If it is not in that exact place on the screen, plus or minus an inch, then the saccading process begins until you find it. After a few seconds of random searching, your eyes finally focus on the needed data. Again, this action may be subconscious—you may not even be aware of it happening—but it causes significant stress nevertheless, particularly when working for many hours reviewing complex clinical data. This mental process also causes errors, and sometimes the data may be misinterpreted, misread, or simply missed altogether, if your eyes did not saccade on the exact spot (this has been studied!).

Wrong Time

The relevant information may appear at a different time than you want to see it. If you see it now but you need it a few minutes later, then you must place the information in your short-term memory. Sometimes you force yourself to remember two or three different values. This frequently happens when you are reviewing the patient's labs results before your actual charting begins. You may discover several relevant abnormal values that you try to make sense of as you review them. Often they are numerical and appear with decimals, such as "137.7" or "3.4." Experiments have shown that the human mind can retain in short term memory only up to three disparate pieces of data, and everything else is forgotten—or even worse, miswritten. Then, when you finally get to your charting area, you often need to go back to the lab area to find some value all over again. What a waste of time, what unnecessary stress, and what a great source of error. (And what a field day for plaintiff attorneys when they ask you in court "Doctor, why did you write that the potassium was 4.3 that day, when it was 3.4?")

If you need to review a result while you are charting, but it is scheduled to appear on the next screen, the same problem happens. You need to stop what you are working on, go to the next area, and return to the exact spot you were charting —a huge and stressful waste of time.

Wrong format

This is a subtle and interesting kind of noise. If someone tells you that the temperature in the room is "74," for those of us who live in the USA, this is easy to interpret. You immediately understand what it means. But if you're told that the temperature in the room is "23 degrees Celsius" that could cause a problem. The issue is not that you did not understand the speaker, or that you cannot multiply by 9, divide by 5 and add 32 —or that you can't consult your friendly Google…
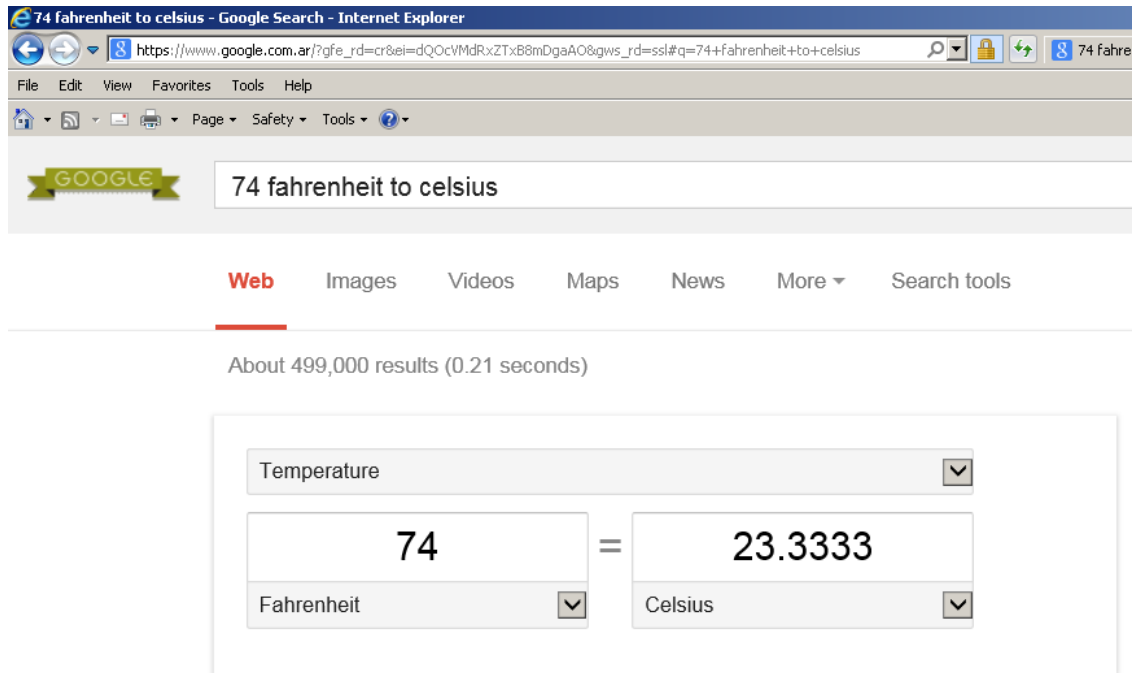
Figure 72.   A quick and easy Google search is neither quick nor easy when you are in the middle of charting....

Of course, the opposite would be the case if you were living in Europe. Fahrenheit for a European colleague would simply be noise. When you get one kind of data when you're expecting to see another, it wastes your precious time and causes needless stress.

What is important to understand is that NO ONE, neither in the US nor abroad, wants to see this:

> *...The temperature in the room is 18 ºCelsius +/- 1 1 º Celsius or 74 ºFahrenheit +/- 2 ºFahrenheit in the spring...*

The above is almost pure noise because the information content is hidden within the data and needs to be "saccaded" to make sense of it. This is the case of "more is less." This is quite a common problem with template-based EMRs, because the programmers of the templates have not the vaguest idea what is noise and what is information for any individual provider. What is information for one provider may be nothing but noise for another. Medicine is an art.

We've all heard doctors complain that they receive incoming computerized medical records which are so verbose that they cannot understand them. This is a serious issue with templates, because they often generate confusing computerized data that isn't even applicable to the actual case. And this is not limited to "pseudo-text"—which template text is often described as—but also includes incoming electronic "factoids" or "discrete data". Until recently, there was no way to manage this excess information.

The Concept Processor turns the tables on incoming Data

The Concept Processor resolves information / noise dichotomy perfectly by working backwards to turn complex disparate incoming data into meaningful personalized text—exactly where and when you need it—thus reducing the noise to the maximum. Let's first look at what discrete data is.

Objects, Discrete Data, and the Relational Database

If you are in Health IT, you may safely skip this introduction on relational databases and go directly to the next section on Dynamic Fields. If relational databases are still a mystery to you, please read on...

Relational databases were introduced about 25 years ago to the computer world, and they became popular immediately. Discrete data has been a godsend for most fields of computer science, such as business, banking, billing, accounting, engineering, etc. Sadly, the use of relational databases has not been successful in medicine, as most clinicians know well from using template-based EMRs. Yet, it is not the relational database itself that failed, but rather the approach to using it directly within the EMR.

The problem is those relational databases rely on a concept known as *discrete data*, whereas medicine works best with a concept known as *free text*.

The following figure describes this dichotomy most clearly:

Robert Frost (1874–1963)
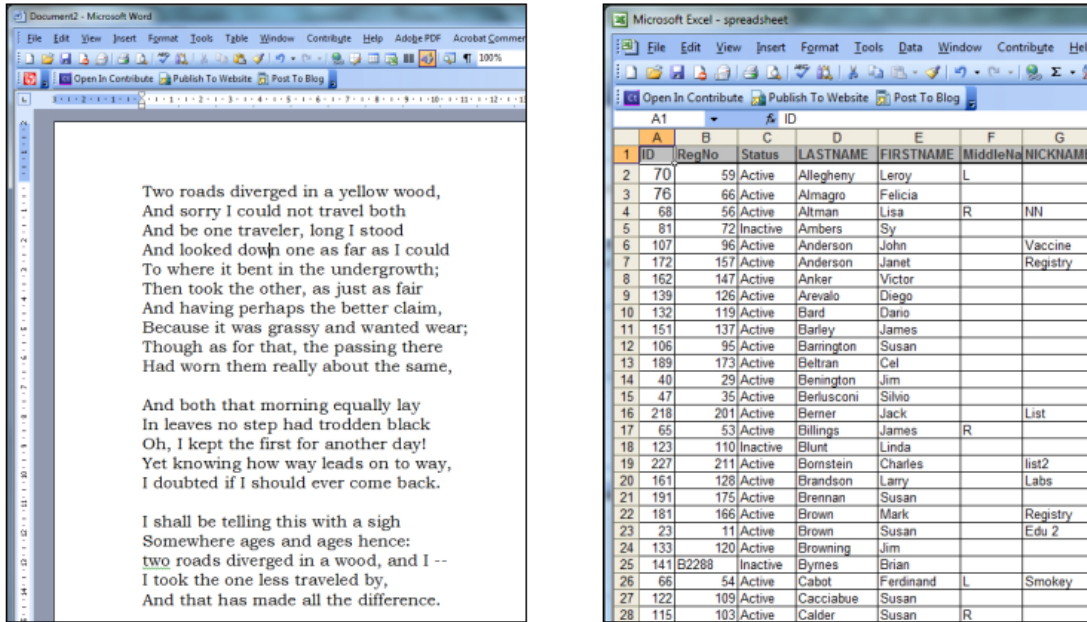
Figure 73.   Two classic Microsoft Applications: Microsoft Word on the left and Microsoft Excel on the right. Word is the quintessential word editor to generate "free text," whereas Excel is an electronic spreadsheet used to manipulate discrete data in a visible form.

The Excel table on the right can find all the patients who are "active" in your clinic and whose last name starts with a "B." Similar tables can find patients whose temperature is higher than 39 degrees Celsius and whose latest fasting blood glucose level is greater than 100. This cannot be easily accomplished with the text found on the left. Additionally, the tables such as the one on the right can be used to automatically trigger advisories. ("Careful, John Imaginary's Fasting Blood Sugar just came in. It is 200 mg/dl!")

So, discrete data is important for:

- Activating practice advisories

- Querying medical information

- Reorganizing information so it makes sense (i.e. creating flow charts, filling out and printing outside reports with arbitrary fields, such as the Workers Compensation form, etc)

- Establishing interoperability with other systems in the medical healthcare field

Because of the critical importance of computer data manipulation, almost all other EMRs have prioritized discrete data. And most have attempted to "force" free text into discrete data with disastrous results:

Figure 74. *This is what happens when you try to place free text into discrete data as template-based EMRs attempt to do.*

Praxis does it backwards. It embeds discrete data into free text. Let's look at this process.

Anatomy of a Relational Database

Computers understand ones and zeros. Their handling of these ones and zeros is so amazingly complex that there is no human alive that can read the results or understand how the computer manipulates these results.

Our language could never be that primitive or, paradoxically, that complex. That is why programming languages were created to translate ones and zeros into human language and vice versa. Because we humans think in terms of nouns, adjectives and verbs, we can make sense of computer operations via metaphors drawn from our physical reality. Nevertheless, we should always keep in mind that what we see on the screen is not real. It is an imaginary "construct" of ones and zeros translated precisely so we can understand them in a made-up virtual world.

Objects

The word "***Object***" in computer science has a specific meaning. Like the words "Table" or

"Fields", Object is a metaphorical construct to make the concept more understandable for us humans. In Object-Oriented Programming, an Object is considered a noun: an independent "thing" that has **properties** (adjectives), **actions** it must perform (verbs), and outside **events** that trigger its functionality (also verbs). A mouse click is an **event**, and so is an action on the keyboard or pressing the **Enter** command. These are all human-initiated events, but other actions or software programs within your computer may also trigger events in an application. The computer clock generates events that may trigger actions at a given time, such as scheduled appointment alarms. Events act on the **Object** to make it either change its properties or cause actions of its own, depending on what it is programmed to do. We will use this terminology to describe Datum, Health Maintenance, Agents, Practice Advisories, and several other items in Praxis.

Table

A metaphor to understand relational database is the noun known as a **"Table."** This is not a real table you eat on, but is a computer rendition of a matrix where you see fields and records. The relational database centers on the concept of the Table.

If you have ever seen or used a spreadsheet such as the one displayed above, you are on your way to understanding this concept. We will use Microsoft Excel to explain how relational databases work.
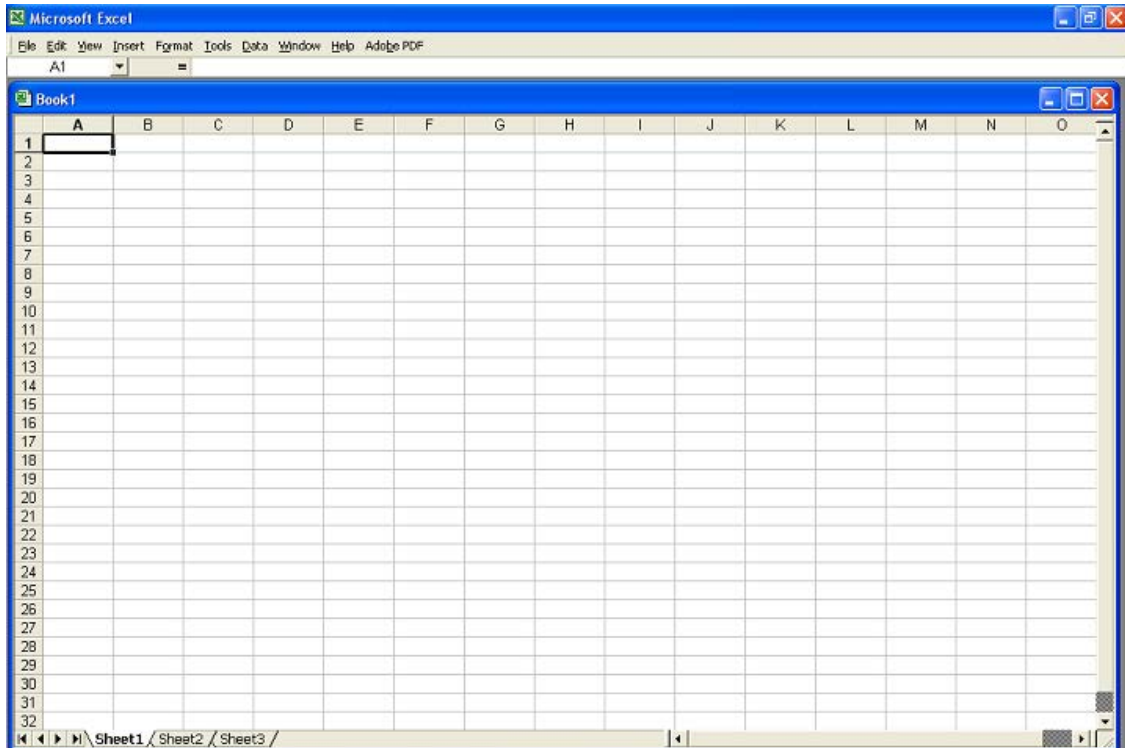
Figure 75. *Microsoft Excel: Simple rendition of a relational database. This is not a classic database table, but rather a "worksheet." However, you may think of a worksheet as a kind of table (e.g. worksheet = table). At the bottom left, the default reads "Sheet1." Other tabs display "Sheet2" and "Sheet3". Those tabs can be thought of as different tables that you may re-label.*

Remember, neither a table, nor the worksheet displayed above really exists in physical terms. All the computer has inside are ones and zeros, however our minds understand visual concepts displayed by these metaphors. So although a spreadsheet is not the same as a database, it may be used to understand the same concepts.

A table is made up of columns and rows (called "Fields" and "Records" in relational database jargon); and where a column and row meet—where they intersect—you have a cell. Each cell holds a single unit of data. In fact, that is a good definition of **discrete data**: data that fits within a cell.

Let's work through some examples.

Figure 76.   *We have copied the data from the Praxis patient table onto this spreadsheet.*

Here you have an output table called "Patients" that we have "exported" from Praxis onto this spreadsheet. Each "field" (column) contains a unique type of data; for example, the "LastName" field contains the last names of all the patients present in the EMR.

Other fields contain numerical information, such as the patients' ages. Others may include dates (such as birthdates).

So:

Table (noun): This is a set of related information. A table might include patient demographic information, Encounter information from another table (the date of visit, provider, visit time, etc), Clinical Parameters (name of clinical parameters, units used if numeric), and medication history (generic name of the drug, brand name, RxNorm coded ID, etc.)

Field (property or adjective): This is the name of a similar type of information made up of discrete data presented within a table: LastName, FirstName, Age are all fields.

Record (property or adjective): This is the actual row of fields related to each other within a table (e.g. Row 17, labeled above, may be thought of as a "record"). A record includes one or more cells of discrete data belonging to different fields. Each cell in the record represents a different field and encloses a separate discrete data item within.

Praxis Table Views

This is an Oracle® database concept. As we mentioned, tables themselves are logical constructs. Likewise, table views are logical constructs of other tables. We at Praxis have created an entire collection of medically intuitive table views such as Patients, Encounters, Providers, MedH (stands for Medication History), and ClinicalParameterH (clinical parameter history), with fields that any medical provider can understand with relative ease.
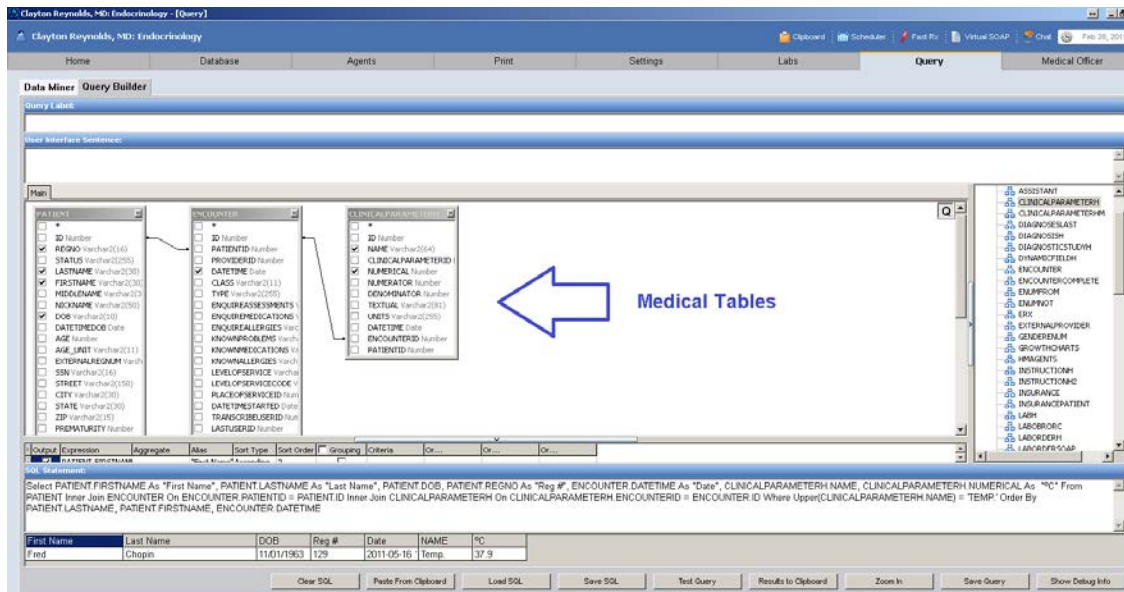
Figure 77.   Praxis Query Builder displaying medical table views that can be used to query anything in medicine. Here is one that finds all patients seen, the dates and times they were seen, where a temperature was taken, and the value of the temperature taken on that date. Only one record can be seen, but you can click on the Zoom to expand and see them all.

Contact Fields, Dynamic Fields, and Clinical Parameters

The Concept Processor handles discrete data quite differently than templates do.

> Within the Concept Processor, discrete data is always subordinated to free text.

This is the crucial difference between the Concept Processor and templates as we will see, and it makes all the difference in speed and information overload.

There are five types of discrete data fields, all of which interact with the Concept Processor in the same way via the Datum object that we showed on page 49, and via the flowcharts, which we will explain next. Both are linked to the Assessment of the case, so that the next time you use it, all the data retrieval is automatic.

- **Built-in Data**
- **Incoming Data**
- **Contact Data**
- **Dynamic Fields**
- **Clinical Parameters**

Let's review each type:

Built-in Fields

Praxis, like all other EMRs, has a limited number of built-in fields, such as the patient's last name, first name, age, date of birth, gender, and other demographic information.

Incoming Data Fields

The world outside your clinic expects you to receive EMR information in discrete data fields represented by diverse codes, where each code is kept in its own field. Outside data includes esoteric codes such as SNOMED, ICD-9/ICD10s, CPTs, LOINC lab parameters, Surescripts[®] Pharmacies data, etc. Each generates a link to the application. Thankfully, your Concept Processor and Datum take over and place what you need to see where you need to see it, when you need to see it, and in the format you wish to see it in. It automatically translates the codes into understandable information that you can easily digest. All this appears almost like magic. You are reading your own writing and not being exposed to all those complicated codes.

Contact Data Fields

You may create these fields yourself. You select the institution type (insurance company,

referring providers by specialty, other medical and non-medical institutions and colleagues, or any other institution type the clinic wants to create). Within each institution, there are member roles (administrator, provider, technician, executive, attorney, etc.).

This information is created once and may then be linked to specific patients for use.

<u>Dynamic Fields</u>

You may create any discrete data field on the fly and then link it to any specific patient record that then automatically populates its value within the SOAP Note via Datum (page 49).

Example: If you are a Neurologist, it is often critical for you to know whether a patient is right or left-handed. You can create a "Right/Left" Dynamic Field, and then your assistant can enter the appropriate choice. Then, this new field can be instantly embedded in this patient's progress note once, and afterwards it appears for this and other patients exactly where and when you need to see it. It doesn't just appear in your progress note, but also in your procedures, instructions, outside forms, etc. For example, in the History of Present Illness you may include the following text:

‹‹Patient.firstname›› is a ‹‹Right/Left››-handed ‹‹Patient.age›› male who...

The information about being right or left-handed appears automatically anywhere on the record where this Datum element is embedded and it remains totally consistent throughout:

"Robert is a left-handed 24 y.o. male who..."
"..because the patient is left-handed, then ...

Note that the information about the patient's handedness may have been originally entered by your assistant in the Pre-SOAP note (the note charted by your assistant before you see the patient as a provider) or during a previous visit, so even you need not enter the patient handedness the first time, but it appears magically in your own note. Once the data is entered, it stays with the patient for you and for any provider in the clinic using the same datum element. It's impossible to make a mistake, because if anyone discovers an error, it will be corrected for everyone. Of course, since datum is discrete data, the entry automatically stores who changed it and when, and it may trigger alarms, practice advisories, and queries at will (see page 130).

Clinical Parameters Fields

The handedness of a patient is not likely to change, and unfortunately, the same can be said for the smoking status of the patient. Dynamic Fields may be used to store all that information which then embeds automatically within free text. On the other hand, Clinical Parameters are similar to the self-created Dynamic Fields, only linked to the encounter rather than to the patient. For example, the fetal heart rate used to follow a pregnancy most probably will change at every encounter, as will the Body Mass Index and many other discrete data values. Still, the information may be entered by the assistant, and then it is immediately available for the provider to view via Datum. The provider may, of

course, change it at will. Every one of these actions can be recorded, queried, and can trigger practice advisories, as they are all discrete data values.

In the Editor...

> *The pain today was reported as ‹‹cp.pain.value››/10*

becomes...

> *The pain today was reported as ‹‹8››/10*

...in the final chart note for today's encounter.

Any kind of discrete data may be created once and then used for any patient or encounter you wish via Datum. The Concept Processor ensures that from then on, the matter will be straightforward; the values magically appear where they are needed. Clinical Parameters include items that are used in flowcharts, items that trigger practice advisories (see page 130), and items that report through queries (e.g. "Find all patients who presented with a reported pain greater than 7." - see page 145).

The Calculated Fields

Clinical Parameters and Dynamic fields may either store values entered at the point of care or operate on previously-entered discrete data and display resulting values calculated from any other field(s) holding numeric values. A good example is the Body Mass Index Calculator. You create this clinical parameter by placing links to the weight and height of the patient via the standard formula...

BMI = ‹‹VS.Wt.value›› * 703/(‹‹VS.Height.value››)^2

...and from then on, the correct BMI appears on any record of any patient that needs it.
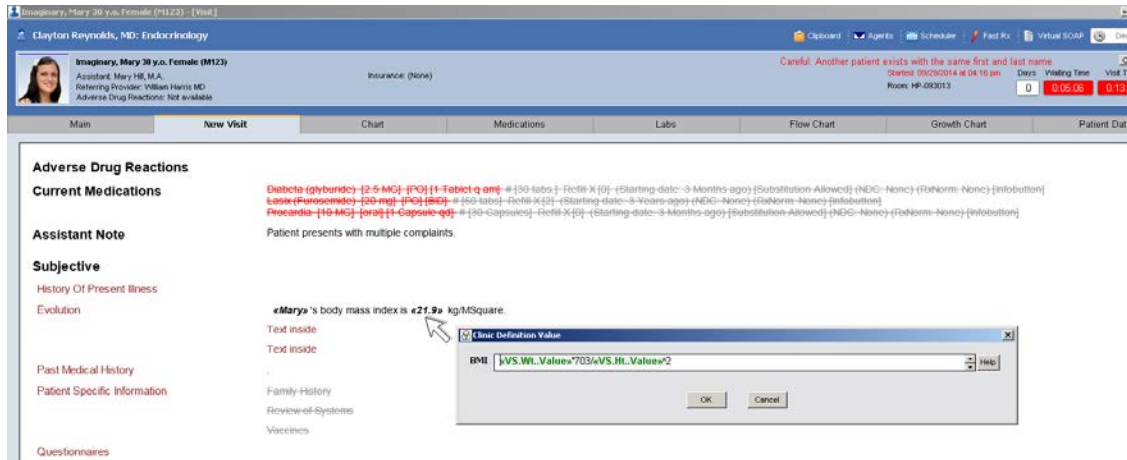
Figure 78.   Body Mass index Datum embedded within free text. Once a formula is created on the fly, it is available for this and any other patient automatically. The assessment knows when to bring it up and exactly where to place it when it is needed.

From then on, the Body Mass index is instantly calculated and displayed, not just for this patient, but for any future patient that needs it. In fact, you don't even have to select this parameter; your assessment will find it and display it even before you realize that you need it. That is the power of the Concept Processor. Without it, finding this object would take longer than to simply type it in. With the use of the Concept Processor, you create these objects once in your life, and then the engine finds them, places the appropriate values for the patient and for the visit, and then instantly displays the results in context before you even realized you wanted to see them.

The same applies to other formulas such as the Creatinine Clearance, Anion Gap, or any other you may need. You create them once, and the Concept Processor puts them in the system permanently for other patients.
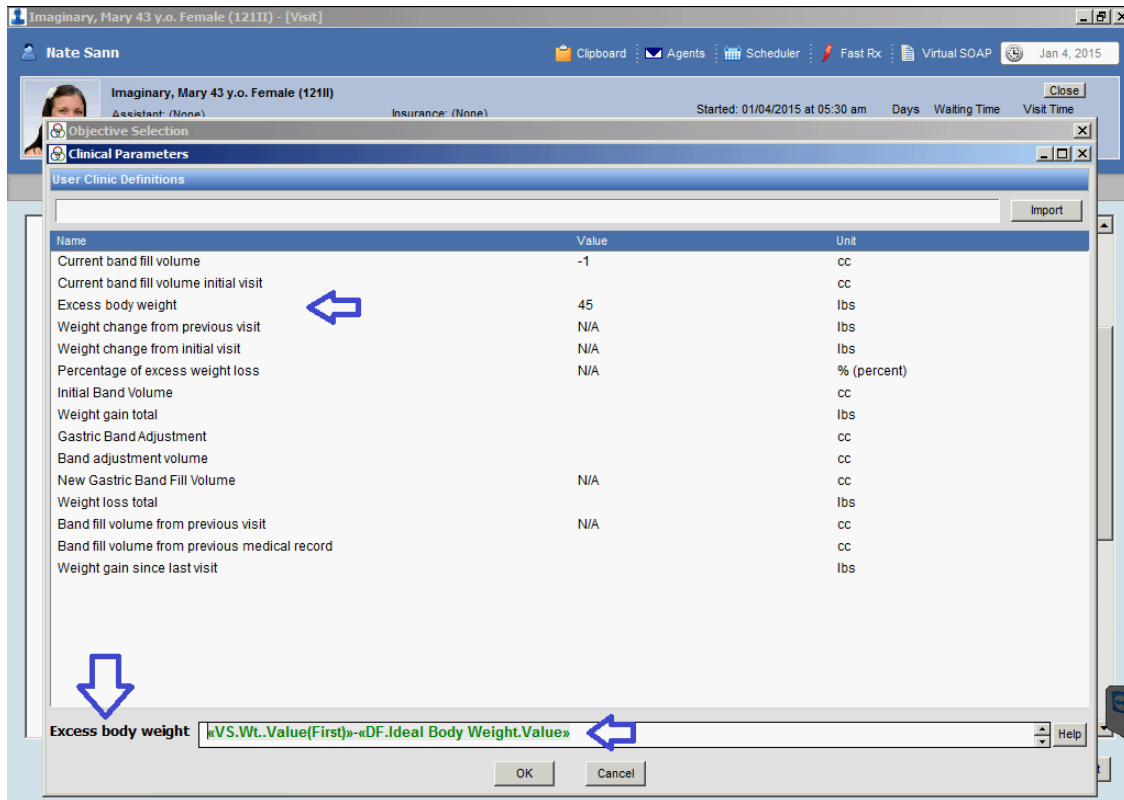
Figure 79.   Here we see several specialized fields created by a weight control clinic. For example, the "Excess Body Weight" is formula driven. It is derived from the patient's weight during the current visit, their weight on the first visit, and from a Dynamic Field describing the patient's ideal body weight, entered by the assistant during that first visit. (Courtesy: Nate Sann, MSN, CRNP, FNP-BC: Alleghenies Surgical Clinics).

The more patients you see, the fewer Datum objects you need to select, and the fewer you need to create. That is artificial intelligence at work.
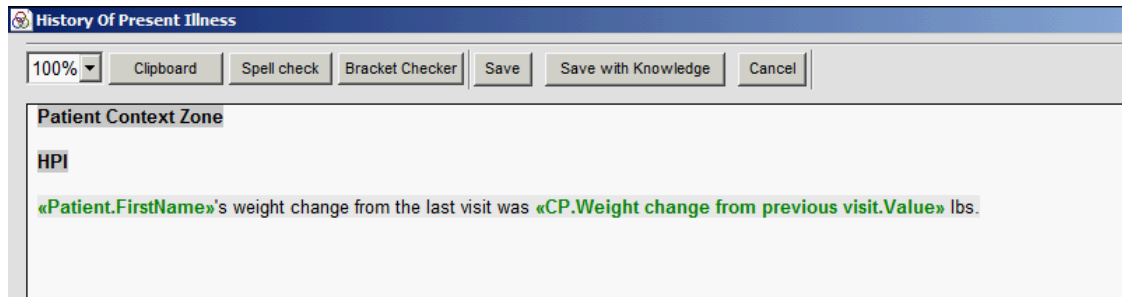
Figure 80.   Here is the information in the editor, appearing automatically with your assessment of the case.

And then look at what happens...
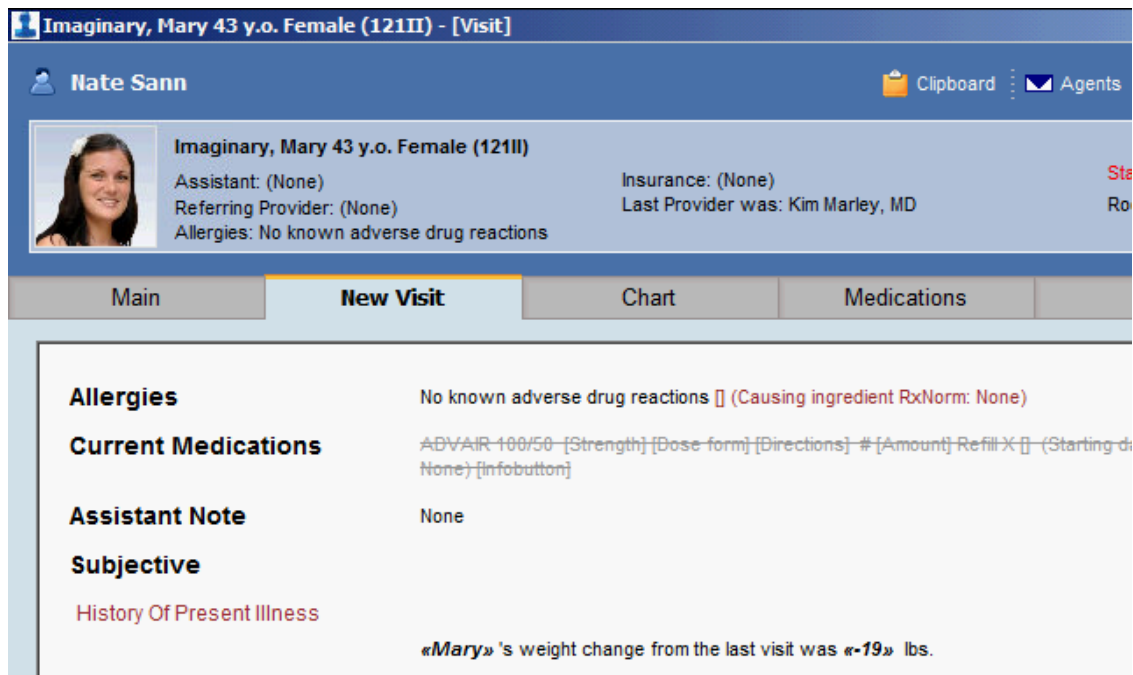
Figure 81.   The calculated information is automatically entered in the record for this and any other patient presenting with a similar case (Courtesy: Nate Sann MSN, CRNP, FNP-BC: Alleghenies Surgical Clinics).

The Power of Discrete Data

Though seamlessly woven into the final medical report, the individual data nevertheless remains discrete. This means that it is compatible with many computer operations that are impossible to carry out within free text.

As mentioned before, not only will the right or left-handedness of a patient appear in the History of Present Illness, but it will display wherever it is needed throughout your discussions and orders, now and in the future, in this and other patients with this condition. And if is amended, it corrects everywhere in the system from then on, with no errors. The name of the user who changed the value is also recorded in the background along with the date and time that it was changed. In addition, you can set up queries to set an alarm for you in cases like this.

If you are not a provider, "Right/Left" data may not sound so critically important, but take a look!
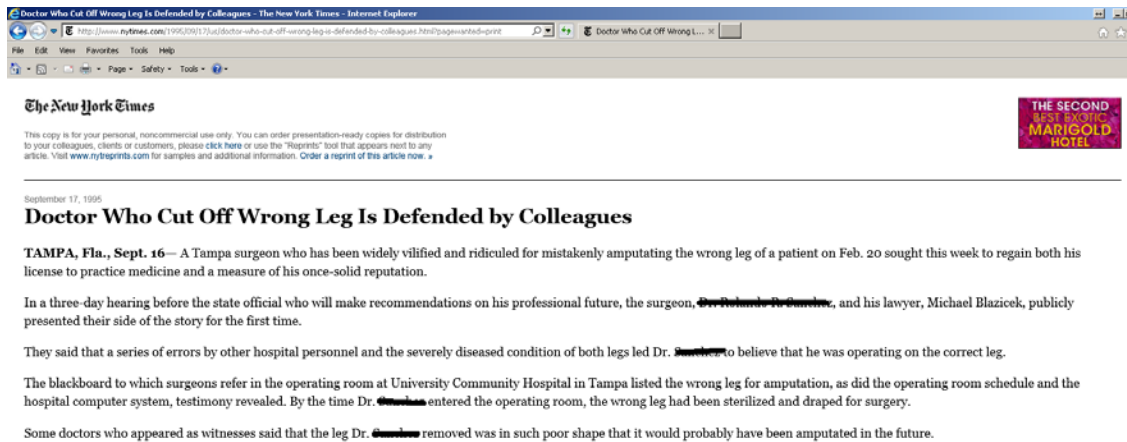
Figure 82.   The practical implications of the [Right/Left] Dynamic Fields cannot be emphasized enough!

Dynamic Fields includes a dictionary link with external data tables and codes. For example, take a patient described as ‹‹*Left*››-handed in the chart: The Dynamic Field can link these values to its SNOMED code (e.g. Left = "87683000") while working invisibly in the background and generating no noise to the user. The provider will see that *"Robert is a left-handed 24 y.o. male who...",* but the outside world gets its related SNOMED code. It is all instant, automatic, and clear.

Discrete data may be specifically identified by the computer and used in other areas, such as filling out specific forms requested by third parties.

Figure 83. *Scanned copy of a Workers Compensation Form where all the fields are mapped to discrete data via Datum or free-text data. As your progress note is instantly generated, so are all your printouts, including outside forms like this one. The clinic scans the form once and then Praxis finds it, and automatically populates with your note, then prints or faxes it all at the same time.*

Interoperability Translator - Meaningful Use

The use of Datum opens Praxis to the rest of the world. This is a world that demands discrete data and codes. Once you have constructed a discrete data field, you can work with it and translate it into values and codes that the world requires. You do so once, and Praxis does it forever on your behalf. In the first encounter with the first patient, it may take just a bit of effort to create and insert a new data field, but afterwards, it is

straightforward. The Datum object representing your created field is inserted and handles interoperability on your behalf.

For example, take the "Smoker" Dynamic Field.
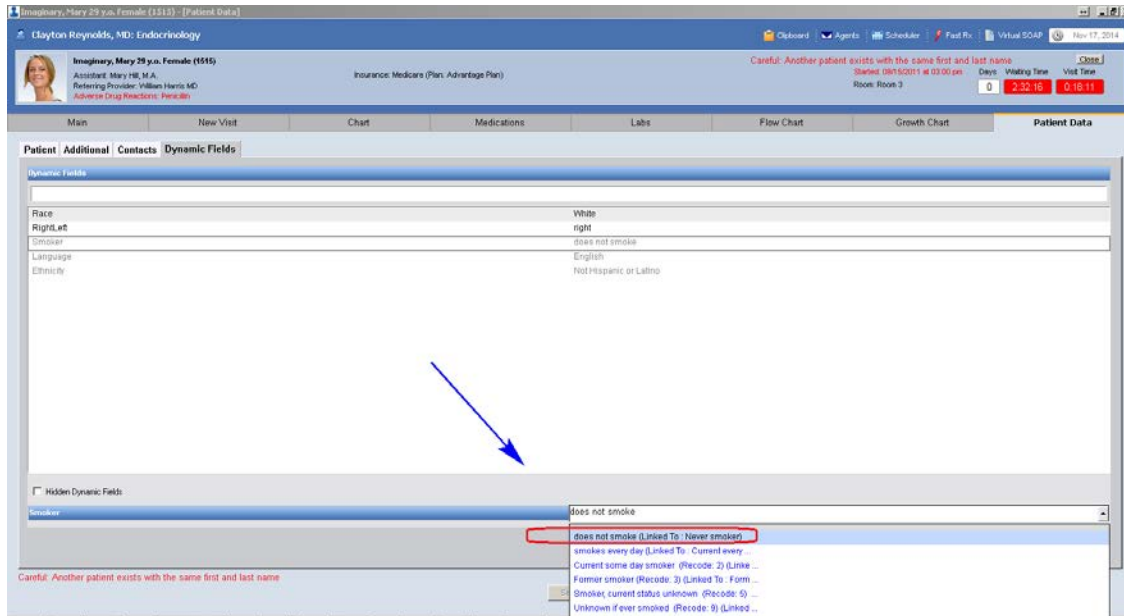
Figure 84.   The value "does not smoke" is automatically translated to "Non-Smoker"— the term the authorities want to see—and linked to a recode number ordered by the government (recently changed to SNOMED codes, and perhaps it will be changed again in the future—no matter!). Still, your chart note will read "Mary does not smoke" or whatever terms you want to use.

So, you write "Mary does not smoke" and Medicare receives "non-smoker" and an unintelligible SNOMED code (unintelligible to us humans, but Medicare computers love it), and everyone is happy!

This opens up the world to interoperability at any level of complexity. "Meaningful Use" and interoperability is not only here to stay, but will also get progressively more demanding. This is the easy solution. Both sides of this equation work: The world, including Medicare, needs this information in order to do research with aggregates of data from millions of patients coming from many different EMRs. You, as a provider, can practice medicine any way you see fit. This way, both sides get what they want. Interfacing is what computers are meant to do. Yes, the first time you handle any new term, you need to consciously "translate" the external request to your terminology, but afterwards, the interface is automatic for any case than needs it. This interoperability approach helps make Meaningful Use Attestation easy, as we discuss on page 132.

Incoming Laboratories

Perhaps in no other clinical area is information overload—pardon us again: ***"data overload"***— a greater problem than with incoming labs.

Of course, you or someone you trust in your clinic always reviews incoming labs, and if any lab value appears significantly abnormal or of urgent concern, an entry may be made in the record, the patient may be contacted, and/or other actions will be taken. This is all easily doable in Praxis as it is in most EMRs, in this case via the powerful Praxis Agents (see page 125). However, this is ***not*** the problem.

The problem is not the emergency; the problem is the routine. When the patient with chronic conditions returns to your clinic for a follow-up, there is certain data you as a provider wish to review during the encounter. This means that then you must search within your EMR to find that specific information within an ocean of available data. The Concept Processor takes care of all that for you. It pulls the relevant data you want and instantly displays it on the screen you are working on in exactly the spot you expect to see it. In other words, the Concept Processor reads your mind! ***Relevancy*** is always defined by you, the provider.

How does Datum know exactly what data you need and where it should be placed? From your own past, of course!

Figure 85.   *Upon opening the patient's record, this provider sees the relevant laboratory information he or she wishes to see. It is "relevant" to this provider. Another doctor may wish to see different data on this very screen or they may view this data but displayed in a different order or format. This provider had requested the latest Glucose and Hemoglobin A1C for a similar patient in the past who presented for a follow-up of diabetes. Now the same type of information is repeated for this patient automatically. It is the same for the Cholesterol/LDL/HDL related to hypercholesterolemia or for the potassium and BUN/Creatinine related to hypertension when taking diuretics. By presenting exactly what you wish to see exactly when you wish to see it, the noise level goes down and so do your clinical errors.*

Flowcharts

> Flowcharts put together any combination of discrete data: laboratory results, dynamic fields, clinical parameters, and medication dosages. This means that changes can be easily followed. They are created on the fly for a given condition and linked to its Assessment. When a similar patient presents, the same flowchart appears and gets instantly populated in the same way.
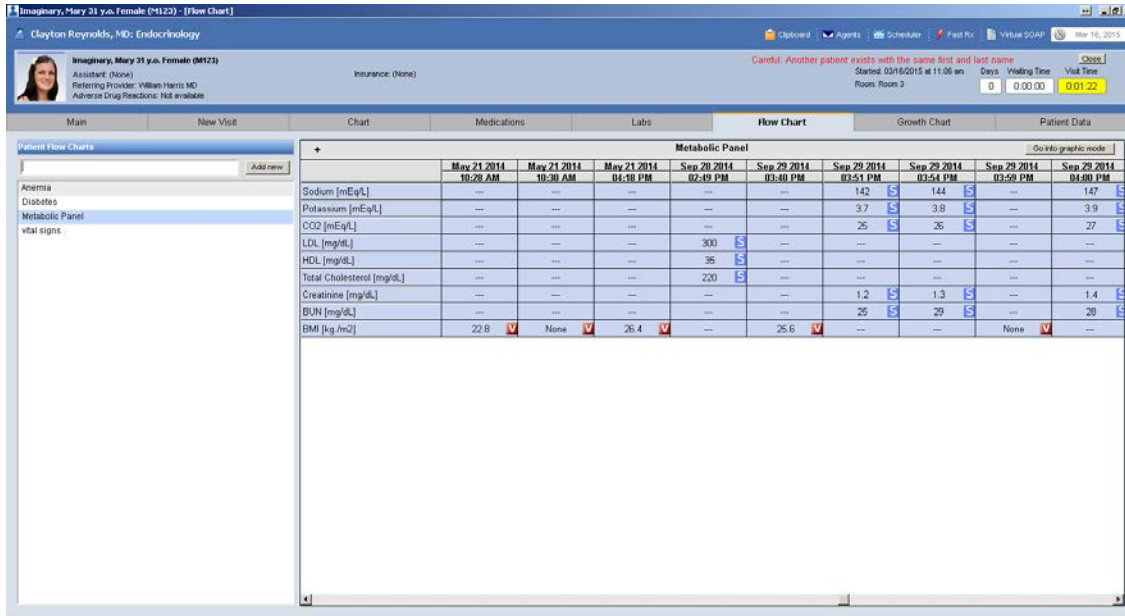
Figure 86.   The linked flowchart called "Metabolic Panel" — consisting of a combination of laboratory studies and calculated BMIs— is automatically brought up in one or more of the assessments displayed...

You take the closest flowchart to the one you need, change it a bit by adding or deleting any elements, such as the blood pressure (next figure), and instantly create a similar flowchart for a different type of case:
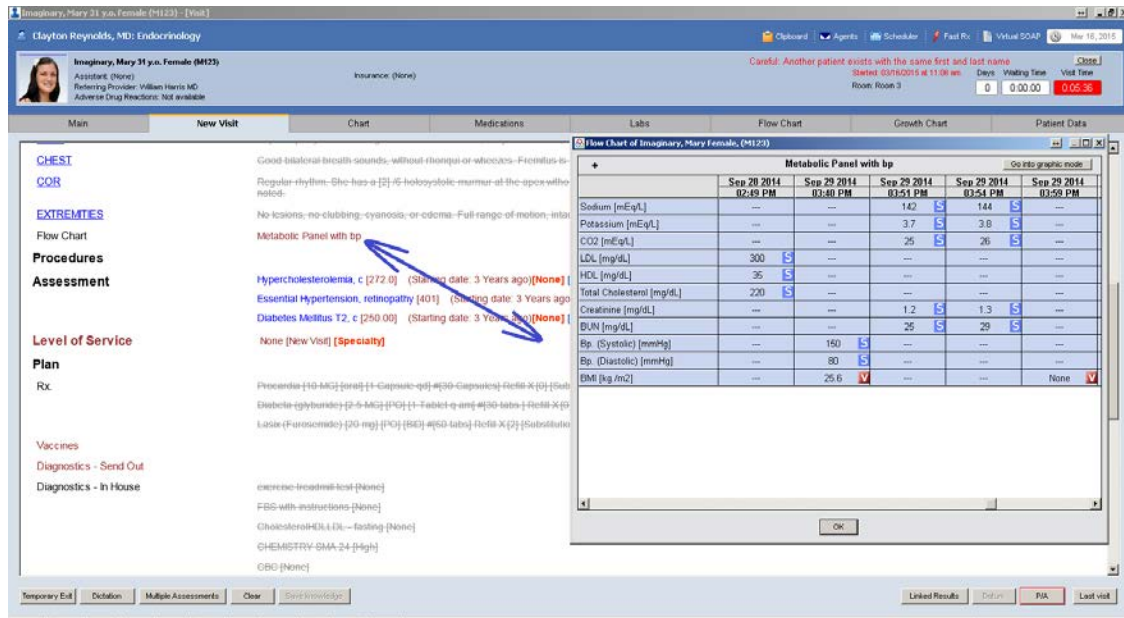
Figure 87.   After the addition of blood pressure, your "metabolic panel" flowchart is upgraded for automatic use in the future.

When this new assessment presents in yet a third patient, the correct flowchart for that patient is generated as well. In this way, hundreds of flowcharts may be created, each one progressively easier to make as you have a more similar startup, and each linked to its own assessment for automatic display whenever the case requires it. They sort by frequency of use and are quickly found via the Search Insert, like any other element (see page 25).

Incoming lab results within your Progress Note

As shown, Datum automatically retrieves the appropriate individual laboratory result and embeds it in the exact place required within your text. It can also perform appropriate calculations to change the units to fit how you need to see it (e.g. Celsius to Fahrenheit). Simply by reading your current encounter, you see the results you want to. Although this does not take the place of the full incoming laboratory data, which you can see in the appropriate laboratory panel, it does allow you to relax when reviewing the labs. You know that all the pertinent findings will appear in your current note, exactly as you want to see them.

Take a look at the following note:

"The patient TSHs in the last few visits were as follows:

4.1 mU/ml on 1/1/2014
4.3 mU/ml on 4/7/2014
5.1 mU/ml on 11/6/2014

These values show [within normal limits but they also display progressive increase over time |no changes over time]"

This is a case of a patient with subclinical incipient hypothyroidism. All the TSHs fall within normal range, but by looking at them side by side, a pattern of progressive increase of TSH points to incipient hypothyroidism. True, you could accomplish the same thing by performing a thorough review of several lab windows and recalling the pertinent data from each window. But the Concept Processor resolves the issue automatically by performing the search and displaying the results right in your current progress note. If you thought this was relevant in the past for another patient with this condition, your own knowledge base displays this TSH pattern again for a patient with the same assessment. If you attend a medical meeting where this issue of tracking normal TSHs over time is discussed, at that exact moment, you can create the above entry within the Virtual SOAP. Then when the appropriate patient comes in, you can see this pattern immediately (see page 72).

The result is that you as a provider handle the creative/intellectual part of medicine, whereas your computer performs all the routines on your behalf. The more you use the system, the more routines are handled by the software and the easier and more effective your charting becomes.

IV -   Meet Your New Assistant

Up to this point, we have shown a method of generating medical documentation that is extremely fast and yet accurate. We've also shown how the Concept Processor works backwards by taking incoming data from many different sources—such as clinical laboratories—and transforming it into useful information at the point of care by displaying only what you need exactly where you need it, when you need it, and in the format you want it. We have shown how this unique technology reduces information overload and clinical errors. Finally, we showed how the Concept Processor progressively improves your practice of medicine by turning your current encounter note into an effective checklist of the many things to evaluate or perform for each patient.

So far, everything has had to do with charting or documentation. Now, we will evaluate how the Concept Processor helps you with many clinical tasks beyond that of simple charting, and how it turns the computer into a clinical tool—an assistant for your practice.

Let's review Agents, a direct offshoot of concept processing.

Agents

An Agent is a communication object similar to instant messaging, but it can be programmed to do medical tasks at the time you specify, and record what transpires in the patient record. It is a personal robot that becomes progressively smarter as you see more patients.

Agents are divided into two types: Free agents and event-related agents (SOAP Agents). Each is generated differently, but both accomplish the same purpose: They communicate the thoughts of the sender and transmit orders to those who must receive them at the right time. Then the agents can check that the orders were actually followed. Finally, they store themselves in the appropriate patient record. The most important aspect of agents, however, is that they are programmable; so the next time they are required, all these actions are automatic.

Agents can include messages and/or attachments. They can carry inserted notes or letters you create, which your staff then prints and mails out. In fact, no external documents can enter the patient record without the use of agents. This ensures that an external report cannot get into the patient's record without first following your handling protocol, which may include that you review it first. Since all agents are programmable, it means that a protocol for the capture, review, and storage of external information will always be followed precisely.

Your agent may be sent to a specific user or to a pre-defined group of users, such as all the nutritionists in your clinic, your lab techs, cardiologists, front office staff, a specific

group of medical assistants, or more than one group of recipients at a time. When you select "First Reader," only the first member of a recipient group will ever see your message. Then the agent will delete itself from the inbox of all the other intended readers, and the name of that first reader will be recorded for accountability purposes. The agent will also record the date and time your message was read by your target recipient. For example, if you work with two specific medical assistants as part of a larger group of 30 others, your agent will only go to those two assistants, and as soon as one of two opens it, your message disappears from the inbox of the other. Then it records the name of the first reader, and the date and time your order was read. Because you often don't care who specifically acted on your order as long as the appropriate recipient has done so, this means you need not search for your intended party by name to send your orders.

Timed Activation

The agents may be sent immediately, or even sent urgently—where an alarm will go off in the recipient computer. Of greater interest, you can program your agent to go to sleep, wake up six months from now, and notify its intended party as before.

Nursing Tasks

You, the provider, can program an agent to return to you if the order *is not* carried out for whatever reason. For example, your recipients might not activate the agent within the set time or they might indicate that your orders were not followed precisely (perhaps because the patient didn't comply). In that case, the agent comes back to you with the appropriate explanation. This way, you are notified of any problems when carrying out your orders. If the agent does not return, it means everything was followed precisely.

Figure 88.   *Anatomy of an Agent: The message will be sent to the front office, and the first user to open it ("First Reader") will delete it from everyone else's inbox. The text displayed on the upper window ("I have ordered a chest X-Ray in three months") will be pasted onto today's encounter note, whereas the text on the bottom window ("Call patient back for PA & Lateral CXR") will be seen by the first reader exactly three months from today. Please take a careful look at the "Save with Knowledge" button located at the bottom of the object. Next time another patient presents with a similar case, this agent will be activated by your assessment. The same exact message will be sent to the same locations three months from that time, all automatically.*
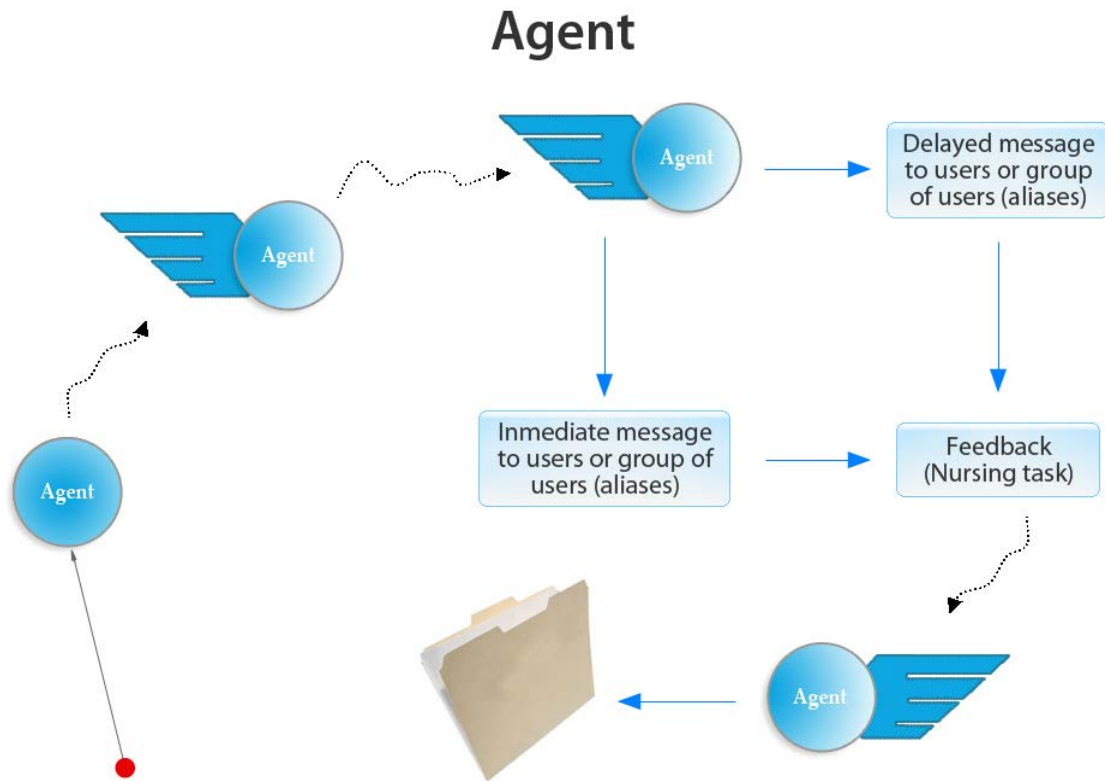
Figure 89.   Diagram of the agent's actions. Agents are the only way that outside documents are entered into the chart, ensuring that a review protocol will be followed prior to storage. .

Free agents

Agents can be programmed in advance to do things within your clinic. For example, you may order an agent to show you certain inserted notes before they are stored in the patient's record. Phone call agents may include preset instructions that your front office staff should follow when receiving an outside phone call. You can have more than one type of phone call agent for different types of phone calls that are received. These agents are programmed in advance, using the editor described in the SOAP generator, including highlighting, brackets, option brackets, Datum elements, and keywords.   Many types of phone agents with different types of prompts may be created this way, each using a different keyword. So if a patient calls your front office saying their child has a fever, your front office staff can go through your protocol and ask all appropriate questions before firing off the message to you.

Agents as Self-Reminders

Keep in mind that you can also send agents to yourself. They become self-reminders, and if linked to an assessment, they are triggered for future patients presenting with the same condition. ("*Remember to call ‹‹patient.firstname›› in 3 weeks for a follow-up*").

As always, these agents would have been impossible to use without the Concept Processor. Here you take your closest agent, change it a bit, and then have a slightly different one to use, now and in the future (and yes, a bell-shaped curve exists at the agent level as well). The more of these agents you have, the fewer of them you need to edit and the less you need to change in the future.
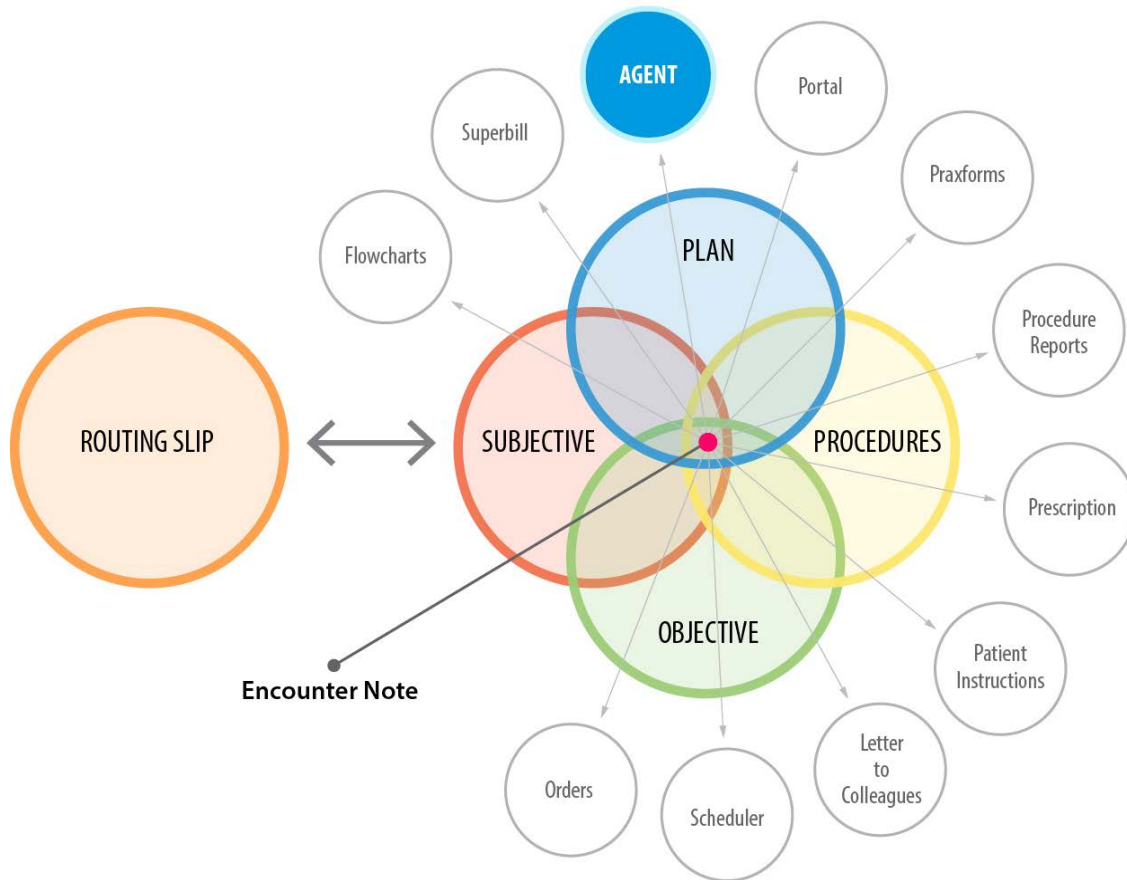
Figure 90.   The power behind the agent is described in this figure. It is activated on your progress note by your assessment of the case. The next time you see another patient with the same condition, one or more agents will go to work on your behalf. Your agents become automatic ambassadors of your mind.

As previously mentioned, the most exciting part about agents is that they are automatically generated by your assessment in your progress note. Once you have linked it one time, the next time you face the same clinical situation, the same agent, with its complete instructions and timing, will be instantly generated on your behalf. If you approve it, it will be sent to carry out your orders. Your progress note then becomes more than a dead memo of what you have done. It comes alive and works in three dimensions, where the third dimension is time. Your own chart becomes a clinical tool, helping you remember what you need to do next and what tasks to do or have others do on your

behalf, now and in the future. Essentially, the agents are ambassadors of your mind, carrying out your requests and reminding you to request them in the first place when new or returning new patients present with similar conditions. And, of course, the agent keeps a record of your pending orders, acting automatically on each patient's progress note. All this protects you legally as well.

Clinical Decision Support

We are finally entering into what is without a doubt one of the most exciting aspects of concept processing— one which is bound to revolutionize the quality of medicine. If you are in medical education, public health, or simply wish to improve the quality of your practice in general, this area is for you.

When the Concept Processor was first developed—close to 25 years ago—physicians who reviewed it welcomed it immediately, but experts in Health IT told us they did not understand how a technology based on free text could impart evidence-based medicine and obtain clinical information at the point of care. Quite frankly, neither did we back then and most of our client physicians do not care enough about these issues to alert us either. Most providers just want to practice more effectively and have less paperwork, period. Providers are in the business of curing one patient at a time. The issues of public health are of course important, but mostly to assist the clinician in taking better care of the patient. A few doctors have been genuinely interested in querying their medical records, but they have been the exception rather than the rule, and even then, the desire is to improve one's own practice by doing so. When looking at larger medical groups, this situation begins to change. The larger the organization, the more interested it is in performing statistical studies on clinical data and imparting evidence-based medicine, as well as linking it with financial data. Of course, the federal government can be thought of as the largest medical organization of all, and it makes sense that the need is so critical at the national level.

Being able to query an EMR and provide information at the point of care derived from best practices is the main reason the government is pushing for electronic medical records today. Several years later, they also included the requirement for interoperability, which involves discrete data transfer. Since EMRs cannot understand natural language in free text form, they are unable to parse incoming and outgoing information unless it is in the form of discrete data.

So how can an EMR like Praxis—which is based on free text that allows physicians to express themselves any way they want to—interact effectively with all the systems that require discrete data to send and receive practice advisories, clinical decision support, and medical information?

As mentioned, 25 years ago we had no idea. But we had 25 years to think about these issues and brilliant physician-clients to help us figure them out. Our clients, as usual, always came up with the epiphany that pointed to the right solution. What was originally perceived as a liability—the Concept Processor being used as a glorified word processor—became its strongest asset. The Concept Processor allows you to perform

Clinical Decision Support, Interoperability, and Queries dramatically more effectively than templates can. People using template-based EMRs are struggling with these issues that the Concept Processor has resolved for good.

The Concept Processor resolved three critical issues:

1. The ability to impart any and all advisories at the point of care without information overload resulting in alert-fatigue.

2. The ability to query **absolutely anything** in medicine with great ease.

3. The ability to interoperate—exchange medical information with other systems including other EHRs—without driving providers crazy.

Suddenly, concept processing has become a major solution for medicine.

Agents and Events -- Discrete Data Handling

Agents have been described in the previous section as communicating objects. They transfer information and orders to and from different members of the team and they do so intelligently; they can be pre-programmed to perform tasks on the sender's behalf. We noted, for example, that the agent can be set to be activated by a timed event. Once sent out, the target recipient does not receive it until the time indicated. At the activated date and time, the agent performs its intended task, passing on the message or directions to the appropriate end user(s).

In addition to the timer, other types of events can generate actions within the EMR. These actions are triggered by events (see "events" on page 106)

<u>Next Appointment</u>

If instead of three months, we enter "Next appointment", the agent becomes conditional. It will only activate if the patient returns to the clinic and meets the intended recipient during that next appointment. Otherwise, the agent will not be triggered.

For example, if you send the "Next appointment" agent to the cardiologist in your multispecialty clinic, only when the patient sees the first cardiologist of your clinic in an encounter will this agent activate. Everything else will have no effect, no matter how much time goes by. So, if you send a "Next appointment" agent to yourself, you will see it as soon as you open the chart during a patient encounter—but not while you are reviewing the chart or when anyone else sees your patient.
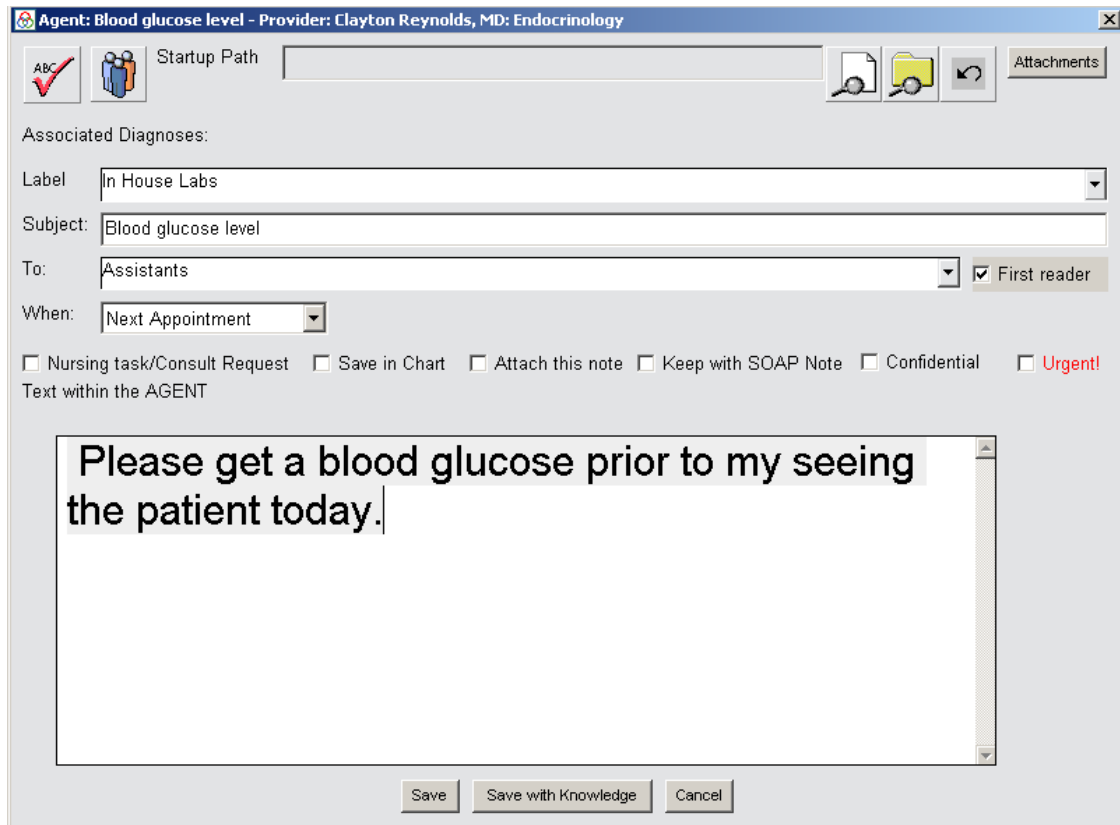
Figure 91. *"Next appointment" event agent. This can be set to activate tomorrow or three years from now or never. It will only be triggered if and when one of the clinic assistants sees this patient during the next appointment.*

There is a similar event for "Chart Review" to prompt the recipient to do something at the precise moment when a chart is reviewed, without the patient being present.

These kinds of events, coupled with the Concept Processor's ability to generate discrete data on the fly, allow for the most powerful practice advisories in medicine. Let's take a look.

Practice Advisories

A Practice Advisory can be thought of as an agent. As explained in our previous discussion, an agent activates under certain conditions, such as when a patient returns for an appointment. This may not sound very exciting, but it is!

The Practice Advisory is an agent, but instead of being patient-based, it is condition or event-based.
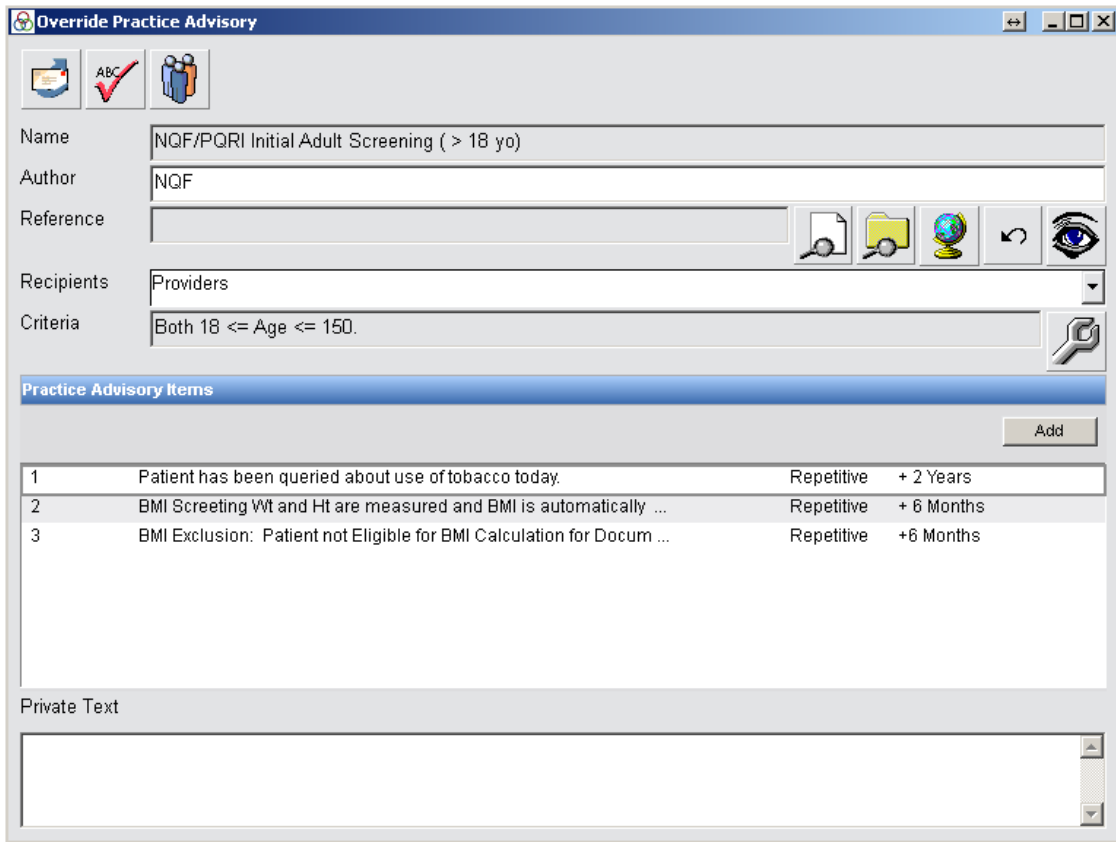
Figure 92.   Practice Advisory Agent. It will trigger only if a patient who is 18 or older sees a provider during the clinic visit.

These conditions can be set up by you as the Medical Officer, or they can be imported from third parties or from us at Praxis. They can be made as sophisticated as you want them to be, and are easy to create.
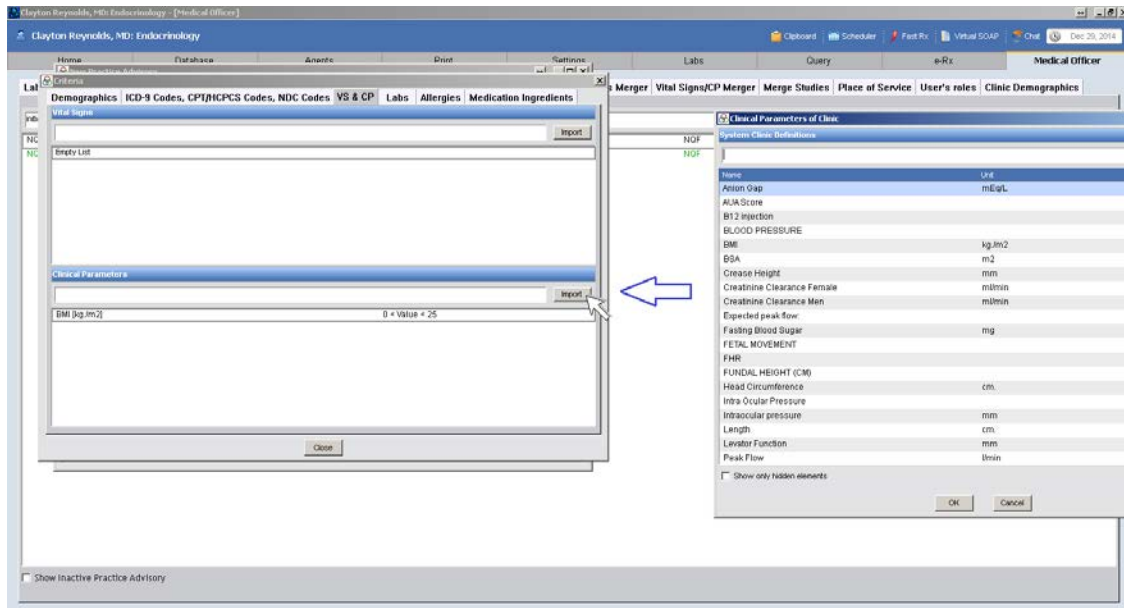
Figure 93.   Practice Advisory displaying BMI range.

The BMI is a Clinical Parameter, which like any other clinical parameter field may be created by the clinic. There is no limit to the kinds of clinical parameter discrete data fields that can be "invented" by a clinic: Fetal Heart Rates, Anion Gaps, Weight differentials, Date of injury, or any other. The fields that can be made are only limited by your imagination. Once created, however, they also appear in the Practice Advisory Clinical Parameter listing.

For example, you can set the BMI so that anyone presenting with a BMI outside of your criteria will trigger this practice advisory when meeting the appropriate recipient of the agent. These Advisory Agents may be made to activate not just by encounter related Clinical Parameters, but by patient related Dynamic fields (page 111 or by any combination of codes such as ICDs, CPTs, lab results, Vital Signs, Medications, Allergies, patient demographics, and any combination thereof. By refining the recipient criteria (*e.g. Nutritionists, Cardiologists, "Doctor Smith's MAs," etc*), the recommendations can be sent surgically only to the precise target users. ("Female smokers presenting to the OB Nurse after their 10th week of gestation with a fetal heart rate greater than 160").

As an example, if you review the clinical parameters created by the weight surgical center on page 115, you will see that all the dynamic fields and clinical parameters were designed by the clinic, which can now create practice advisories that trigger under certain conditions—such as if there are no significant improvements or if something gets worse.
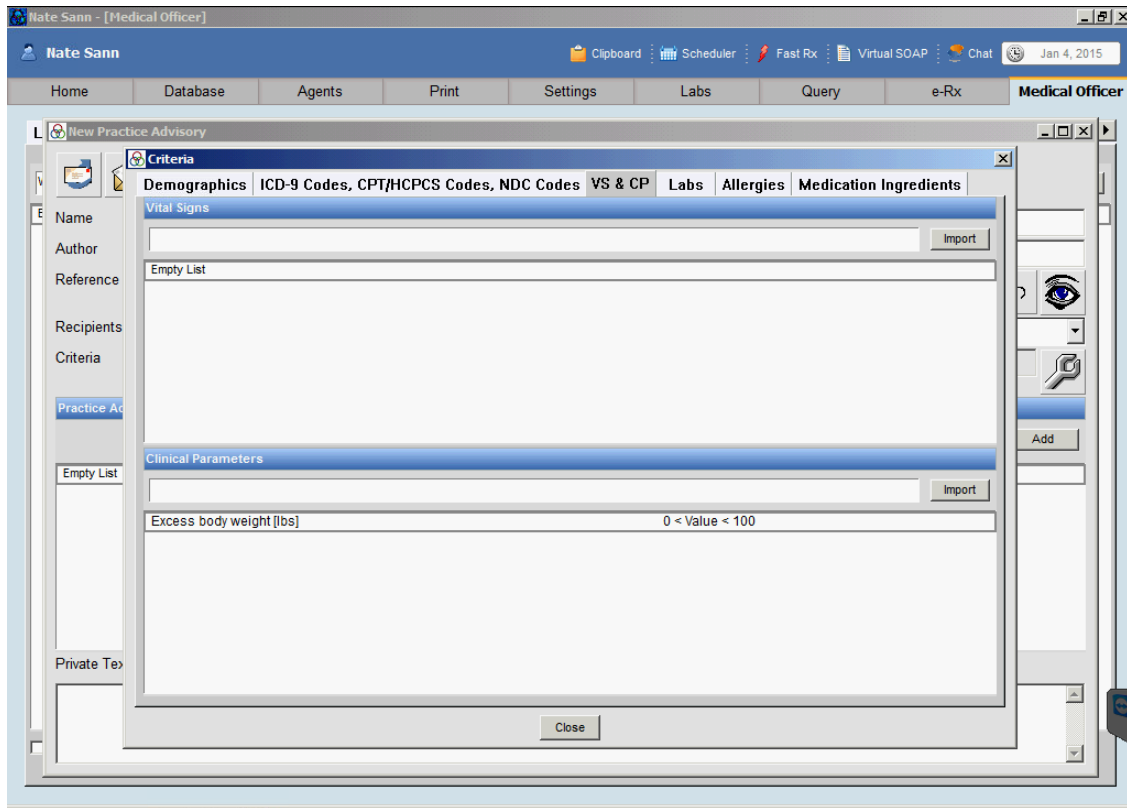
*Figure 94.   The Surgical Weight Center whose data is displayed on page 115 may now create a
Practice Advisory that will trigger when a patient with an excess body weight of 100 lbs. meets a
provider for the first time. At that point, the provider can read its recommendations and links to
websites that further explain the issue at hand.*

Because you may create your own dynamic fields and clinical parameters, and then
combine these criteria with any medications, allergies, vital signs, laboratories, and
default demographic information, there is no practice advisory you cannot create with a
bit of imagination.

The power of the Line-Item recommendation

Once the practice advisory "triggers" at the point of care, then what happens?

The Practice Advisory agent carries line-item recommendations with it. These can be
thought of as secondary missiles that fire off when the practice advisory has triggered for
the appropriate patient (who meets all the criteria you set up) and the appropriate target
recipient (e.g. the nutritionists, providers, assistants, pediatricians, etc). They carry the
message, or messages depending on the number of line items you create.

Figure 95.   Practice Advisory line- item recommendations.

Let's look at a single line-item recommendation by clicking on it.
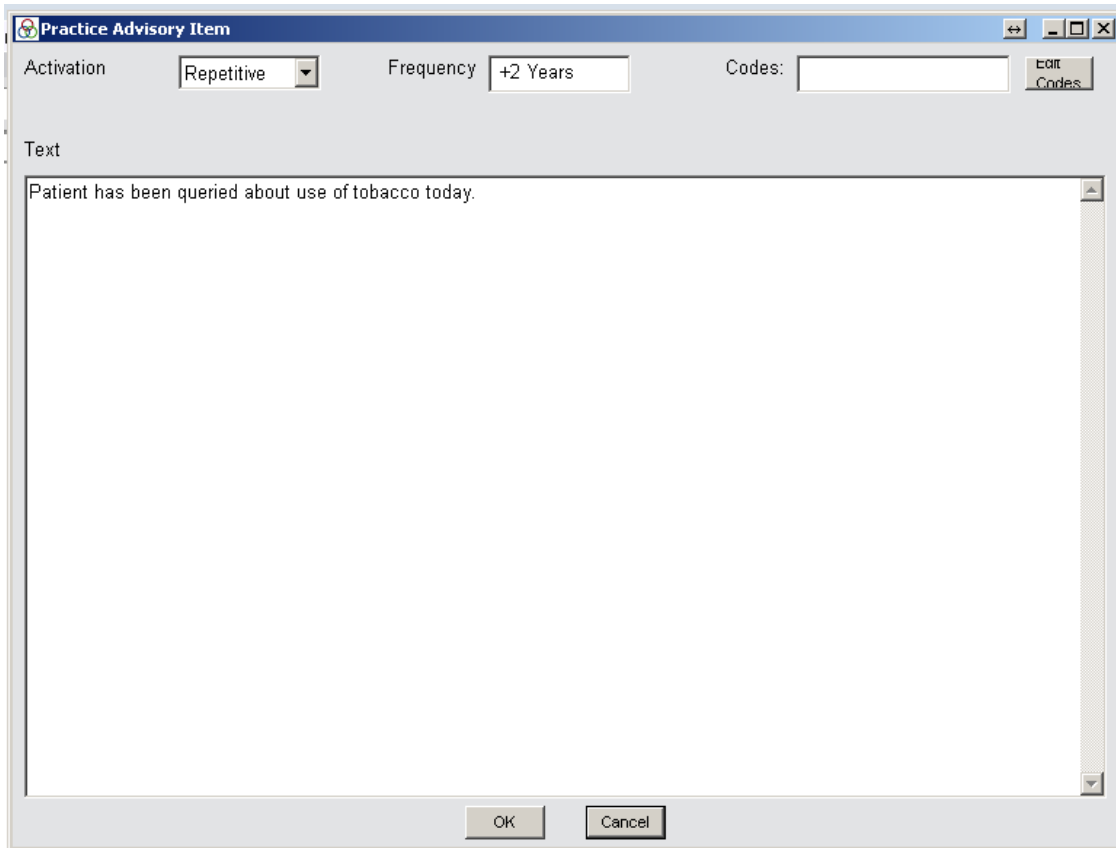
Figure 96.   *Inside the first Line-Item Recommendation seen in the previous figure. This Line-Item recommendation may appear simple, but it is highly effective, and it does not appear to be a recommendation at all at first, but it is!*

Line-item recommendation is its own event-driven action item. Note that the text is not written as a *recommendation* per se, but as a *fait-accompli*, as a *done deal* (i.e. we did not write "Remember to ask your patient whether they smoke" but rather "Patient has been queried about the use of tobacco today."). Why? So that once your intended user agrees to follow your recommendation, it is automatically documented, making the charting and/or the order automatic. The target user simply accepts it at the point of care, and it is done. Indeed, your line item recommendation could be written as a complex order or a complete patient instruction that is carried out and also immediately documented on the chart.

As any provider knows well, often it takes less time to tell a patient not to smoke than to have to write about it!

And note the timer on the figure above. Your recommendation may be a one time event or it may be set up to recur periodically up to a certain point in time. For example, if you schedule a recommendation to recur every two years, but the parent practice advisory is set for those under 18, then the recommendation will trigger every two years until the

patient turns18.

The blessed codes

The small button found on the top right of the previous figure ("Edit Codes") is of particular interest.
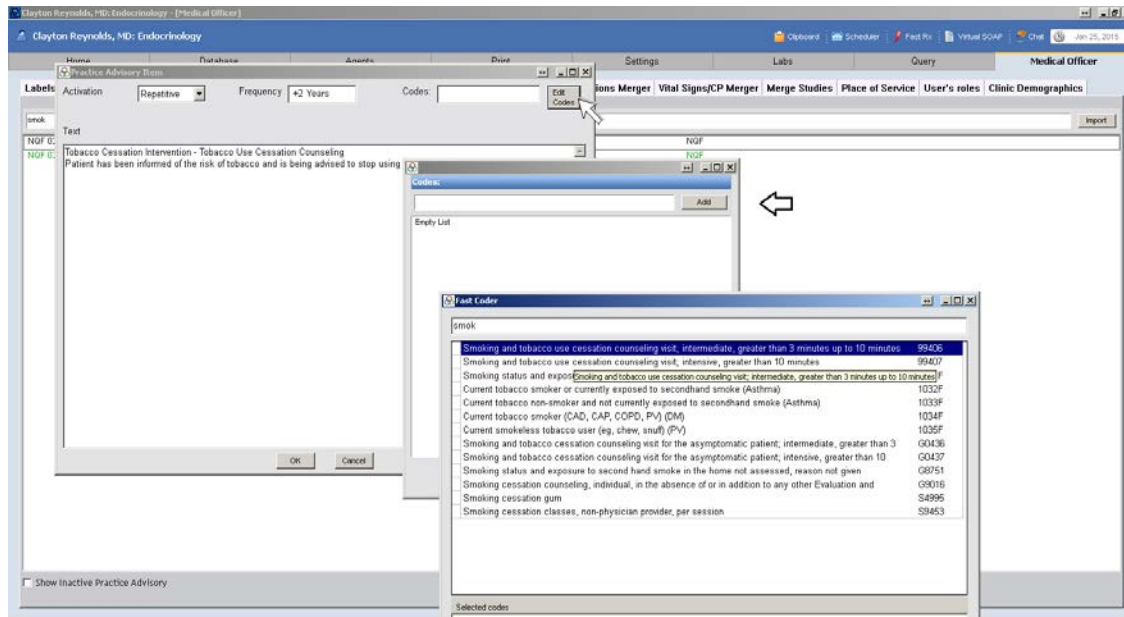
Figure 97.   Many different code types may be linked to the line-item recommendation. If the physician accepts this recommendation, the text within the line-item is not only instantly copied onto the chart, but the advisory also sends the related code to Medicare or any other third parties, with the clinic's consent.

You can link this response to any kind of CPT, SNOMED, LOINC, or RxNorm Value (or any other codes invented in the future). This means that third parties—particularly Medicare—will receive the appropriate codes in response to your action at the point of care and will be able to use them to perform their own queries. Since codes are discrete data, the user, date, time, and related encounter are automatically recorded as well. You as the provider at the point of care do not have to bother with any of these codes. Each of them is optionally selected by the creator of the advisory, and they trigger when the user accepts this advisory.

Import and Export Advisories

Who has the time to create practice advisories?

Just as in the case of the Knowledge Exchanger (see page 92), Datum Elements, and

Flow Charts, Practice Advisories may be created by your Medical Officer and then not only used in your clinic but also exported to any other clinic in the world that uses Praxis. Likewise, you can receive Practice Advisories from the outside with ease. In fact, we design and distribute any of the Practice Advisories required for Meaningful Use (MU) and for the Patient Centered Medical Home (PCMH). These may also be adapted to your clinic's particular circumstances. You have total flexibility, and you need not be a programmer to set these up or change them. Practice Advisories were developed so that anyone with medical knowledge could easily work with them.

What happens at the Point of Care?

When an advisory is triggered for a patient at the point of care, you as the user are warned by the advisory's message written as a statement of fact. You simply approve, decline, or ignore the recommendation. If you approve it, the text is automatically pasted in your chart. (i.e. *"Patient has been queried about use of tobacco today."*)

Of course, your approvals or disapprovals are noted for queries and attestations, and the codes are generated for any items you approve. The advisory may simply be informational. It could simply provide a differential diagnosis or other clinical explanations triggered by the findings detected via the criteria (i.e." Careful with the Lasix prescription as the Potassium is low!")

If you decline an advisory, it will not trouble you with this patient in the future; it will not return for this patient. You also have the opportunity to explain your reasons for declining the advisory right on the advisory itself. Your feedback can then be analyzed with your response, and this action of yours will hopefully improve the advisory itself, by taking into account the exceptions that you and your colleagues discover in the real world.

This mechanism for transmitting information and knowledge at the point of care opens up a new approach to ensuring medical quality. How does it do this?

Let's find out the answer to this in the third part of the medical quality trilogy where the Recommendation and the Recording of the note are the first two: the Medical Review (Query).

A Medical Query Revolution

It's time for another seemingly insane statement:

There is no such thing as retrospective queries of Electronic Medical Records!

Oddly enough, one of the main reasons that everyone wants to shift healthcare into the

information age is to be able to perform retrospective queries on medical records. Big data is what this game is all about, and this is what non-providers and the governments who pay for all this technology want. The hope is that if "*de-identified data*" (data that cannot be traced back to individual patients without authorization) can be pooled from thousands of clinics seeing millions of patients, then we might learn how to keep people healthy by having effective prevention programs with superior outcomes, lower costs, and increased quality. These kinds of studies cannot be done effectively on paper records. It has been tried[vi].

So our statement above—that there is no such thing as a retrospective query—may come as a big surprise to those pursuing the EMR for the specific purpose of going inside and getting answers. How can we categorically state that true retrospective queries in electronic medical records cannot be performed?

The reason is simple. To query electronic medical records retrospectively—that is, to be able to search backwards in time based on information currently found within the EMR—two assumptions must be made, and if either one them is false, then the entire argument falls like a house of cards.

> Assumption Number 1: The programmers of the EMR must be God.

Programmers must be 100% omniscient, i.e. they must know in advance every question that will ever be posed by anyone in the future, and must have already created the appropriate fields, where the answers can be instantly found. These programmers can do this because they are God!

If any field were missing, then the related question could not be asked. Simple example: Say that as a director of a large clinic, you want to know how many of your patients have blue eyes. (Why you would ever want to know the eye color of all the patients in your clinic is another matter, but let's assume for the moment that you did.) In this case, the field for eye color has to be already available inside your EMR or you will not be able to query that information retrospectively.

To be fair to the wonderful folks at SNOMED[®vii], they do share some godlike traits. They have been toiling away for years to create every possible field that can be conceived for medicine: all the possible symptoms, all the possible findings, and all the possible therapies, and then they have convinced the powers that be that this is the way to go. Every child who will become a doctor should learn the SNOMED language rather than English. And indeed, eye color is one of the fields available in SNOMED. Behold!

```
<observation classCode="OBS" moodCode="EVN">
 <code code="247030006|Eye color|"
codeSystem="2.16.840.1.113883.6.96">
   <displayName value="Eye color"/>
 </code>
 <text>Green eyes</text>
 <value xsi:type="CD" code="371246006|Green|"
codeSystem="2.16.840.1.113883.6.96">
   <displayName value="Green"/>
 </value>
</observation>
```

All that stands for a patient with green eyes. To be fair to SNOMED, the idea is that computers will someday learn how to parse normal English into SNOMED. So when a doctor writes "Mary has green eyes," the above code will be magically produced![viii]"

However, as mentioned, there is a **second** assumption that must be met:

> Assumption Number 2: Every one of all the possible fields must be filled out in advance for every patient and for every encounter that requires it or you cannot retrospectively query it.

Say your clinic had implemented the SNOMED code above and entered it into your EMR. In that case, the eye color would have to be filled out for every patient coming to the clinic, or you would not be able to do a successful query either. In many other cases, the field has to be entered not just for each patient, but for each patient's every encounter, for you to be able to do a sensitive query[ix]. In other words, for a true retrospective query, all the fields that will ever be queried in the future must be fully filled out in the past. How do the users in the past know that this query will be needed in the future? Well, they must be God as well!

The solution, in our view, is much simpler:

> Actually, all retrospective queries are prospective queries in disguise!

Ahhhh! A prospective query is quite a different story. This is a type of query that you plan ahead, even before performing the study or asking the question. It is done **after** the field(s) in question have been created and activated and in full use for a significant period of time (called the "reporting period"). Everyone responsible knows how to enter the related values and is motivated to do so 100% of the time. This means that a query is always prospective. Not only must the fields for it exist way before the query is run, but as you can see, this is also a political issue. Everyone should be informed in advance about this field and must be willing to enter it on every patient and on every encounter before any query can be performed accurately.

Of course, a few fields do exist prospectively from day one: For example, the medications

prescribed. (Unless you enter the drug by hand, 100% of the medications prescribed by the clinic must also be prescribed through the EMR for your query to be sensitive.) Other examples of discrete data include the name of the patient, their age, gender, registration number, and other basic information that is required to operate the program. Queries can easily be made retrospectively about these fields, but only because they were set up prospectively from day one.

Because data depends on the type of clinic and the medicine that is practiced, creating automatic fields simply gets in the way. It is the worst kind of noise (see page 98). And the existence of these fields is no guarantee they will be filled out. If they are forced on users by the program— which some EMRs do—this limits freedom of the users and slows things down for the practice. Yes, you may create your own dynamic fields and clinical parameters; so there are no queries you cannot prospectively make, but remember that every one of these fields must be filled out prospectively every time for you to be able to perform retrospective query in the future. So the more you have, the worse it gets for the clinic. So this is not the best solution either.

Fortunately, the answer is found in another statement that may seem strange as well:

> Every prospective query can be thought of as a practice advisory in reverse!

Now we are getting somewhere! We've already reviewed Practice Advisories; they are agents or messages delivered intelligently to the target recipient at the precise time. In our previous discussion, we focused on recommendations made at the point of care. Many advisories appear to be statements, yet they are actually recommendations or messages sent from the powers that be to the end user that trigger at the point of care. However, the line-item advisories you saw within the Practice Advisories may also be set up as questions or prompts. For the eye color example, one line-item could be "Blue", another one "Brown", and so on. You may also add the line-item "other," and don't forget your reason for the request to improve compliance.

> *Please indicate eye color. We are doing a study linking eye color to liver dysfunction.*
> *Blue,*
> *Green,*
> *Black,*
> *Brown,*
> *Other*

The responses can be used as a learning tool. (E.g. "My patient presents with a blue left eye and a green right eye." (Heterochromia?))

When the user selects the appropriate line-item, this puts an entry into the database indicating the action taken, when it was taken, and by whom. This information can then be queried in the future. And always keep in mind that people will usually do what you ask provided you first explain your reasons for the request. When creating your prospective queries, it helps if you add a comment, such as "We are performing a study

relating eye color to [whatever explanation applies]". You can measure the response or lack of response to your query at the end of the study period.

Note that with this approach you do not need to use SNOMED nor any other code to perform an accurate query. English (or your nation's language) is good enough! However, you may wish to link the codes to the line-item recommendations as we described earlier, so that third parties get the codes they want. Once you click on the color green, the complex set of SNOMED code for green eye color that we displayed could be automatically generated and sent to the third party's computers.

The only requirement for this type of query is that your end user understands your question and be willing to respond. You may be amazed to find out that what you originally thought was an obvious statement, actually includes ambiguities that confuse your target users, which could lead them to respond inaccurately. But you quickly learn from all this feedback. As you receive replies to your prospective query, your end users may add their own comments, including questions or exceptions, which can help improve your original practice advisory. This process is important when imparting information and measuring performance in evidence-based medicine.

Here is a corollary to the previous statement, now turned inside out:

> Every Practice Advisory implies its own potential query.

This is not just for practice advisories like the eye color example you have just seen, but for any practice advisory you wish. The response to any Practice Advisory whether set up for purposes of prospective query or simply to impart a recommendation, may be queried. This has major practice implications. It means that you can query: 1) Whether the advisory was accepted. 2) Whether it was declined. 3) Whether it was ignored. 4) Whether the end user had any questions or comments about the advisory. 5) The time the advisory was accepted, ignored, or declined, in which encounter, and by whom.

Now let's review how the Praxis queries work.

The Praxis Query Builder
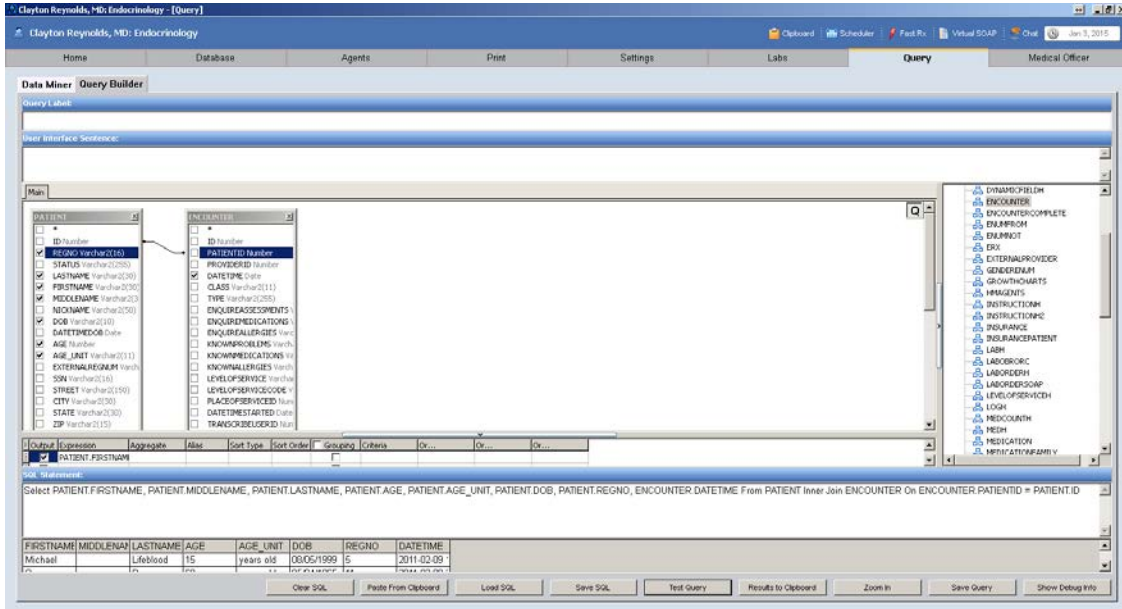
Figure 98.   SQL Query Builder: Query of all the patients in the clinic and the dates they were seen. This is one of the simplest queries you can make. As you link the tables above, the SQL code is generated automatically, below. This way, the computer can teach you the language and how to code[x]...
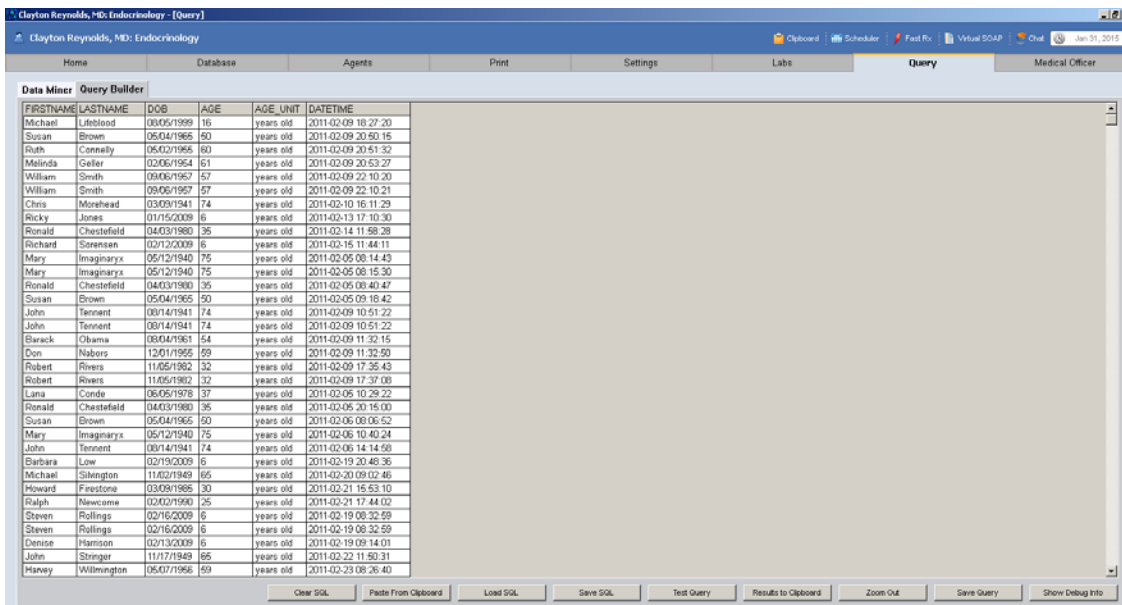
Figure 99.   Expanded view of the previous query.

As we mentioned, Praxis has created a complete set of View Tables (see "Oracle View Tables" on page 110) using medical terminology. These View Tables may be accessed from within the Praxis EMR or from any outside query engine, via ADO[xi].

Knowing how to program in Standard Query Language (SQL) is all that is required to create any query[xii]. Creating queries in SQL requires 95% medical knowledge and 5% mathematical knowledge, at the High School level at that! (Set Theory, Unions, Intercepts, Venn Diagrams, etc. Remember?). However, the key to creating valid queries depends on a deep understanding of the clinical question one is asking. This sounds simple, but it is the most complex part in creating a query. That is why we believe that with a bit of training a clinician can create better queries than a programmer who does not practice medicine. After the query is made, it can be immediately tested and changed until you are satisfied. Sometimes you think you know what you are asking, but you really don't. Computers will not interpret your words; they simply obey. To know what to ask requires medical knowledge and a bit of trial and error practice.

And once a query is created, it may be exported into the Praxis Dataminer™ of your clinic to be used by anyone with permission, math expert or not, or by any other Praxis user in the world with access rights to the Dataminer.
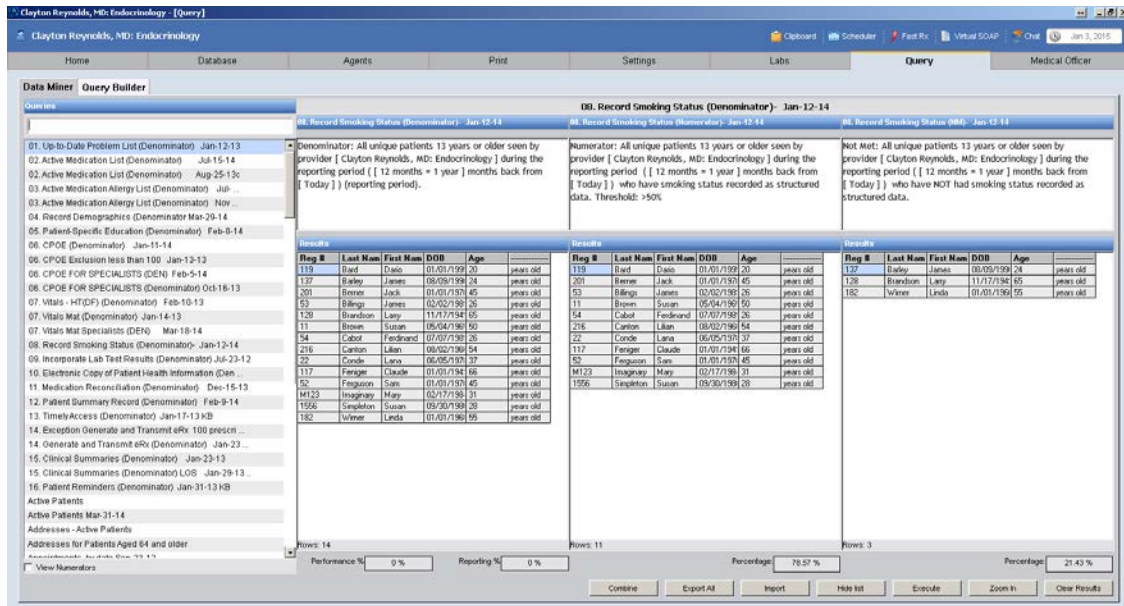
Figure 100. Praxis Dataminer disclosing a Meaningful Use query, with the different windows denoting the Denominator, Numerator, and Condition not met. Once a query is built, it can be imported into the Praxis Dataminer, so that anyone with access rights may use it automatically.

These queries can be transferred from one Praxis system to another. Our company provides requested queries for Meaningful Use, Patient Centered Medical Home, or anything else needed. However, any medical expert can develop queries with just a bit of training, and he/she will probably do it better than us. Querying medicine is not rocket science; it is medical science.

You will first see what appears to be an enormous number of table views and fields in the Query Builder, but the number is insignificant when compared to all the possible fields needed to query medicine. However, as we have discussed on page 111, you may develop your own Dynamic Fields and Clinical Parameters in order to expand your options and that makes your ability to create practice advisories and queries infinite.
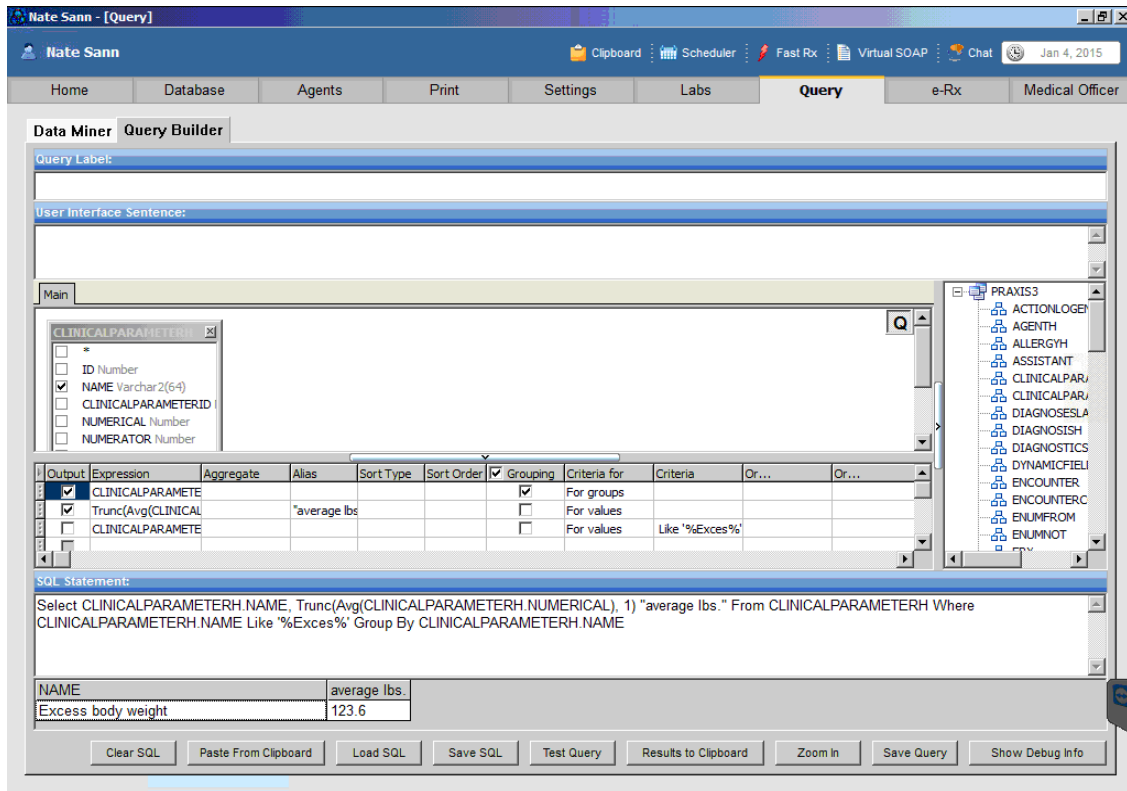
Figure 101.   Let's review the Weight Center on page 115. A query can be made about any Dynamic Field created by a clinic. The screen above displays the average excess body weight of all patients coming to this clinic.

Still, this is not the optimal way to ensure quality medicine; one more piece is missing. Now that you have reviewed how queries work, we are ready to use this knowledge to explain how this approach will revolutionize the quality of medicine.

Enter Clayton Reynolds MD. The Three Rs

Doctor Reynolds specializes in endocrinology, but his passion for the last forty years has been quality medicine. For more than 20 years, Doctor Reynolds enthusiastically performed the difficult task of reviewing the hospital medical records of hundreds of patients. He acted as chair-person of the medical quality committees of several hospitals located in the Antelope Valley, California. He was also the first Praxis user, and has been an amazing mentor in the development of our technology since day one. We selected Doctor Reynolds as our first beta tester back in 1992 on the assumption that if he found Praxis acceptable, we did not have to worry about the issue of medical quality. And Doctor Reynolds did much more than just test the Concept Processor and approve it. Praxis changed the way he viewed medical quality, which resulted in his breakthrough discovery. In 2008, Doctor Reynolds published his paper on the "Three Rs: Reminder, Record, and Review", based on monitoring quality medicine and his experience using the Praxis Concept Processor.

CANADIAN
Healthcare Technology

www.canhealth.com

> With over 30 years of experience, Clayton Reynolds, MD, CAAP is a practicing Endocrinologist and nationally recognized Medical Quality expert in both the US and Canada. Doctor Reynolds is the developer of "The Three "R"s, a powerful new approach to Clinical Practice Guidelines and Medical Query. The new Praxis EMR v4.0 is the only system on the market that utilizes this revolutionary approach.

The three Rs of medical quality:
Reminder, Record and Review

Incorporating clinical practice guidelines into EMR systems leads to improved quality of care.

BY CLAYTON L. REYNOLDS, MD

To date, most physicians in clinics and hospitals have delivered healthcare in a non-standardized fashion. The range of treatments applied to particular diseases can be quite wide – and the clinical outcomes rather varied.

It has been argued, with good reason, that evidence-based medicine would reduce that variation, and would result in better outcomes and overall improvement in the quality of healthcare. In this article, I suggest that incorporating clinical practice guidelines – a form of evidence-based medicine – directly into Electronic Med-

Dr. Clayton Reynolds is a practicing endocrinologist based in Victoria, B.C. He has worked extensively in Canada and the United States, in ambulatory care clinics and hospitals. Dr. Reynolds has also served as Chair of Quality Improvement Committees in several hospitals and as Director of Medical Informatics for a group medical practice in California. He can be reached at: reynoldsclayton@msn.com or 250-858-8883.

ical Record systems would lead to dramatic improvements in healthcare quality.

In brief, the electronic medical record can be a boon as we try to apply, use and evaluate the effectiveness of clinical practice guidelines (CPGs). The EMR cannot replace the process of construction of the CPG, but it can make their distribution much easier and more complete than a paper-based system.

Through integration with the EMR, clinical practice guidelines can be made available in a uniform way throughout a clinic – with a single version disseminated to all caregivers. That immediately eliminates a major problem with paper documents – namely, they tend to circulate

in multiple versions, many of which are out-of-date.

Any EMR could be customized to display clinical guidelines, using a 'dashboard' approach and word processing and spreadsheet programs. Moreover, as providers employ the EMR in their daily use of CPGs, they can send messages by internal email to the clinic managers, who can make appropriate use of comments to revise and improve the CPG. As a result, there is quick and continuous feedback that allows clinics to develop the most effective guidelines.

Chart reviews: A curious thing happened in 1999 that brought me to a new understanding of the relationships among several facets of quality of care.

I had done a medical chart review on patients with hypertension. The review showed poor compliance with the criteria that I had used in setting up the review.

Discussion with the providers in my department revealed that poor compliance was linked to poor knowledge of the guidelines. In fact, the guidelines had never been presented to the providers in my department! We easily concluded that the guide-

---

This was followed by his second paper on "How to get things right using an EMR: a checklist for healthcare," published this year[xiii].

As Doctor Reynolds explains it, during part of his time in Lancaster, California, he was

Chief Physician for the Antelope Valley branch of the Los Angeles County Department of Health. There, he had set up ten parameters for the providers to follow on all patients presenting with Hypertension, and he reviewed hundreds of charts searching specifically for mention of these parameters on each patient's record. Not surprisingly, his query process found the charts incomplete. When meeting with the members of his department to discuss this, they asked him point blank: "Doctor Reynolds, how are we supposed to remember to follow all these items you are testing us on if you do not tell us what these items you are looking for are?" In other words, the healthcare providers needed a method of remembering (or being reminded of) the items required to provide quality care to any patient, with the parameters of such care being set out in advance and readily available at the point of care.

That is when Doctor Reynolds realized that a query and a practice advisory were one and the same. And he went further: He noted that the *Recording of the note* is part of the triad that starts with the *Reminder* and leads to the final *Review*. The trio can be thought of as one and the same!

In other words, any query in medicine can be turned into a practice advisory that generates its own documentation and fulfills its query prospectively! They are three sides of the same coin. No, a normal coin cannot have three sides, but this one can—they are all one and the same!
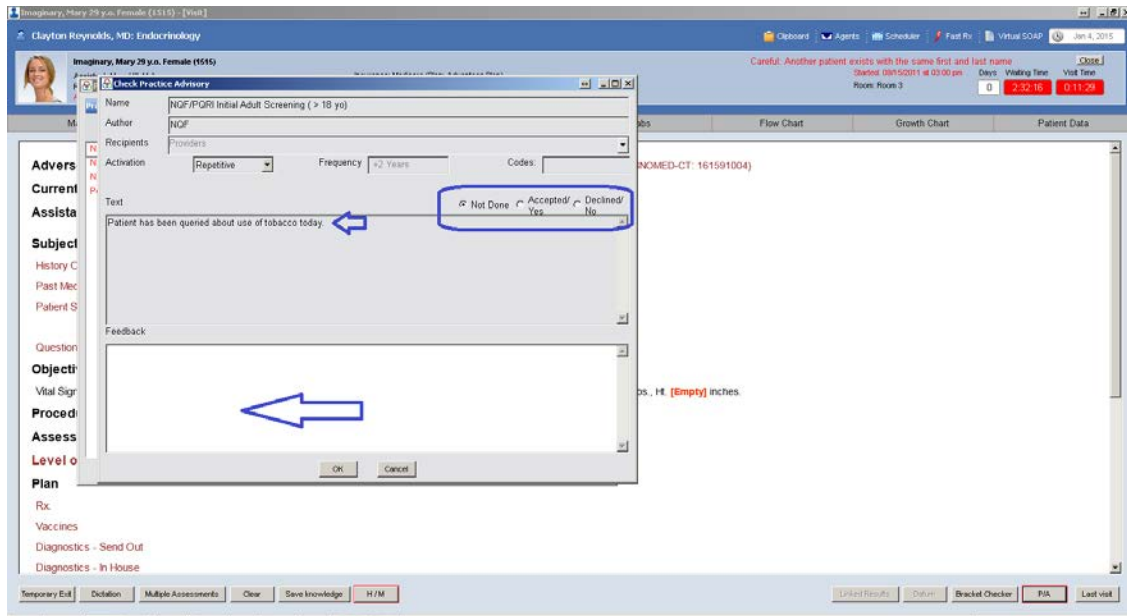
Figure 102.   Practice Advisory activation at the point of care. The recommendation should be written as a fait accompli (e.g. "Patient has been queried about the use of tobacco today."). Upon accepting the recommendation, the text will be pasted on the note. Please note the feedback area. The action taken or not taken (Not Done, Accepted, Declined), the date/time, the user, and the possible feedback options are all entered in the database for potential query at any time in the future.

In fact, Doctor Reynolds had unwittingly resurrected the Hawthorne Effect to improve quality medicine. The "Hawthorne Effect" was a term coined by Dr. Henry Landsberger in 1955. He noted that the very process of observing the factory workers was improving their performance[xiv]. Consequently, Praxis users have scored close to 100% in many of the Meaningful Use and Patient Care Medical Home attestations. Unlike the observations made by Doctor Lansberger's studies, where the positive effects on productivity were due to observer influence and found short-lived, with the Concept Processor there is no observer influence, the reminders are persistent and improvements progressively increase.

This applies to medicine as well: Basically, the use of the query dramatically improves the results of subsequent queries. Although this may appear to some as "cheating" because the provider sees the expected "answer" that is being measured at the point of care ("Jim, don't smoke! Do you want some Nicorettes?") it is also a prompt that allows the provider to practice superior medicine. After all, this is not high school where the correct answer is hidden from view and must be figured out. On the contrary. Why shouldn't a provider score close to 100% in all measurements of healthcare quality? All he or she has to do is follow the prompts seen on the screen and in the process, they are automatically recorded as facts, unless the provider disagrees. Why is it required to waste time trying to remember what one must do, then type it from memory?

Actually, clinicians probably wouldn't score 100% all the time, even with the use of the concept processor. There are valid exceptions. Say that a smoker comes in with a terminal cancer; many clinicians wouldn't dare tell that patient to stop. So, if in addition to stating "Patient has been queried about tobacco today", you create a new line-item stating "Patient was not queried about the use of tobacco because he has a terminal illness," then provider performance will increase. This is called an exclusion. For the powers that be to create these improvements, they need feedback from our colleagues in the field. This feedback loop is essential for improvement of the advisories, and it starts a two-way communication between the practice guideline makers and the clinicians.

Why Meaningful Use Dashboards are Insane

This method does away with the impractical Meaningful Use Dashboards that many EMRs have touted. The Meaningful Use Dashboard is like having a police officer in the software. The provider must constantly be alert and measure how well they are performing, and whether they are meeting the "threshold". That's crazy. Why shouldn't a provider score 100%? You would certainly not want to be the patient of a clinician whose performance meets the official thresholds but not yours.

As a result of using this unique query attestation technology, Praxis won the prestigious HIMSS Davis award, when our physician's attestations hit close to the 100% mark[xv].

Praxcoder™: The Level of Service Optimizer

(currently available in beta)
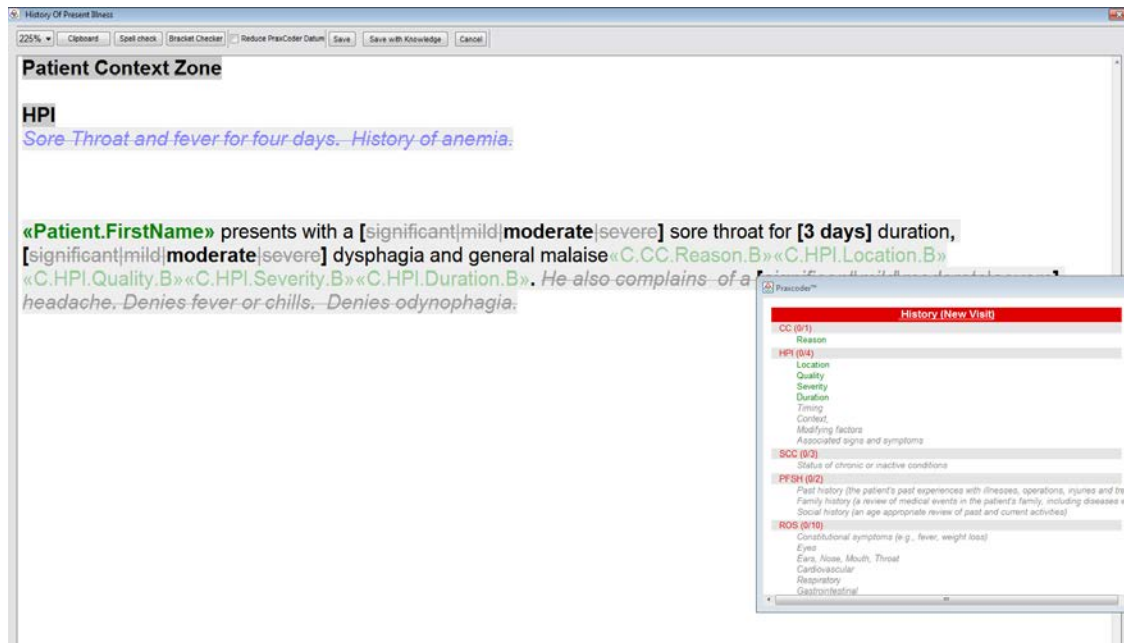
Figure 103. *Like most everything in Praxis, the Praxcoder™ Level of Service Wizard works backwards. It protects you against illegally over-coding an encounter, or foolishly under coding it.*

As mentioned on page 168, Levels of Service are part of 1997 Medicare regulations meant to pay for the complexity of thought as opposed to the complexity of action. The theory was that if a third party paid for medical services being performed rather than for care that prevents illness, then providers would tend to perform more procedures rather than prevent them. This was felt to be unfair to the non-procedure oriented specialties that focus on illness prevention and counterproductive for society.

That was how the Levels of Service legislation came into being. Medicare stipulates a payment rate based on the absolute complexity of the case, but it must be charted following strict regulations.

This method of payment is based on two premises:

1. A more intellectually complex case should be paid better than a less intellectually complex case.

 2. A more intellectually complex case should also be more complex to chart. Additionally, it must be charted in the way stipulated by Medicare to count as valid.

The flaw with the first premise is that the complexity of a thought process, as opposed to the complexity of a physical action such as a procedure, depends entirely on the provider's previous experience with it. If a doctor has never seen a case of HIV, the case might take all morning, whereas for a doctor working in an HIV clinic, the same case might take only a few minutes, unless procedures are involved.

The second premise states that the more "complex" a case is, the more complex the history and physical must be to justify a payment. Not just that, but in order to get credit, the history and physical must be performed in a way that is stipulated by the government. Why should a more complex case be necessarily more complex to chart? And why would a case be better treated if the case is charted in a certain way? This physician certainly does not know the answer, nor has any colleague with whom this doctor has spoken.

The way this works is that a level of service CPT code must be generated for the entire encounter. The government has contracts with private agencies which send auditors to review medical records and count "bullets" (i.e. individual factoids of information). These auditors need not be experts in medicine, since all they do is check for the presence or absence of precise text and then ensure that the regulated "bulleted" text is present in the progress note. Then they add up the points from all the bullets and determine whether the charges made meet the bullet count to qualify for the payment level claimed. If this is not the case, the physician and his/her clinic are subject to heavy fines.

This Level of Service paradigm will probably go out of use in the near future as "evidence-based" medicine using EMRs takes its place. However, this is currently the law of the land, and this White Paper is certainly not a place to discuss its merits.

Here is the problem for practitioners: No doubt a few providers are unethical and would change a diagnosis or add unnecessary treatments or procedures simply to make more money. This is certainly not the case for most practitioners. The issue is that once a clinician has reached his/her diagnosis and set up a reasonable plan of action for the patient, then the provider must ensure that the history and physical descriptions entered in the record add the bullets set arbitrarily by Medicare. Because doctors do not have the time or inclination to try to second guess these bureaucratic requirements, they opt for the safe approach of "down coding" their case, which puts them at a financial disadvantage.

The Concept Processor tackles this issue head-on, backwards but in a rational way.

In this case, the Concept Processor breaks the problem into two steps: At first, it counts the bullets as the elements of the Diagnosis, Procedure, and Plan appear in the record, but it ignores all the History and Physical bullets. If the text has not yet been linked to a bullet, the system prompts you the first time. ("Acute Pharyngitis": Is it a Minimal, Low, Moderate, or High level of complexity? "Penicillin" medication: Is it "Minimal, Low,

Moderate or High" level of complexity?"). Of course, all these selected levels of complexity for each item need only be defined once.

At this point, the Concept Processor takes into account whether the patient is new, returning or a referral, and provides them with a temporary "Optimal Possible Reimbursement" (OPR) Level of Service Value. This is a theoretical value based solely on the Assessments, Procedures, and Plan elements that would be earned if the history and/or physical examination taken at the time met all the level of complexity requirements demanded by Medicare rules.

This Optimal Possible Reimbursement (OPR) is a theoretical value. From this value, the system then works backwards and advises the provider at the point of care about what items may be missing in the history and examination of the patient to meet the level of complexity required by this level OPR. Then the provider has the choice of improving his or her history and physical exam following Medicare rules while the patient is still in the room, or accepting a lower fee for the services rendered. Each element of the History and Physical is attached to hidden bullets, which trigger a bullet counter that generates an alarm if the history or physical exam do not meet the standards of clinical complexity according to Medicare. Level of Service is the lower of the two sets (History and Physical or Diagnosis/Treatment plan plus the timer). This setup is attached to an alarm warning the provider whenever the complexity of the History and Physical text is lower than warranted by the diagnosis, the treatment rendered, and the time spent with the patient.

As everything else with Praxis, the more cases you see, the more bullets are entered for each item, and the less frequently you have to set anything new. For example, if a patient presents with more than one diagnosis resulting in a higher level of the History and Physical or when you spend more time than expected for a given level of complexity (and you can justify doing so), you will be informed what History and/or Physical elements are required by Medicare regulations to justify that level of service, all this while your patient is in the room. This ensures that you never illegally over-code, but never mistakenly under-code a case either.

The Future

Now that we have explored this technology and its advantages, you may agree that not only have templates never worked, but they are actually getting even worse with every innovation made on EMR technology (for a full discussion on templates, please look at page 177). It isn't that the template makers are not excellent programmers, but simply that the template architecture is incompatible with the practice of medicine, and the more features you load onto templates, the worse they will perform. The Concept processing technology, on the other hand, not only makes sense today, but also allows for amazing growth along the same lines of thought.

The following is a partial description of work currently in progress with features soon to be released.

Final Divorce between the Assessment and the Diagnosis - the ICD10 Solution

At the beginning of our development, we did not fully appreciate the full power of the Assessment. So we included it as part of the Diagnosis (see page 28), and this approach has worked well, but is not optimal.

Example: This is what Medicaid says[xvi]:

> Examples of the enhancements made to the ICD-10-CM code set:
>
> It enables reporting of laterality (right vs. left designations), reflecting the importance of which side of the body or limb (e.g., left arm, left kidney, left eye) is the subject of the evaluation.

Praxis has used the ICD-10 database in Europe and South Africa for years; that is not the issue. This can be done today simply by creating one assessment for the right leg and one for the left leg. They would be identical in every other way, except that they would have the laterality ICD-10 code to satisfy the requirements of the third party. In fact, this is how Praxis has been successfully used in England and South Africa for several years.

This approach works but is not optimal to use with SNOMED or ICD-10, the two codes now required by the US Health System. A problem exists if the Assessment is integrated into the Diagnosis of the case. Probably no provider would consider using a different assessment simply because the closest one happens on the left leg and the new one is similar but happens on the right leg. Yet, the codes require laterality to justify certain diagnoses.

You can think of the laterality codes in ICD-10, just like the old ICD code, as simply a label you place on the patient to comply with the law, to have others understand you, and to get paid (and if you can believe this, the rule is meant to protect you from cutting off the wrong leg! - see page 117). However, the diagnosis with its related codes is just a label you place on the patient. It is not really how you think of the case. How you think of the case is represented by your assessment, which is a far more powerful, subtle and personal concept than the old ICD-9 diagnosis, never mind the new ICD-10 diagnosis. So your assessment is not likely to change simply because one patient's gangrene was on the left leg, while another's was on the right. These requirements of SNOMED AND ICD-10 codes demanded by third parties represent a waste of your time, since they usually do not make your work easier or faster.

So the real issue is how easy it is for you to access the correct ICD-10 codes during the patient encounter. As in any good EMR, Praxis has developed a way to get you from ICD-9 to ICD-10 and SNOMED codes quickly—this is called a "crosswalk", but that is not the problem either because you have no time to do these kinds of searches for every patient you see.

The elegant concept processing solution is very different and can be represented like this:
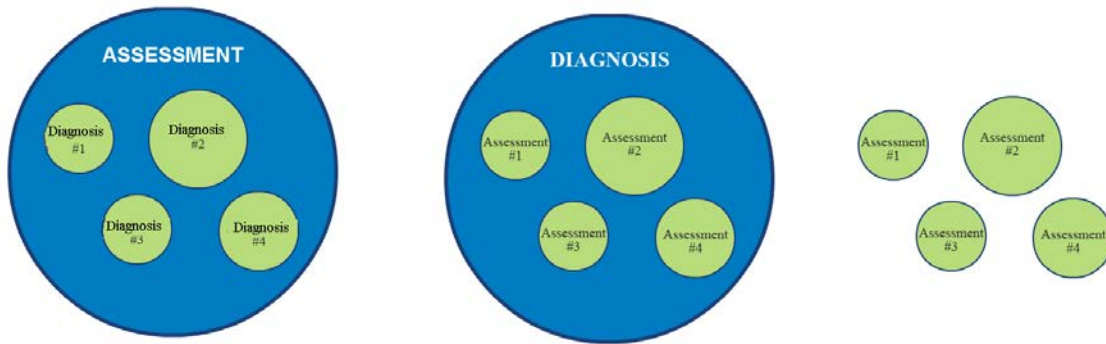
Figure 104. The Venn diagrams displayed by the circles in the middle and the right represent the current approach of the Concept Processor. The figure on the left is the new approach that will be added to the other two. The Diagnosis will be made a subset of the Assessment as well as the Assessment being a subset of the Diagnosis. Difficult for the mind to understand, easy for the computer to accomplish. This resolves the ICD-10/SNOMED issues with elegance and ease, and as usual, it resolves a few other issues as well.

Inside Praxis, it appears like this:

Figure 105. New relationship between the Diagnoses and the Assessments. The diagnoses become simple labels and only include the ICD-9/ICD-10/SNOMED codes. They are related, like all the other elements of the SOAP note, to your Assessment, whose label now is virtual (invisible) but which still includes its discussion or management text as visible, if available. Thus, you could approach the Diagnoses from the Assessment or vice versa.

The divorce between the Assessment and the official Diagnosis and its codes allows you to sidestep the issue of conceptual irrelevance with ease. Once you select your assessment, the entire case comes to life, including your treatment and your plan, and you immediately see all the equivalent diagnoses used in the past in relation to this specific assessment. All these diagnoses appear initially inactive (de-highlighted) except for the most frequent one, which becomes your final diagnosis, unless you change it by clicking on one of the others. A simple click on any alternative equivalent diagnosis changes both the related diagnosis and its ICD-10/SNOMED code. And if you must create a new equivalent diagnosis as part of the same assessment, you don't have to change your entire case simply because it is now the left leg instead of the right leg.

This goes back to our original definition. "An Assessment is your personal reason for

thinking or doing a case the way you do". It generates your complete case; whereas the diagnosis is simply a label you need to put on a case so you can comply with the law. The case is always related to your assessment, and so are the equivalent diagnoses.

> This method resolves the ICD-10 issue for providers. No template system can fix this problem because with their way of working, the provider needs to find complex ICD-10 codes every time.

Datum+ And Interoperability - Meaningful use Phase II, III, IV, V...

Initially, the Concept Processor was conceived simply as a way to chart medicine effectively. Then our clients realized that this technology could do far more for their practice. It could receive data and turn it into meaningful information (Datum), and it could issue instructions and orders on their behalf (Agents). Later, we saw how this ability to input outside data could extend to such issues as the factoids demanded by third parties, such as race, ethnicity, language, smoking status etc. (Dynamic Fields and Clinical Parameters). It became obvious that the list of discrete data codes and factoids was going to continue to increase in the world and change as time passed. How could Praxis protect our providers from the onslaught of discrete data?

You do it once, and then it will do it on your behalf forever without you having to worry about it. Datum translates the incoming barrage of factoids from third party applications, including other EMRs, into text you understand, thus lowering the noise level associated with all the incoming data.

But we also knew that adding fields alone was not the answer. Adding more and more fields would make the noise level of our software unusable, as we have seen happen with almost all of our competitors. Yet, the world was both sending noisy data into Praxis and demanding factoids back! Who has the time to fill out all these fields that the government wants? Certainly not you!

Take a look, for example, at the new requirement for transfer of care.

2014 Ed. CEHRT Data Requirements
Example: Transition of Care Criterion

Criterion	Description	Summary Type
Transition of Care *170.314(b)(1)&(2)*	Electronically create a transition of care/referral summary	**Transition of Care/ Referral Summary**

Common MU2 Data Set

- Patient name
- Sex
- Date of birth
- Race **
- Ethnicity **
- Preferred language
- Care team member(s)
- Allergies **
- Medications **
- Care plan
- Problems **
- Laboratory test(s) **
- Laboratory value(s)/result(s) **
- Procedures **
- Smoking status **
- Vital signs

Objective-Specific Data Requirements

- Provider Name & Office Contact Information (Ambulatory Only)
- Reason for Referral (Ambulatory Only)
- Encounter Diagnoses **
- Cognitive Status
- Functional Status
- Discharge Instructions (Inpatient Only)
- Immunizations **

NOTE: Data requirements marked with a double asterisk (**) also have a defined vocabulary which must be used

4

Figure 106.   New fields required for Meaningful Use Stage 2. Many of them, such as Reason for Referral, Care Plan, Cognitive Status, and Functional Status, will be automatically completed via our new Datum+ bullets (see next).

Each one of these entries cannot be satisfied by free text. It demands an independent field of discrete data that you or someone in your clinic needs to complete for any patient when you do a transition of care, i.e. when you send the patient to the hospital. For example, not only is the Goal Plan required, but they want an associated SNOMED code for it too. It is pretty easy for a vendor to create all these fields for you to fill out, but who has the time to do so?

What if we could turn Datum upside down?

What if we could magically take your normal English free text and "encapsulate" it into discrete data? (please see our discussion on free text versus discrete data on page 104)

That is what **Datum+** is all about.

Datum is described as a way to embed discrete data into free text. **Datum+** works the other way: You highlight any text and link it to discrete data fields that you can create on the fly if you don't already have them from a previous case. You can also add a dictionary as we have shown on page 117 to translate your words into the code that the government and/or any third party may want. You create the link once and the Concept Processor ensures it can be automatically re-used for this and any other patient who requires it in the future.
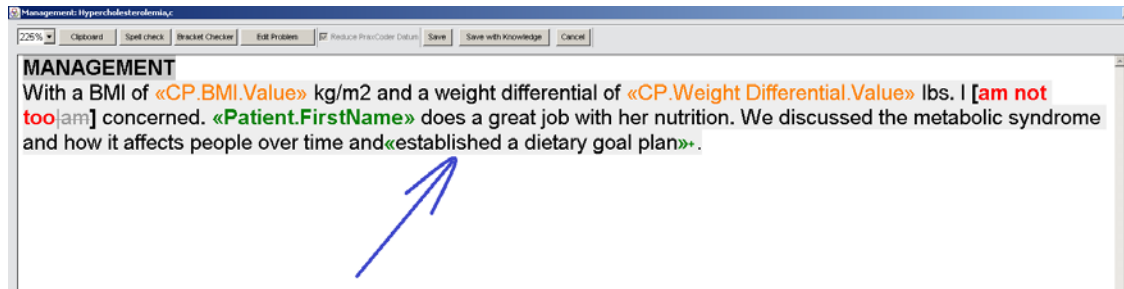
Figure 107. Datum+ bullets. Once you create them, they stay embedded within the editor text. When highlighted or selected (as with regular or option brackets; see page 47), they encapsulate the selected text inside and convert it into a factoid of discrete data. This may then be further translated into the language/codes required by third parties via the translator. You do this once, and the Concept Processor does it automatically for every patient who needs it in the future automatically.

This closes the full loop on interoperability, no matter how complex or extensive the demands by third parties (particularly Medicare) become in the future. And the Knowledge Exchanger helps to bring ready-made options from any clinic which has done this to any other (see page 92).

One useful approach is to link it to Option Brackets. This way, the bracketed information can be queried and used for practice advisories. Datum+ closes the loop on interoperability by moving selected text to fields that require it. This will also be most useful in the area of Praxforms—the Praxis printing system which populates external forms automatically. It will be perfect to send patient summaries with richer clinical data to third parties, such as the Workers Compensation form we showed on page 118.

Concept Processing based Patient Portal

Praxis currently has a Patient Portal certified by the Office of the National Coordinator of Health Information Technology. However, the new Patient Portal will link to the Assessment, which will lead to dramatic improvements.

After all, you don't want every patient to see exactly the same thing as every other patient. How about a highly customized portal for each one of your patients?
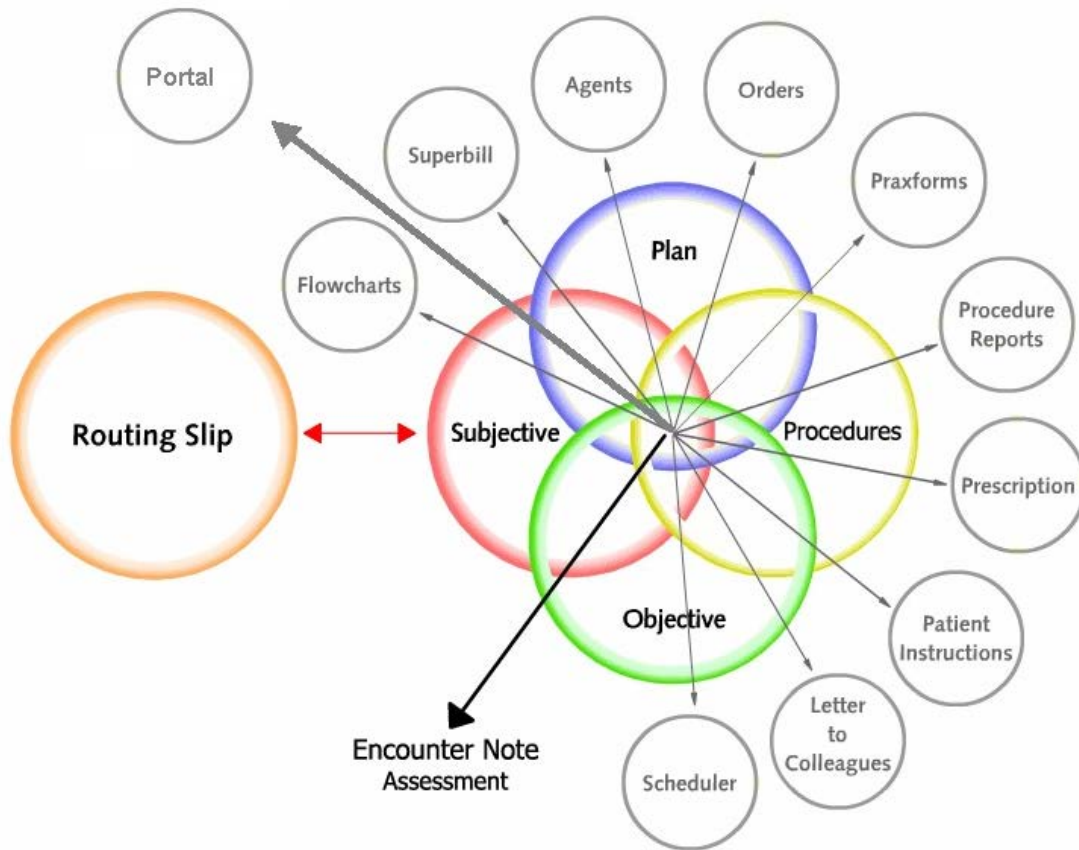
Figure 108. The new portal will work similarly to the other SOAP Elements. It will put information into the correct patient's portal by learning from the past via the assessment. Each patient will see different flow charts (with customized labs, vital signs, clinical parameters, and medication list), questionnaires to fill out, patient instructions, and messages (agents).

Let's say you create a specific questionnaire for your patient to fill out, or perhaps a specific flowchart of the weight, blood pressure, cholesterol, fasting blood glucose, and Hemoglobin A1C. Then, you link it to the portal, which is instantly displayed in this patient's portal.

The next time another patient presents with a similar issue, the customized Patient Portal will make this information available for that patient as well by learning from your assessment. It automatically customizes itself for each patient.

And yes, the patient schedule and demographic data will be linked as well. Then the patient may make changes that will need approval from your staff.

Portal, emails, and Patient Communication

Your agents will be able to reach your patients as well for back and forth communication in the same way as today it reaches the other clinic users.

<u>What is PGP</u>

The concept is fascinating. There is a mathematical way that two different numbers can be generated that are absolutely related to one another and yet having one of those numbers cannot tell you what its pair is. So there is a way to encrypt data with one of those two numbers but only be able to un-encrypt it with the other number. The generation of these two numbers is trivial, so it is easy to go in one direction but virtually impossible to go back. One number (key) your Praxis makes public, and the other it keeps private for you. This is the basis for all modern encryption models and the way you can send and receive secure communication that cannot be viewed or changed on the way and that cannot be refuted.[xvii].

This means intelligent patient communication. Patients will be able to download their own secure HIPAA-compliant messaging application right from their own secure portal. This allows the notifications to be automatic. On your side the message is sent and received by your agents, following all the protocols that we have shown, including the appropriate timers.

For example, in six months, the agent will activate and your request to the patient will automatically appear in the indicated patient portal. The patient receives a notification by email or SMS telling them to view the message or if they downloaded the secure message application, then they can actually read your message in their own email system. Then their response turns into agents that follow your protocol for each case. Your agent protocols may indicate that the message be sent not to you but to the users in your clinics who are to read them. Then the messages may optionally be included in the patient record with your comments.

In other words, we have simply extended the powerful Concept Processor capabilities to the portal.

Datum+ (page 158) will also be a part of the Portal. Selected patient entries can be used to perform tasks such as trigger practice advisories or queries and automatically appear in other areas of the patient record with your approval.

<u>KIOSK:</u>

A patient Kiosk is just Portal you place in the waiting room. You provide the patient with a sturdy tablet PC, and they can do the job while waiting to be seen. In addition, there will be a site for signing the documents they generate.

Practice Advisory Concatenation and Outcome Analysis

One of the exciting upcoming features involves the triggering of a new practice advisory when selecting the line item of a current advisory. If the line items bring you choices at the point of care and you select among them, your action will trigger yet a new advisory

that brings more options, thus creating a chain of clinical algorithms. The new advisory may not appear now, but in a future encounter, thus checking for outcomes about your current action.

This may also generate the corresponding queries in the Dataminer (remember, all queries may be thought as practice advisories in reverse 142), to improve on population outcome studies.
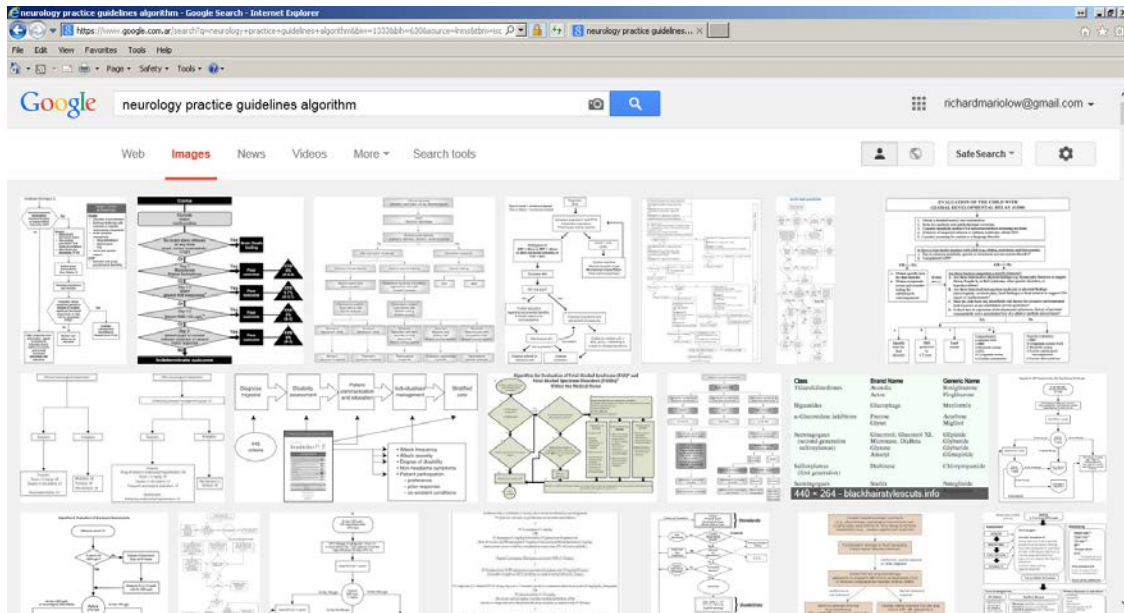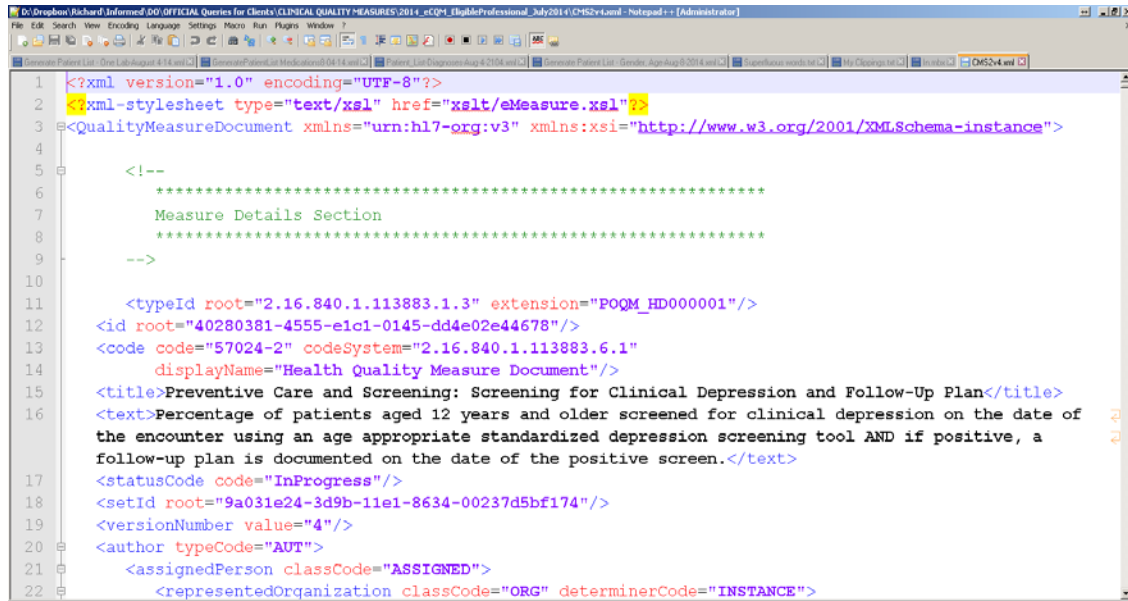
Figure 109.   Typing "[x] practice guidelines algorithms for any specialty in Google and selecting "Images" displays thousands of different algorithms that can be reviewed. Creating these logical cascades with Practice Advisories will be easier in Praxis than drawing them in Powerpoint® as shown here.

Practice Advisory Concatenation will allow their maker to generate algorithms faster than doing so on Microsoft Powerpoint[xviii]!

Semi automatic Practice Advisory/Query Creation from Clinical Quality eMeasures

Figure 110.   This several page long xml document represents a clinical quality measure in computerized form. Praxis will help you create its practice advisory/query duo, semi automatically from any such measure.

As we have shown in our discussion of the Three Rs' (page 147), you can turn any kind of query or attestation, no matter how complex, into a practice advisory that you then query. As we stated, a clinical query can be thought of as a practice advisory in reverse. These two are simply different sides of the same coin.

So far, we have been creating the practice advisory/query duos for Meaningful Use and Patient Care Medical Home. However, we are now creating an engine that will assist you to do this on your own so that you need not wait for us every time someone sends you a quality eMeasure. If you choose to do so, you will be able to make it happen with little or no effort.

<u>And many more...</u>

This is just a small sample of many future features that derive naturally from this breakthrough concept processing technology. Please keep in mind that other EMRs based on templates cannot follow or copy this but must resort to hard-coding it, meaning you need to appeal to the programmers to build these for you, with all that this implies.

V - Is Concept Processing the Solution?

The previous section of this paper concluded our technical description of the Concept Processor. The following section is meant to answer concerns raised especially by Health-IT experts who do not practice medicine. Interestingly enough, most objections to and concerns about the theory of the Concept Processor haven't come from medical colleagues; they have come from experts in the Health IT industry, non-physician consultants, and competitors. The competitors we understand. Millions of dollars have been invested in template technology, and this new concept-processing approach makes some people anxious. However, many of the objections are well-intended. After all, if templates are so bad, why is everyone using them? Fair enough!

Here we explain (in a perhaps not so politically correct way) why physician freedom is crucial, and how this freedom actually improves the cost-effectiveness and quality of medicine. If you are a healthcare provider, it might feel like we are preaching to the choir, and you may skip some obvious explanations. Just keep in mind that this part is meant for non-providers who may not appreciate how we doctors think and practice our art.

If you disagree with us, we hope you don't throw the baby out with the bath water. This technology is valid even if our view on healthcare is not to your liking. We look at medicine from the healthcare provider's point of view, although we fully recognize that there are other viewpoints that are also valid.

Concept Processing has been misinterpreted for quite understandable reasons. It takes an entire white paper like this one to explain how the Concept Processor differs from templates. Many IT experts who do not practice medicine themselves have performed a superficial evaluation of our application and have misunderstood it. They often mistake the Concept Processor for templates that save or chart by exception— a method which clearly doesn't work in medicine.

Templates that save or charting by exception does not work because a diagnosis is not handled in one invariable way; it is handled in many different ways depending on who the provider is, who the patient is, and what the variations of the clinical condition are. Many non-clinical aspects of the case including insurance, ability to pay, social history, patient understanding, etc. may change the way a given diagnosis is handled. And sometimes, there is no diagnosis, yet there the provider immediately generates a plan to follow.

This is also why cloning notes from visit to visit does not work. The presentation and treatment for the same diagnosis may and probably will change from visit to visit. As we have discussed, this matter is more complex than simply copy-pasting, which is dangerous from both a medical and legal standpoint.

Even new Praxis users sometimes misunderstand how this software works and try to use it as a template at first (perhaps because they've used template-based EMRs in the past and have not received appropriate initial training). This approach doesn't work well because the power of the engine is defeated. It is like taking a vintage Ferrari, disengaging the engine from the transmission, and then pushing it down the road with all

your might. It will move all right, but...

On the other hand, most clients do reach the "Eureka Moment" and email us to say "Yes! Got it!" We hope that by reading this paper, you will arrive at this "aha" moment of clarity much sooner. As soon as you do, Praxis becomes totally intuitive.

In this part of the paper, we focus on clearing up misunderstandings about this technology. We start by discussing basic questions, such as why we doctors chart. Charting is something we providers take for granted, but perhaps we should give it a second look.

The Charting Nightmare

To understand how charting got to the state it's in now, we need to go back a few years.

Res Ipsa Loquitur, Medical Malpractice, and Charting

Medical Malpractice is clearly not a new arrival. The first case of medical malpractice in English law was recorded in 1374. However, it was only recently in the 1960s that malpractice cases began to increase dramatically both in number and in amounts paid out.
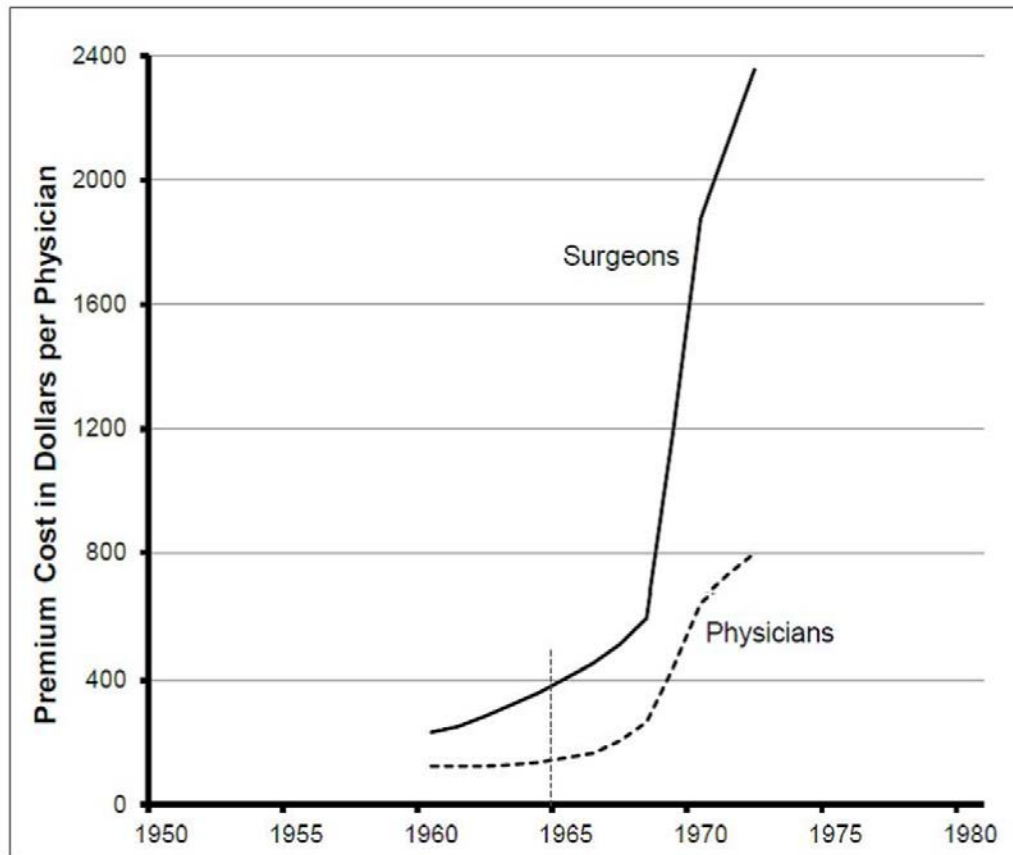
Figure 111.   Malpractice insurance for physicians and surgeons from 1960 to 1972. (Source: U.S. Department of Health, Education and Welfare, Medical Malpractice Report. http://mises.org/blog/how-government-regulations-made-healthcare-so-expensive)
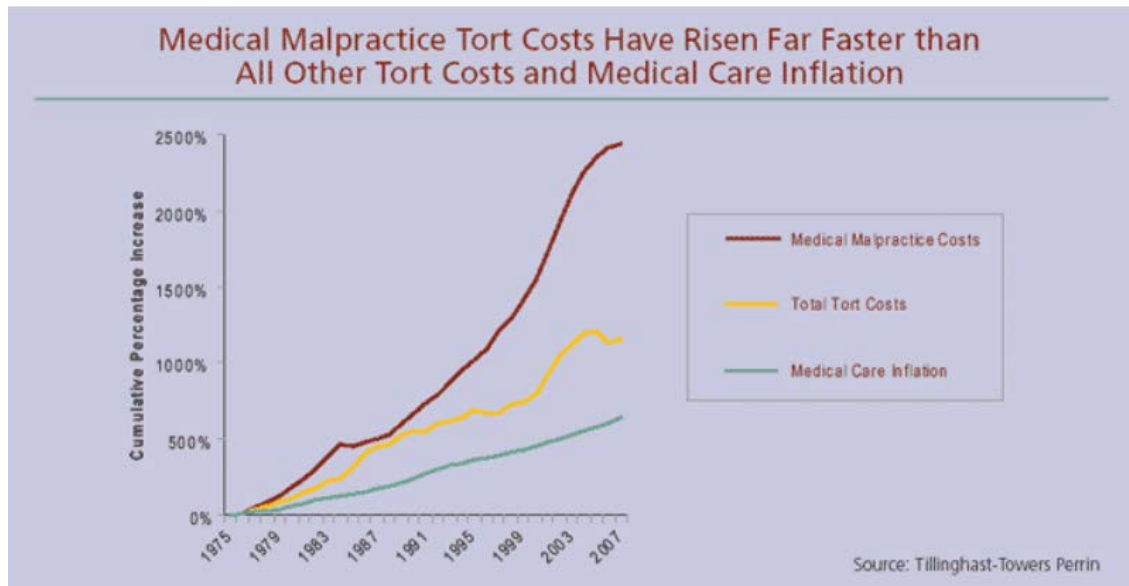
Figure 112.   A more recent graph displayed in a different way.

The reason for this dreadful increase in malpractice litigation over the last fifty years is due to:

1. An increase in the relative income of physicians versus the income of the general population, beginning after World War II (i.e. "deeper pockets").

2. An increase in the cost of new technology and its impact on the overall cost of medical care, making physicians appear to be part of the problem ("all those rich doctors"). This is precisely why anti-kickback laws were enacted in the 1970s.

3. A major geographical mobility experienced in the states, disconnecting patients from their lifetime family physicians and thus eroding the special trust that existed within the doctor-patient relationship.

Quickly, providers learned from their attorneys that the medical record offered an unequal defense against malpractice claims. **Res Ipsa Loquitur** ("the deed speaks for itself") is what attorneys call it when they find the scissors buried inside the abdomen in the patient's X-Ray. This kind of evidence is compelling to say the least. No expert witness is needed with an X-Ray like that. No trial is necessary either, as the matter will probably be settled out of court. Likewise, it is assumed that whatever is written in the clinical note is the truth, unless proven otherwise. The note must carefully predict potential problems and explain why the physician felt justified to act the way he/she did with the information available at the time the care was rendered. A note written hastily, under the normal time pressures of a busy medical practice, will be closely examined by teams of experts years after the fact. They will attempt to uncover errors or inconsistencies in the evaluation and management of the case, or to prove haste on the part of the caregiver.

If it's not documented, it's not done. If it's documented improperly, it's done improperly. Thus began in the 60s the most significant transformation of medical recordkeeping in America. It changed a succinct clinical note into a complex medical-legal quagmire that became the bane of the healthcare profession. Up to the recent implementation of EMRs, doctors in primary care were reporting an average of two hours a day handwriting notes and other required third party documentation. Indeed, charting has long been a source of major physician dissatisfaction. Many have taken up voice dictation with external human transcription, and a few others have hired scribes to go into the room to record the exchanges. Serious potential costs and clinical downsides are present with any of these options. Many other providers have taken their medical records home at night to continue writing after dinner.

In a 2005 Survey published by the American Medical Association, 93% of doctors admitted they had practiced defensive medicine, and 92% of physicians indicated that they had made unnecessary referrals or ordered unnecessary tests or procedures[xix]. Although charting behavior was not included in the study, charting behavior is an obvious form of defensive medicine.

In 1968, Doctor Larry Weed, the founder of modern clinical recordkeeping, noted the resulting expansion of charting and observed that it resulted in disparate, disorganized, and confusing notes that were difficult to read and compare. He proposed a rational, organized framework for charting all clinical information. Doctor Weed devised the Problem Oriented Medical Record, also known as the "SOAP" method, which stands for Subjective, Objective, Assessment, and Plan[xx]. The idea behind the Problem Oriented Medical Record was that the medical encounter must be documented in a precise, logical order following the scientific method, so that inductive reasoning could be applied to the data in a rational manner.

This approach required even more writing and was even more complex than past methods. It became the standard of care. This increase in writing also came to the attention of third parties, notably government agencies and insurance companies. When these entities saw the extensive documentation already in place in the 70s, they began to use this extensive writing as evidence for the purposes of denying both medical licensure and payments for services rendered. Complex clinical charting had become the rule in the USA, and it slowly spread to other industrialized countries.

In 1997 the US passed legislation that required doctors to document medicine in a prescribed manner in order to get paid for their Medicare services"[xxi]. The government and its subcontractors hired an army of auditors—most of who were not providers—to visit clinics and hospitals on a regular basis, read medical records, and "count bullets," i.e. search for specific details in the text that justified payment of services (at the expense of taxpayers). Since then, physicians have been severely fined for missing specific text in the record. This approach made charting difficult, wasted time, and increased providers' stress levels. Often the only explanation a doctor gave for writing a certain phrase on the note was that "it is demanded by Medicare." Long gone were the days when the only purpose of medical records was to help the provider easily remember the clinical situation (please see our discussion on the Praxcoder on page 152).

And what is the unfortunate result of all this?
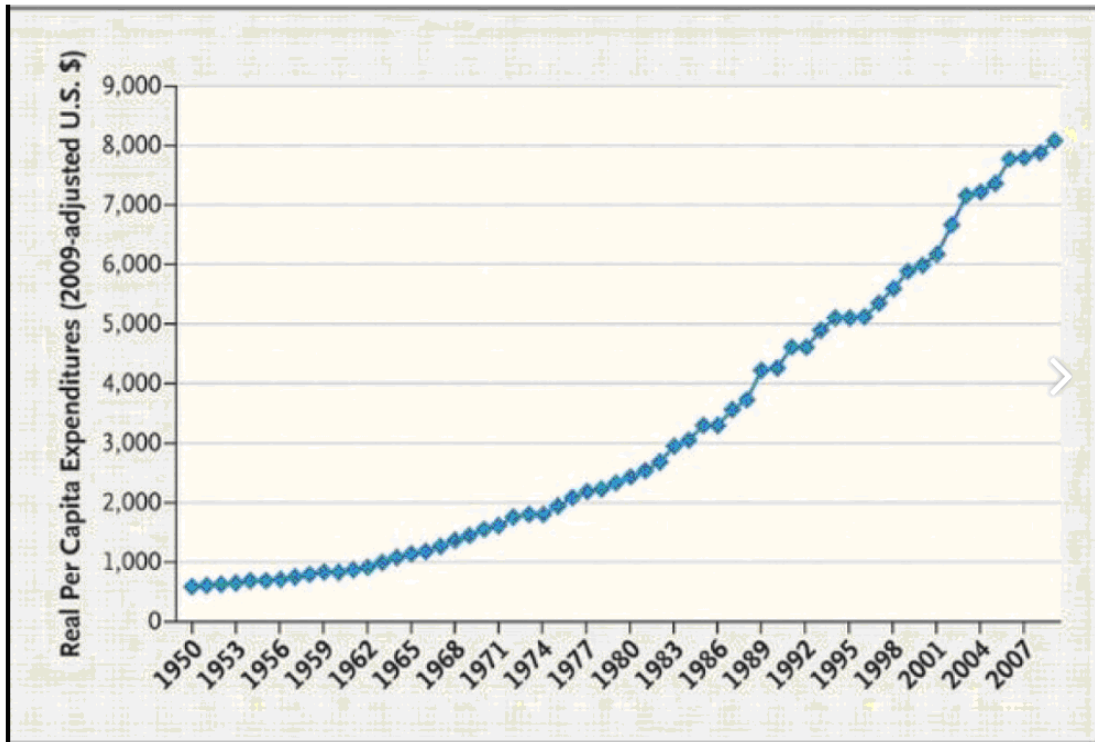
*Figure 113.   Why non-providers should care. Per capita medical costs expenses in the U.S.
Source: Washington Post[xxii]*

Healthcare costs: The above figure shows why we should reassess issues that we assume to be obvious, such as why we chart the way we chart. We are not saying that charting is the only reason healthcare costs have increased, but it is a major contributor—as both bureaucracy and expenditures expanded simultaneously. Physicians' direct earnings have decreased in real dollars after discounting for inflation and additional staff and malpractice insurance expenses.

And these increases in costs have not been compensated by higher medical quality, quite the opposite, in fact. Although for many patients the medical care received has improved dramatically, for others it is substandard—inexcusable for the wealthiest and most advanced society in the world. The figures in the graph indicate that something is terribly wrong. We agree with the government's position that the EMR can help us understand where inefficiencies lie by using statistics—but not with the current technology in place!

Please keep in mind that all that we have discussed here happened on the paper record

before EMRs even came into existence!

The Charting Paradigm

To understand why templates make a bad problem worse and why Concept Processing is a viable alternative to charting, we first need to understand the nature of the soon-to-be-obsolete paper record.

The only justifiable reason to chart is to help the provider practice better medicine. Of course, protecting a physician from malpractice or from losing their medical license, and making sure they get paid, is also quite important. In fact, those three things are what caused the explosion of paper and electronic medical record use in the first place—unfortunately, most of these records turned out to be a nightmare to manage. We make the argument, however, that the number one justification for documentation is to improve the practice of medicine. Please keep this in mind when reading the following discussion. In other words, if the EMR does not improve the medicine being practiced, then the technology is worthless no matter what else it is good for. Practicing good medicine must be the gold standard to measure charting and any EMR.

Also keep in mind that no computers were available during the first two hundred years of medical charting. This was particularly the case during the latest period starting in the 1960s when the whole charting process mushroomed to become a nightmare. The old paper record was all we physicians had to go by, so vendors made the assumption to transfer this unworkable paradigm into the computer. This significantly worsened thing by exposing and expanding on its underlying inadequacies.

So, what is charting from a purely medical perspective? From a clinical viewpoint the medical chart allows providers to review what has been done for their patients in the past, so they can use this information at the present moment. Fair enough! In many cases, physicians must work without a chart, such as when the patient is new to the clinic and brings no old records, or when someone shows up to the Emergency Room of a hospital, and they do so. In other words, charting is not absolutely essential to practicing medicine. Yet, from a medical standpoint, the chart can be viewed as an important additional medical tool to assess the clinical situation. In short, the medical record is a clinical tool no different than a lab, ECG, or MRI.

Additionally, if charting is adequate, this will allow people performing public health research to perform new types of outcome analysis on specific populations. This will help us learn new ways to improve the practice of medicine and discover hidden costs/benefits. In turn, an effective EHR allows researchers to share these discoveries at the point of care. Electronic charting also assists local medical groups to perform their own focused outcome studies correlated with finances. This improves the cost/benefit ratio of medical care and its bottom line, while providing for adequate treatment. These studies could also help consumers rate healthcare delivery from a cost/outcome value perspective. In any case, information should be accurate and helpful at the point of care. Otherwise, all else is for naught.

The Scientific Method and the Cartesian Approach

Who determines whether a piece of information has clinical relevance? Well, the provider does, of course!   A patient presenting with the same clinical condition to two different providers will be charted differently by each provider. And this difference is not just limited to words. There may be differences in the way each case is approached by different competent clinicians. This seems obvious, but it is not. The opposite way of looking at it is that the patient has an inherent clinical relevancy already built-in. In other words, if two patients with exactly the same demographics and the same clinical condition were to present for care to two different providers, they should be charted in exactly the same way—the one best way possible. This has been the theory for the last 200 years. There is one single scientific truth that may be initially hidden from the observer. It is the job of the diagnostician to uncover this truth by using his/her skills and knowledge in the correct way. And because there is only one truth, then everyone should derive exactly the same answers given the same presentation. This is the essence of British Empiricism, which states that what one clearly and distinctively perceives must be the one and only Truth[xxiii].

At about the time that British Empiricism took hold in Europe, the French Rationalist School led by René Descartes expanded on this theory and merged inductive with deductive reasoning to create the scientific method we know today. Modern science took off from there.

Medicine followed the scientific method by putting the pathologist at the center of medical truth. For the last 200 years, medical specimens taken from biopsies (living patients) or autopsies (dead patients) have ended up under the pathologist's microscope. The pathologists have given the final verdict about the nature of the case, and the correct diagnosis[xxiv]. In this scientific theory, the human body is viewed as a sophisticated clock ("Deus ex machina" - God from the machine) that may be broken down into small parts and analyzed separately, to figure out what is wrong.

If seen in this light, the chart may be considered a metaphor for the old scientific laboratory notebook, where experiments are jotted down and hypotheses (differential diagnoses) are tested and turned into theories of reality and nature (final diagnosis). The physician can be thought of as a scientist. They obtain *appropriate* raw data from the patient by taking a *competent* history, then write this data down on paper (or nowadays enter it in the computer by typing or using voice recognition software) and then review the resulting text entered in the chart. Then they use this text to formulate a "differential diagnosis" via inductive reasoning.[xxv] A differential diagnosis is a fancy term for a list of possible diagnoses the patient may be suffering from that match the subjective and objective data obtained.

This time-tested approach leads the clinician to ask more questions to try to rule out some of the possible diagnoses. They ask general questions about things such as Family History, Review of Systems, Past Medical and Surgical History, Social History, and History of Medications. Finally, an *appropriate* physical exam and simple lab tests are performed to rule out yet more diagnoses, until the provider reaches the final and

"correct" diagnosis. If this is still not possible, then the physician must narrow down the possibilities by ordering the appropriate studies to eventually reach the correct diagnosis.

The goal is to arrive at a final diagnosis, one that that will explain the patient's clinical condition and lead to the best treatment available. This is the religion, the mantra, of our medical profession. It has been the medical truth for the last 200 years. And as truths go, this method has worked remarkably well. Coupled with the industrial revolution and its technological advancements, the scientific method has led to a dramatic improvement in the quality of medicine, up until recently. As technology has become more advanced, more powerful studies have been undertaken to make a diagnosis and treat patients more effectively. And the medical record theoretically reflects this methodology.

Enter Emmanuel Kant - German Idealism

Today, these scientific theories are God-given; no one in medicine dares to question them. But back in the 18th century, the situation was quite different. These theories were just that, theories, and immediately, brilliant thinkers found logical flaws in them. Emmanuel Kant was the first one to poke holes in the incipient Cartesian logic. In his point of view, one cannot separate the perceiver from the object of perception. According to Kant, all knowledge is mental, and the Ultimate Truth of external reality can never be separated from the human thought process, unless we are God, and we are not God. Kant's ideas split knowledge into two distinct camps for 200 years: the scientists on one side and the non-scientific thinkers or humanists on the other.

It got so bad, that they stopped understanding one another's languages entirely. In 1959, CP Snow, the English writer and philosopher, delivered his well-known lecture in Cambridge called *The Two Cultures,* where he wondered why two equally brilliant groups of scholars—the scientists and the humanists—could not understand one other.[xxvi]

Enter Thomas Kuhn, a revolutionary historian of science. Kuhn's masterpiece, *The Structure of the Scientific Revolutions*[xxvii] published in 1962 caused much controversy within the scientific community, and even greater controversy among the historians of science. What Kuhn did was simple. He translated Kant into a language that any scientist (or medical provider) could readily understand. He was harshly criticized by most of the important historians of science of the time, lead by the famous Karl Popper of England[xxviii]. Kuhn's argument, like Kant's, was that perception is colored by the experience of the perceiver, or what Kuhn calls the "Scientific Paradigm."

What we are getting at is not that the scientific method is wrong—it isn't—but that it isn't the only possible approach to obtain medical knowledge. With the use of computers, the Kantian method becomes just as viable, if not more so. In this day and age of holistic medicine, outcome analysis, and cost-containment, an approach that looks at the body as a black box and tries to understand health by performing population studies, paves the way to a kind of understanding that has major practical applications. Indeed, the Kantian approach was impossible to use before the Computer Age. Before then, scientific paradigms were required to comprehend medical reality, because without paradigms or theories the data was too complex to make sense. For years, health had been defined as "the absence of disease." This means that if patients or parts of patients did not end up at the pathologist's table, and if their problems could not be broken up into pathologic

processes, then we doctors could say nothing about them. This explains the lack of knowledge about what keeps people healthy and the conflicting statements about health. Nutrition books written by medical "experts" often contain different and contradictory positions. It is also why we have so little to say about cost-effective approaches to treat most conditions. Unfortunately, the pathologist is not much help in answering any of these kinds of questions, but fortunately, there is a better approach.

Medicine uses science to various degrees, but ultimately it is about the clinician. Medicine is as much an art form as it is a science.

Why is all this important in a discussion of medical records? Well, paradigms are essential for scientists to understand complex technical issues, so that science can be developed and technology can move forward. Why? Because the scientific paradigm is used to clarify and classify complex technical information so we may remember it later. This paradigm helps us mentally process, package different types of information, and transmit them to other physicians in a way they will understand. Finally, scientific paradigms as defined by Kuhn make predictions about how our world works and guide us in the search for information. Although, as Kuhn also noted, this same approach "boxes us in" to answers we expect to see.

What would Kant say about charting if he were alive today? First of all, we think he would get quite excited. We believe Kant would fully agree with our statement on page 37 that:

> A diagnosis has nothing to do with what's wrong with the patient; a diagnosis has everything to do with what you think is wrong with the patient.

Similarly, the clinical history taken has nothing do with the patient either, because the patient did not write the history; the provider wrote the history[xxix]. In our discussion on Cartesian theory, we stated:

> *... They (the providers) obtain* **appropriate** *raw data from the patient by taking a* **competent** *history,...*

Kuhn (and Kant) would argue that it is precisely the years of training that generate the history and create the competency and the appropriateness. The provider filters the incoming story given by the patient, creates the history in his/her mind, and projects the resulting thoughts on the chart. That is why without this extensive medical training, non-providers cannot take clinical history no matter how hard they try.

In a way, both the diagnosis and the history are mental projections of the provider who generates them. This is a perfectly Kantian concept, and one that computers manage quite well. We already mentioned that a provider is not "a tape recorder" but rather a thinking human being. Upon being exposed to the patient, the clinician uses his or her past experience to generate a history that justifies the diagnosis delivered and invariably leads to the resulting course of action. Of course, this diagnosis may be refuted by other

providers. This is why medicine is an art.

The template paradigm makes sense from a Cartesian point of view. In fact, with templates, the doctor becomes a simple technician that plugs data into a computer and follows all the correct directions developed by experts in the field. Then, the computer magically spits out the Truth (the right diagnosis and treatment) because it has been programmed to do so. It sure sounds good, but it is way off track! Sadly, almost everyone seems to be working in that direction, which is getting more and more futile.

The concept processing paradigm is more modest. It projects the thought process of its own user. No more than that, but also no less. The computer becomes a mental extension of the user's mind, rather than an inflexible model that his/her thoughts have to work around.

In other words, with the arrival of the computer, these two apparently conflicting philosophies—the Cartesian view of reality and the Kantian approach—may now peacefully coexist for the improvement of medicine. What is important is the practical result for the health professional, for patients, and for the practice of medicine.

Statistical Studies and Modern Health

How can a system based on the projection of the mind of each provider be more effective for statistical studies than one based on entering specific data in a myriad of pick-lists?

Emmanuel Kant had opened a unique line of reasoning, one ignored by scientists for decades. However, that is not quite true either. George Hegel, a follower of Kant, viewed history from a macrocosmic standpoint. He believed that individuals or single events did not explain historical movements; social movements created the individuals that were needed for each time period and for each society. In other words, people and events don't make History; History makes people and events. Johan Fichte and later Karl Marx followed up on those ideas that eventually lead to the major ideologies of the 20th century.

At first, you would think that we scientists would have nothing to do with any of these macrocosmic theories, but Thomas Kuhn shows us otherwise. The first development of the Theory of Thermodynamics began at the same time as the social theories just described, in the middle of the 19th century. This theory was then refined by the German physicist and philosopher Ludwig Boltzmann, with his Statistical Analysis of thermodynamic events[xxx]. In this parallel intellectual universe of science, thinkers began to look at populations to understand physical reality, without focusing on the individual atomic components that made them up. Nature behaves in a precise and predictable way. Statistical studies allow us to make extraordinary scientific predictions without dissection, without breaking things up into their components.

Medicine had not been a part of the Kantian movement until recently, when holistic

medicine appeared on the scene. And the holistic movement is still considered somewhat unscientific by our medical peers, and perhaps rightly so[xxxi]. It is essentially an approach where the physician does not invade the body and send parts to the pathologist for review. The problem with holistic medicine today is that there is very little scientific data to back it up. It does not use the pathological approach because pathology is precisely what it tries to prevent. Because of this, our medical profession has a blind spot on the issue of health as mentioned before. Until recently, if a person was not ill, we physicians assumed that they were healthy and had little more to say on the subject.

Now we absolutely must learn about what keeps people healthy. Today medicine finds itself at a crossroads. The scientific method and its Virchowian[xxxii] approach of breaking the human body into its smallest components and sending the parts to the pathologist for analysis has paid off. However, in other important areas of health this kind of knowledge has not been helpful. Now it is critical to resolve the issue if for no other reason than our traditional approach is sending society into bankruptcy by making the nation uncompetitive.

Simple questions, such as: What makes people get sick? What is good nutrition? What is the right kind and right amount of exercise? What is the effect of stress? Is there such thing as "good stress" on quality of life and the probability of illness? Effective statistics on larger human populations could answer critical questions such as: Is meat good for you? How much exercise is good, and what kind of exercise is good for what? Is wine good or bad and how much should you drink? Do certain types of stressful environments lead to specific illnesses in certain groups of populations?

Then there are more immediate questions of crucial economic impact: Given certain symptoms or conditions, what are the diagnostic and therapeutic approaches that lead to the best outcomes at the lowest cost? And a fundamental question: What is cost-effective medicine?

The EMR is perfectly suited to answer all these questions, but not using templates, that's for sure. Templates only restrict providers and force them to take shortcuts that ruin the data.

If you own a roulette table in Vegas, you probably do not need an insurance company to protect you from the risks. You go to your local bank to borrow playing money. At most, the bank may send a technician to calibrate your table and make sure that it is working properly. Then you, as the house, have no risk (actually, a risk exists but it is negligible). This is because the odds are known perfectly and they work overwhelmingly in your favor.

Medicine lies at the opposite extreme. We currently don't do well in predicting the odds of illness, and because we don't know the odds, we need to pay for expensive insurance. Yes, armies of professionals are hired by the insurers to figure out the odds by reading records, and they drive clinics crazy with paperwork demands. The clinics must retaliate by hiring bureaucrats of their own to respond to the paper onslaught, and society foots the bill for all this insanity. This "cost containment approach" by third parties and by governments has only added to the cost burden without improving anything.

Suddenly the computer comes of age; and now the Kantian approach should be revisited.

If you have thousands of doctors writing whatever they want, practicing how they think best, can you still get superb data and improve medicine doing so? Yes, if the systems to funnel this data are created properly. We have explained why there is no such thing as a true retrospective query in electronic medical records (page139); but we've also shown how a direct and positive line of communication between providers at the point of care and the public health investigators can be established. Researchers and practicing physicians are all on the same page. We all want to get to the truth, and the Cartesian approach does work well here. The Kantian approach may not tell us why things happen, but it will surely tell us what happens and how. It is, therefore, high time to use both the Cartesian and the Kantian approaches with the aid of the computer. They can complement one another marvelously. And we are certain CP Snow would be happy at last!

True, the information may be sent to and from the Concept Processor in codes and jargon (not the best way, although we understand why codes are needed, please see page 139), but it may also be sent in normal English. ("How many bananas does your patient eat per week?"). Then answers start coming back from hundreds if not thousands of providers seeing many thousands of patients. Later, the question may be refined as users respond. ("And how many melons, and is the patient taking Potassium tablets?")

As shown on page 139 statistical analysis of medical data is always prospective. All the US Medicare Meaningful Use Queries may be created as prospective queries. Of course, if a researcher questions a feedback response, they may access the clinical note where the data came from and read everything in free text. It may even be advisable to do so to sample responses, in order to verify that the questions are being understood by end users. However, micromanagement is usually not necessary because individual responses are not as important. The key is to look for population responses.

We believe that providers will welcome queries if responding to them isn't stressful, especially when a rational explanation is included within the question. Most doctors not only want to practice good medicine; they want to participate in improving healthcare as well.

The result is that the appropriately-programmed computers will assist providers at the point of care and researchers in public health. Together, we will learn about what makes people healthy and how to treat illness at the lowest cost with the best outcomes.

Templates and Queries: Garbage in is equal to garbage out

Let's be honest: When a doctor opens up a template and starts selecting information from a huge set of pick-lists while under time pressure, it means that the resulting data will **not** be useful. This lack of freedom experienced by the provider at the point of care and the unfortunate relationship between speed and flexibility displayed on page 65 is reason enough to cut corners charting, for expediency's sake. The quality of data suffers

accordingly. Furthermore, because the options given by the template are often external to the provider, an experimental bias is built-in with templates. ("Is the pain on the left or on the right?" Well, it may be in the center or neither or both, but the template maker forgot to add those options.)

Why Templates Don't Work

The problems with templates are simple:

1. Templates slow doctors down.

2. Templates don't allow for flexibility.

3. Templates are legally dangerous.

As one doctor put it recently. "My templates are like having a shackle around my ankles"
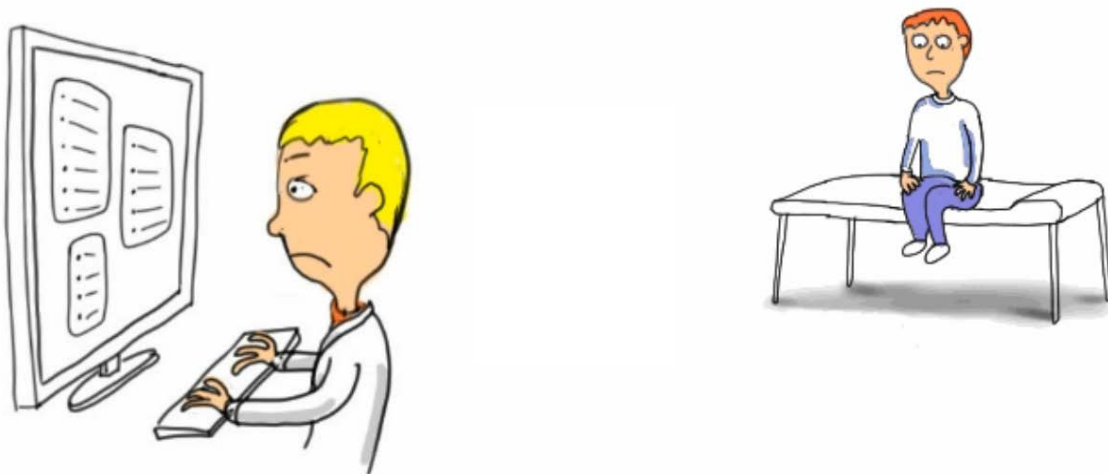
Figure 114. Fighting the templates and forgetting about the patient

The problem with template-based EMRs is that they take the method of charting on paper (previously described) and simply convert it to an electronic format on the computer. Yes, a computer can certainly be made to operate as a glorified typewriter, but then it defeats its purpose to be of help at the point of care. A template just makes a bad problem worse.

No two clinicians think or practice the same way. They can't fit conditions or patients into pre-set molds, like a technician. And nothing destroys the quality of care more than a computer that breaks your train of thought in the middle of a patient visit. Soon the issue

is no longer the patient or the illness, but how to outsmart the template—a most difficult task indeed, and a complete waste of time!

Bottom line—templates are based on a simple but incorrect principle: There is one *correct* way to practice medicine, and the template maker knows that way better than the practicing provider. This means that the doctor turns into a kind of data entry clerk, fitting patients into preset structures and categories.

In the late 1980s, we at Praxis saw the first templates appear on the market, and found them lacking. The first ones were natural extensions of the early WordPerfect® macros that appeared at about that time. Indeed, templates were relatively easy to build. Then we saw all vendors copy each others' templates, which got progressively worse and more complicated to use.

Templates are getting progressively worse!

The more templates have been "improved", the worse they have been working. The issue is not the intrinsic quality of the template; the issue is that the template paradigm tries to fit a square peg into a round hole, so to speak. And they continue to get worse the more external requirements are placed upon them. Recently, as templates have begun to be used for third party micromanagement of medical care, and for transmission of medical data from one system to another, they have started generating alerts that further confuse providers and lead to the well-documented "Chronic Alert Fatigue Syndrome[xxxiii]" (see discussion of "Noise" on page 98).

Here are two interesting stories. The first one has to do with a nationally-renowned medical authority who gave a talk at a medical conference about the future of the electronic medical record. This physician, like many others, advocated template-based EMRs. After the meeting, I approached this professor and showed him our technology. He was gracious, and listened attentively to my short explanation, which he grasped immediately. But then he asked the following question, leaving me stunned: "Doctor Low, do you really think that we should let doctors practice medicine any way they want to?"

I must admit that his question made me pause for a few seconds. I needed time to think of what to say. I couldn't believe I was hearing this from someone who I still consider to be absolutely brilliant. My reply was straightforward: "Doctor X, with all due respect, neither you, nor I, nor a thousand physicians like you and me will ever make our colleagues practice any other way than the way they want to."

This professor saw working physicians in a different light than we do, probably because, unlike him, we are constantly working with these brilliant minds, who happen to be our clients, and who always help us move forward. He was also borrowing thoughts from a previous era, an era where knowledge was unidirectional: going from the university to the masses. Knowledge today may start anywhere, even in a small practice in the midst of the jungle. In fact, it is perhaps even more likely that some types of knowledge will come from a place like that, and we could all benefit from it.

On another occasion, we contacted the head of a hospital's Internal Medicine teaching program. He had never used an EMR, and was contemplating putting the first one in his facility. After listening politely to my initial presentation, he said: "Doctor Low, I actually like templates, because by using them, we can train our residents to do things our way from day one." My reply was just as brief: "Doctor Y, do you realize what will happen when your young residents leave your training institution and go to an HMO that changes the templates on them? " He got the message!

We need to let young physicians learn to think on their own, and not allow template software to manage their thinking and turn them into technicians. The previous doctor didn't know any better, because he had never used an EMR before. His idea sounded great on paper, but the reality is that EMRs are becoming omnipresent. Isn't it about time that we listen to the providers using them?

Loss of Eye Contact

Another terrible problem with templates is loss of eye contact with the patient. This destroys the well-known "bedside manner" required of a physician.

Many physicians complain that reviewing and entering information into the EMR means that they can't make much eye contact with their patients during visits. This depersonalization can have serious legal consequences.

"Physicians who have fewer minutes to speak with and examine patients may provide lower-quality care," Sharona Hoffman writes:

"In addition, patients may resent the doctor's focus on the computer and apparent inattention to them and be more apt to sue if they are dissatisfied with their health outcomes." "This concern is not theoretical," she adds. "Multiple studies have shown that patients most often decide to sue when they are displeased with the quality of the physician/patient relationship and feel they cannot communicate well with their doctors.xxxiv"

Clearly, the problem is that because the doctor is struggling with the template, he or she is not paying as much attention to the patient. With the Concept Processor, you will find that your patients are actually supportive of your use of the computer. All the questions you ask them are carefully worded and **relevant to them,** because you use your own chart to check the appropriate areas that are important to you, not because a third party told you to say this. You know exactly what is on your note because you put it there yourself; so then you can focus solely on your patient rather than trying to understand the noise coming from a template. You are not reading someone else's checklist. You are going through your own thought process. Patients perceive this, and admire you for being so detail-oriented in your treatment of them.

The relevance of your notes is close to 100%. You are not wasting time. You chart faster **and** your relationship with the patient improves.

Problems caused by Template Based EMRs

Most of the popular EMRs—all based on templates—have made the charting situation far worse. Some papers have reported that up to 40% of medical residents' clinical time is spent in front of the computer[xxxv].

Assuming that the paper record was the gold-standard, all these EMRs have done is to transplant the paper paradigm to the computer. They work like glorified typewriters at best, but even a program like Microsoft Word, that allows total freedom, would be an improvement, at times. Most EMRs do not use the computer's potential to be helpful at the point of care, and thus have made a bad problem worse.

Here are two recent articles on this issue:

"How interns and residents spend their time has been of interest to academic researchers for more than 50 years, but in the late 1980s, as training programs came under increasing pressure to limit the work hours of young doctors, one study in particular raised concerns. The researchers trailed 15 doctors-in-training over five nights and found that residents spent only about 20 percent of their time with patients, with the bulk of their nights at the hospital devoted to paperwork, tasks that did not have to be done by a doctor like drawing blood and inserting intravenous catheters, and frequently interrupted attempts at sleep[xxxvi]"New York Times, May 20, 1013

"Time efficiency is one of many benefits targeted by EHR implementers, but, conversely, time inefficiency is also recognized as a major barrier to successful EHR implementation. Our initial search of the literature in the area of workflow and time efficiency allowed us to identify that the benefits of the EHR are still widely assessed from a user's perspective, looking at single processes (e.g., documentation) rather than on its impact on the set of processes involved in care delivery. We learned that expectations of EHR implementation projects that documentation time will be decreased are unlikely to be fulfilled, especially with physicians. However, EHR and CPOE systems can generate time savings in other activities, such as accessing a patient chart[44] or maintaining patients' report forms.[22] Consequently, assessing the impact of EHR on an ensemble of work processes and outputs such as the effectiveness of communications across care providers as measured by patient outcomes (e.g., reduction in medication errors, lower readmission rates) could potentially generate favorable results that would then act as incentives to physicians. This suggests that a shift from the user's efficiency to the organization's or even the system's efficiency is needed.[66] Such a shift will require that the EHR be seen as a tool that can transform work processes and support innovation in care delivery.[67,68]" Lise Poissant, PhD, Jennifer Pereira, MSc, Robyn Tamblyn, PhD, and Yuko Kawasumi, MSc; The Impact of Electronic Health Records on Time Efficiency of Physicians and Nurses: A Systematic Review, J Am Med Inform Assoc. 2005 Sep-Oct; 12(5): 505–516:xxxvii*

This second article listed, taken from the recent clinical literature, says it all. We fully agree with the observations made in that article, but we respectfully disagree with their conclusion, which bears repeating below:

> *"...This suggests that a shift from the user's efficiency to the organization's or even the system's efficiency is needed. Such a shift will require that the EHR be seen as a tool that can transform work processes and support innovation in care delivery..."*

In other words: The reduction in physician efficiency by the use of Electronic Medical Records is a necessary evil justified by the overall improvement in efficiency of the organization.

Are we losing our minds?

We truly understand the problem organizations experience, and know that in order for important studies to be run, excellent clinical information at the institutional level is key. It is even more critical at the national level to get a handle on healthcare issues, improve patient outcomes, and reduce medical costs. There is no question that getting this information from EMRs is important. But the ends do not justify the means. If this technology does not offer a clear benefit to practicing health professionals—to the doctors and nurses who are working hard on behalf of their patients—EMRs will actually worsen the quality of medicine delivered, leading to physician dissatisfaction and increased costs. And this is something that legislation cannot cure. When doctors state that they need more time with patients to express compassion and understanding, the template-EMR burden becomes unfair and unviable, particularly if an acceptable alternative exists.

Some experts in the healthcare industry and academia have claimed the problem is that physicians are ignorant about technology, and afraid of change. Some have even

claimed that doctors are not that smart because they don't embrace technology! Amazing! To become a physician, the level of scientific and logical training most students undergo is far superior to that of most professions. When it is for the good of the patients and when the technology works well, providers embrace it. Many practitioners have told us that they would have loved to investigate our technology further, but were prevented from doing so by the powers that be within their hospital or larger medical organizations[xxxviii]. Larger institutions often reject this innovative technology because of claims about interoperability, as it is difficult to get permission from our competitors to interface at a deeper level. However, we are certain that these are not insurmountable issues. Interface issues are not technological; they are financial, legal, and political. Where there is a will, there is a way.

However, let's make one thing clear. When providers say "no" to a specific technology, their statement must be taken seriously. Without the crucial support of healthcare providers, healthcare IT risks failure no matter the amount of political, legal, and financial pressure that is brought to bear. We are seeing this right now. Providers should embrace EMR technology because they want to, not because they are forced to embrace it[xxxix].

That's why alternative solutions, like concept processing, need to be carefully evaluated. Indeed, there may be other non-template-based options besides the Concept Processor out there—we are not aware of them—but one thing is for sure: Templates are not the solution, and they never will be.

The Issue of Honesty

Let's go back to the unpleasant issue of clinical errors and malpractice.

We give you another seemingly insane statement, the corollary of our previous Kantian definition of a diagnosis:

> It is far easier and more effective to do what you wrote than to write what you did!

This may sound strange, especially given *Res Ipsa Loquitur.* It appears dishonest, but actually nothing can be more accurate or more honest than this approach.

Police officers know this well. They go to the scene of an accident and take various statements from the drivers and from all the different witnesses. Many times the statements are contradictory, even among witnesses. Yet we cannot assume that all of them are dishonest. This shows that perception is by its very nature biased. It is Kantian. Then the final report—*the res ipsa loquitur*—reflects each participant's biased viewpoint. Now what?!

Some people think that if the medical exchange with the patient is prewritten, it must

somehow be dishonest. Honesty, these experts claim, means having a blank sheet of paper, listening to the patient, and writing down verbatim what the patient says. There is an easy solution: purchase a tape recorder with a video, and with the patient's consent, record them. If any authority figure questions your honesty, just give them the recording. It will save you from spending hours completing tedious paperwork!

Honesty also means accuracy. It means that what has been written is exactly what has been asked and responded to, and what has been examined. The Concept Processor, based on free text, allows for easy editing of your note, but the number of changes you need to make progressively decreases with time and cases entered as you become progressively more accurate.

Certainly a corrupt physician could simply document without even seeing the patient. Of course, they could also document by hand without ever seeing the patient. In fact, the latter approach would be easier to get away with. It is harder to detect fraud in a note created by manual entry than it is with a computerized note absolutely identical to all the others.

And the final argument: "Yes, but if the system makes it so easy to chart, it tempts the doctor to cut corners." A similar argument was made by the farmers of the early 20th century when they witnessed the first automobiles crashing into their fields. True, a drunk driver can take a car and smash it into a crowd of people simply by keeping their foot on the gas pedal. Since it is so difficult to kill twenty people by riding on a horse, we should all use horses instead!

The comparison to a car is not far-fetched. If an internal combustion engine simply extends human muscle power, then a computer does likewise for brain power. It helps you practice the way you normally do, but much faster and easier. You could think of the Concept Processor as a car for your mind. And as in the case of the automobile, this technology must be studied carefully before it can be used properly. Like the automobile, certainly an EMR may cause damage if not used correctly. Nevertheless, you wouldn't make the argument that you should hitch a horse behind your car to prevent you from going faster and killing people.

Enter Atul Gawande MD - The Checklist Manifesto

Figure 115.   Doctor Atul Gawande's revolutionary approach to solving medical errors.[xl]

According to the New England Journal of Medicine, Doctor Gawande's 2009 paper is one of the top five surgery papers published by the Journal in its 150 year history (starting with the use of anesthesia during surgery in Boston in 1849[xli]). And what is it that Doctor

Gawande discovered? Well, he persuaded his surgical colleagues in five different hospitals to implement a checklist in the operating room. The result was that they lowered the intra-surgical mortality rate by an impressive 36%. Doctor Gawande extended the argument for the use of checklists not only to surgery, but to all of medicine. His ideas are explained in his best seller "The Checklist Manifesto: How to get things right[xlii]". **Gawande makes the claim that the vast majority of clinical errors are not errors of ignorance, but human errors, caused by forgetfulness or stress**. As he clearly shows, a checklist helps people avoid these kinds of mistakes.

The Gawande approach cannot be underestimated; it is sound. In fact, when we first developed the Concept Processor 20 years ago, our only desire was to help physicians save time. Quite frankly, we did not think beyond that. We wanted to turn the hours doctors spend charting every day into seconds. Imagine our surprise when we found that the software also decreased medical errors. **The only minor difference in our approach is that we believe that the checklist should be created by its own user and not by a third party.** After all, the checklist is a memory aid, and it should work with the flow of one's brain in order to be the most effective. It is not a learning tool, but a protective tool; it is made precisely for those areas one knows best. It protects us from making human errors.

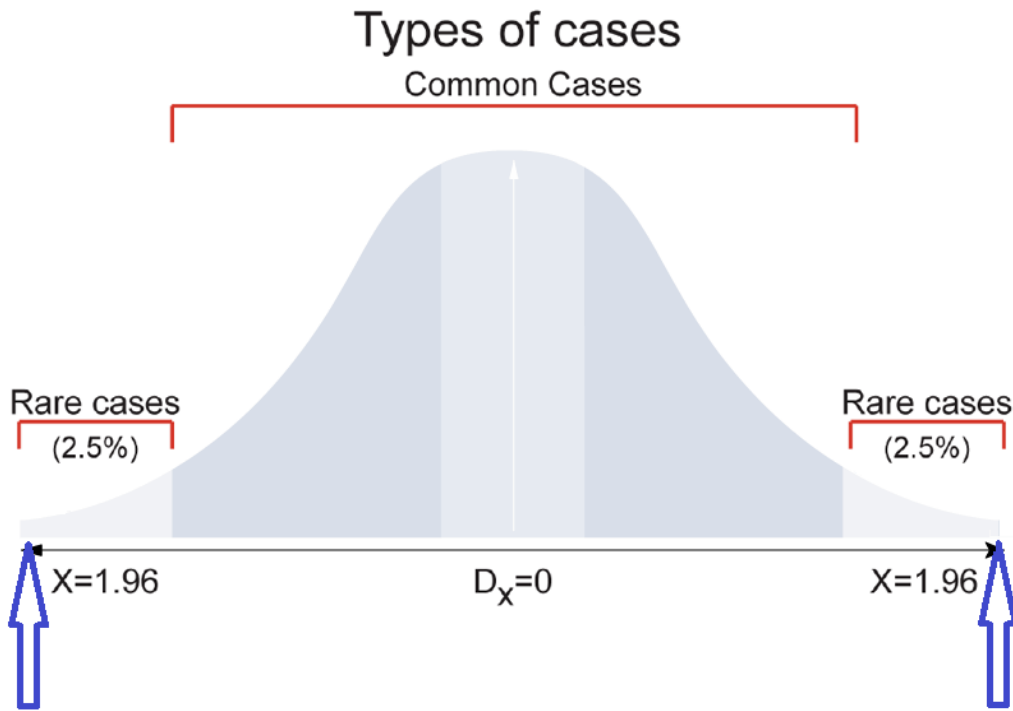Let's look at the bell-shaped curve one more time.

Figure 116.   *The majority of clinical errors do not happen in rare cases...*
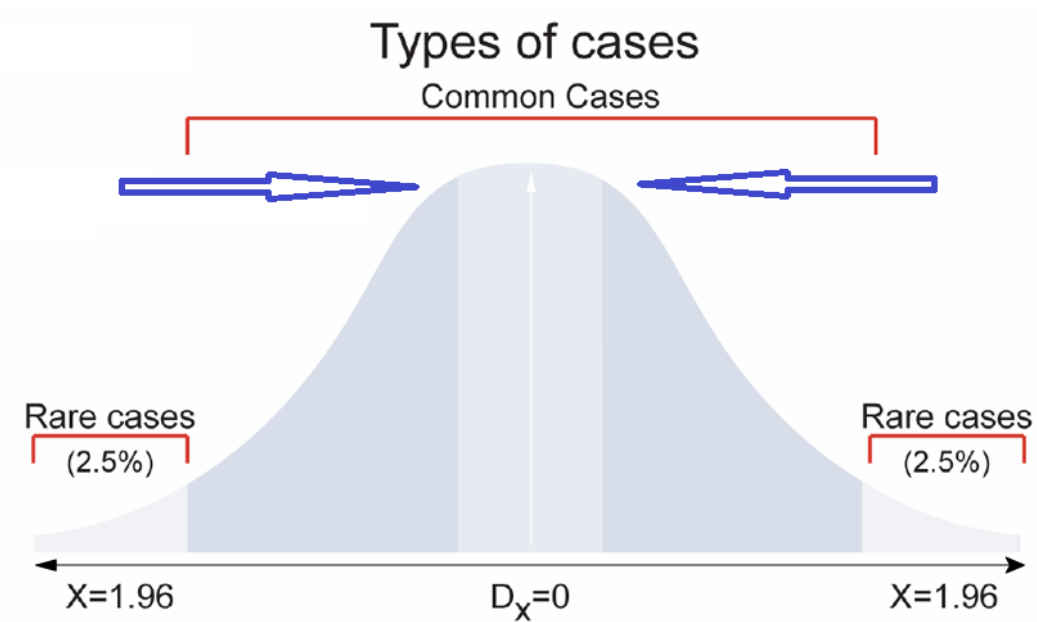

Figure 117.   *...they happen right here with the common cases in the center of the curve.*

The majority of random errors do not happen with the rare cases in medicine, but with the common cases. This is not only due to mathematics (rare cases happen infrequently and therefore errors resulting from them are uncommon). It is also because when facing a rare case, you go into alert mode: you ask more questions, you slow down, and you may read pertinent clinical information and get colleagues' opinions. Errors are less frequent with rare cases, the cases that appear difficult or unusual. Clinical errors happen commonly with cases that you have dealt with correctly many times in the past. You might forget to ask a critical question, check for an important finding, or order a critical blood test, even though you know better. However, if this case has been handled correctly in the past, you use your own chart as a checklist to make sure that nothing is forgotten or overlooked. On the other hand, if your case was performed incorrectly in the past and now you correct it, you will never make that same mistake in the future. This means that the random errors in your practice continually decrease the more you use the EMR. And, as Doctor Gawande points out, most clinical errors are random and not the product of ignorance, but rather of being in a hurry or simply being human. A checklist helps with all this, and that is what your chart becomes: An intelligent checklist developed by you to handle the vast majority of issues you face daily.

Errors of Ignorance and Medical Habits

Even if we agree that the vast majority of clinical errors are random, what about errors that stem from ignorance, also known as systematic errors? Certainly for those of you trying out our technology for the first time, it would appear that if a doctor created a case incorrectly, the mistake would propagate forever. Part of the answer to this was provided in the previous discussion on correction of random errors. In addition, when a case is handled incorrectly there are often repercussions. You quickly learn that you've made a mistake. The pharmacist may call you back and ask whether you are certain you want to use a particular medication on a given patient, or a laboratory return may send an alert that you made an error on your treatment. If you correct this error now in your "Virtual SOAP editor," this mistake will never return. See page 72. The same happens when you attend a medical meeting or read a journal that discusses a topic that changes the way you would handle a given case. You immediately improve your current case or create a new one from scratch. You may even reference journal information, impressing your future readers. Finally, if a practice advisory shows you a different way to handle your current case and you agree with its recommendations, presto, your treatment has been changed instantly, and the advisory should not return.

This brings us to the fascinating topic of "habits". A habit is the best friend and the worst enemy of the medical provider. It is your best friend because it allows you to perform complex tasks with ease based on your previous experience with that specific kind of case. And it is your worst enemy because once a change in medicine takes place—a rather common occurrence—then your habit turns against you, particularly when you are tired or overworked. With the Concept Processor, your habit is changed immediately. Once you agree that there is a better way to handle a case and you make these changes correctly on a current patient's record or in the Virtual SOAP area—perhaps after being prompted to do so by a practice advisory—then when you see your next patient with this condition, your changes become automatic. You will have all your steps clearly laid out in your own words, so you can easily follow them. You are using your chart like the Gawande checklist, but it is your own checklist to follow, one you can never forget. The Concept Processor is like your instant habit changer[xliii].

Enter Curtis Harris, MD, JD.

Here is an unsolicited letter we received from Doctor Curtis Harris, a practicing endocrinologist, attorney, and Praxis user. Professor Harris taught medical law at Oklahoma University.

"PRAXIS has much greater utility and flexibility... than a template-driven program. In addition, PRAXIS has another very valuable feature that you may not have considered: that is, enhanced legal protection for the busy practitioner.

"Good documentation is critical to properly defend a physician against a malpractice claim. However, it is not only important to record what was done, but also to show the logical progression of thought that lead to A diagnosis or course of action.

"PRAXIS requires the physician to record his thinking process, and to refine the logic with each new patient. By focusing on the difference between patients, the record necessarily reflects why one given diagnosis or therapy was chosen over another.

"This in turn allows the defense attorney to use the record to assert the uniqueness of the patient, and why this therapy was chosen for this patient. Since a physician is not held to be a guarantor of a cure of a good result, but instead must choose an acceptable treatment based on the information available to the physician at the time the choice was made, clear documentation of what was known is usually an adequate defense.

"There is another related problem that is latent in every template-driven program that is not present in PRAXIS. The templates in other systems are subject to discovery and to use against the defending physician. Imagine how pleased a plaintiff's attorney would be to find that a physician's entire practice could be reduced to a series of simple statements.

"Suddenly, the art of medicine is diminished, and the defending physician appears to be a mere technician in the way he practices, forcing all his patients into a single mold. However, since PRAXIS is based on the examination of previous patients, these records are not subject to discovery since they are protected by physician-patient confidentiality.

"While the process by which a physician using PRAXIS to enter data is discoverable, that process is little different than what is now done without PRAXIS. While several other systems provide for such things as accurate and legible recording of notes and prescriptions, it is the flexibility and theory behind PRAXIS that will, in the long run, provide the best legal protection for the practicing physician."

Curtis E. Harris, M.S., M.D., J.D., Practicing Endocrinologist, Professor of Medical Law University of Oklahoma, Oklahoma City, Oklahoma

The last paragraph of this masterfully-written note bears repeating: "While the process by which a physician using Praxis to enter data is discoverable, that process is little different than what is now done without Praxis." (This statement was written a few years ago and "now" referred to the paper-based world.) In other words, every one of us has a biological concept processor we draw upon to explain our concepts to the world. The cortex of our brain only generates abstract ideas and concepts, and then it is up to our subconscious mind to find the written or spoken script. What the Concept Processor does is expedite that secondary mental process. No more than that, but also no less.

Yes, without question, the fundamental reason for keeping good medical records should be to provide excellent medical care. Physicians all over the world work this way. However, defensive medicine, i.e. medicine practiced to reduce the risk of malpractice claims, has turned record keeping into a nightmare—one that has recently been made worse by third parties, who use the record to deny payments for services.

Who has the Time to Learn all This?

Somehow, there is an idea that learning an application must be instantaneous. And for many simple mass market applications, it is. Indeed, there are many EMRs out there that may be learned in only a few minutes. We've heard—by experts in usability no less—that the "look and feel" of an EMR should be like that of any other application, to make it more user-friendly. Many EMRs have been built this way, but their usability is awful. They have been developed by people in the computer science world who do not have a deep understanding of medicine or how we physicians think. Predictably, those applications are simple to learn precisely because they don't do much for providers; or worse, they are constructed similarly to other types of applications that do not apply to the way medicine is practiced.

We have seen 3-year-olds driving tricycles like the experts they are. But you have to go to driving school to learn how to drive a car or fly an airplane. Few would argue, however, that a tricycle's usability is higher than a jet aircraft simply because it is easier to learn how to operate one. The time it takes to learn is a small price to pay for a lifetime of use. If you can lower charting time from two hours to 15 minutes a day, improve the quality of charting and the medicine you practice, and take the errors and stress out of your practice, isn't that worth the effort it takes to learn a new technology like an EMR? Indeed, the clients that love Praxis software the most are also the ones who know it the best.

Finally, let's not underestimate providers' intelligence. Discovering your own thinking process is a wonderful experience in and of itself. Why? Because when your thoughts come back at the speed of your mind, one of the most unpleasant aspects of medicine—the dreary charting— turns into a fascinating intellectual experience. Some clients have described Praxis as being addictive. This makes sense: it turns one of the most disliked aspects of the practice into a rewarding intellectual exercise. Providers then do not mind putting in the time to learn Praxis; they look forward to it. As doctors explore the many possibilities of this tool, they create even better knowledge and enjoy the entire process. In fact, if you got to this page and understand the basic concepts up to this point, you are 90% there. Everything then makes sense. It becomes totally intuitive.

Response spectrum: 'I enjoy using this EHR.'

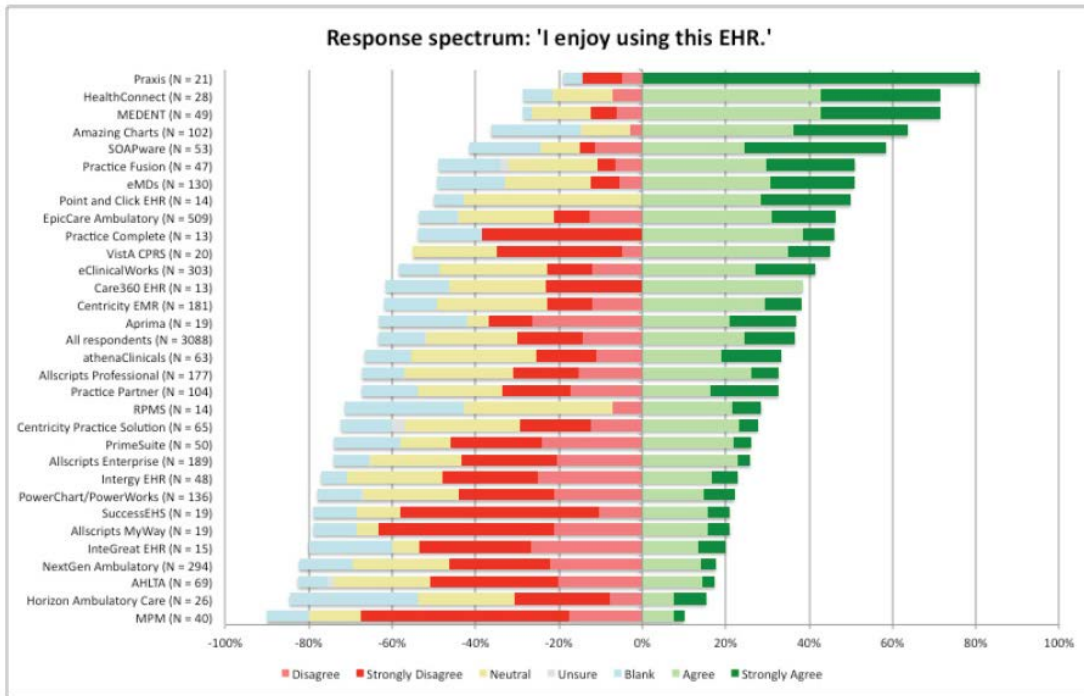FAMILY PRACTICE MANAGEMENT | www.aafp.org/fpm | November/December 2012

Figure 118.   Learning an EMR like Praxis is an intellectually rewarding activity because the provider sees his or her own thoughts coming back at the speed of the mind. It displays your own thinking process to you and helps you think. The Concept Processor liberates physicians from the bureaucratic joke in the practice of medicine.

What Hath Meaningful Use Wrought!

So why would you want to learn this? It is a question of freedom. We believe that the future holds yet more charting demands for overburdened physicians. The government and third parties have not even begun to make demands for data. If you look at medicine from a Cartesian standpoint (page 171), it is easy to see how these mistakes are made. Everyone is supposed to use exactly the same language of "Codeese". Not only that, but the syntax (i.e. the order in which the codes are placed) is also supposed to be regulated. What has to remain flexible is the provider's mind at 3 o'clock in the morning while working with a sick patient. Yet, translating flexibility into codes is exactly what computers excel at! The system must translate what you the doctor are thinking into factoids that the authorities will accept. Where is the art of medicine in all this? Because the Concept Processor can easily "translate" provider thoughts into factoids, it keeps everyone— providers in the trenches and those who require the critical information—happy. Yes, the provider must explain complex concepts and codes, but only the first time for the first patient. Afterwards, the bell-shaped curve will make sure that one need waste time with these bureaucratic requirements. This is what the computer is meant to do.

The Concept Processor is a liberating tool. Although it may be painful for some physicians to admit it, the third parties and the government are also correct. Without population studies and best practices, the cost of medicine will bankrupt our nation. We are doing a pretty good job already! However, we providers are also right. We didn't go to medical school to become bureaucrats and technicians entering factoids for the government. The current way of working is taking away from our true role as healers. It takes up precious time, and more importantly, confuses us at the time when our brain needs to be the sharpest.

The Concept Processor is the way to resolve this quandary with elegance. No matter how tough the third party demands become—and they will become much tougher—the Concept Processor will do them on the provider's behalf automatically and perfectly. The third parties get what they want in the way they want to receive it, and doctors are able to practice superb medicine with minimal stress.

Now, with your first cases under your belt, and, after reading this paper, you will be ready to examine your software in greater detail. The more you know about Praxis, the more powerful it becomes.

Conclusion: Forcing Doctors into EHRs is NOT the Answer

As in any other field, medicine can be divided in productive versus unproductive work. In medicine productive work has to do with 1. Listening to and examining the patient, 2. figuring out what might be wrong, and 3. treating the patient. Everything else is mostly unproductive work, which in the last fifty years has increased dramatically and accounts for many of the medical problems today, including most of the financial issues that beset us. Computers are meant to assist in reducing this unproductive work, but the old charting paradigms need to change. Transposing the old paper paradigm to the computer by the use of boilerplate templates has made things much worse. Among many other problems, it has caused many great doctors to abandon our wonderful profession, and many others to retire early. And not a few excellent providers are working for the bureaucracy, and you can't blame any of them.

Please understand that the computer is not the problem. The EMR software is the problem; and we have presented a solution that works, resolving most of these issues, and then some.

If you are a provider and have been following the arguments presented, you are beginning to realize that you have been using your own biological Concept Processor located somewhere in your subconscious mind to deal with most of these issues. This is an unproductive use of your mind that leads to errors, omissions, and much unnecessary stress.

The Concept Processor is a medical tool that works on behalf of your mind; it is an extension of your mind. It does exactly what your subconscious mind would do, only faster and better. With the advent of the computer, doing what you write makes far more

sense than writing what you do, and there is something to be said for the enjoyment of the charting process and the pleasure of using an EMR that does not insult your mind but works with it. Many physicians have thanked us, stating that this tool makes them understand their own thinking process. It displays the method behind the madness as healthcare gets ever more complex. It projects how we physicians think of illness and practice medicine, and whenever our habits get in the way of sudden developments in medical knowledge, it instantly helps change our habits for the better. The computer is meant to allow for freedom of thought and freedom of action. The computer is meant to assist, but never take over our thinking process. The computer is meant to do the routine tasks and the details, and liberate us so we can practice the creative, holistic, enjoyable part of our wonderful profession. Finally, the computer is meant to provide third parties what they need without wasting our precious time as healthcare providers.

Finally, if our medical colleagues find that this EMR helps them practice better and easier medicine and keeps their practice under control, they will welcome the use of an EMR. This is what the Concept Processor based Praxis EMR is all about.

Thank you for your support. I would love to get your feedback whether you get Praxis or not!

Sincerely,

Richard

<richard.low@praxisemr.com>

Note that we make extensive use of Wikipedia references in our end notes. We do this because Wikipedia references are easy to find and quite readable. We also find, in disagreement with some, that Wikipedia provides a highly accurate source of information, perhaps due to the built-in checks and balances therein. When disagreement exists in some text, it is clearly noted. In addition, references are readily available for all notes. Yes, it is democratically created, but that does not mean that it is not excellent reference material.

http://www.doctorslounge.com/humour/bloopers.htm

[i] In Osler's time there was hardly any charting done. Certainly nothing compared with today's insanity.

[ii] Lown, Beth A. MD; Rodriguez, Dayron; Commentary: Lost in Translation? How Electronic Health Records Structure Communication, Relationships, and Meaning, Academic Medicine: April 2012 - Volume 87 - Issue 4 - p 392–394 - Most perceptive discussion on medical student learning process. Although we disagree with the conclusions of the paper, their findings are accurate. We believe authors had not evaluated the Concept Processor in reaching their conclusions. Their conclusions are nevertheless applicable to the vast majority of EHRs today, based on templates.

[iii] For an interesting book about the Magic of Praxis and the Concept Processor, written by an actual user, please see Gold, Stephen, MD MPH, **The Magic of Praxis**, *http://www.praxisemr.com/the_magic_of_praxis.htm*. Doctor Gold very appropriately relates Praxis to a magic act of sorts.

[iv] Elisha Atkins was a brilliant clinician at Yale. He mentored an entire generation of physicians. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2589895/

[v] http://www.healthcareitnews.com/news/how-use-ehr-depends-who-you-ask

[vi] The arguably most ambitious health study ever done in medicine is the famous Framingham Heart Study. It started in 1948 with 5,209 men and women. In a government-funded study, many doctors and nurses looked at what factors cause cardiovascular disease and how to prevent it. After more than 60 years of ongoing monitoring of this population, this is the basic information we have learned: "High blood pressure, high blood cholesterol, smoking, obesity, diabetes, and physical inactivity" are bad, and we still don't know what kind of exercise and how much of it is best. https://www.framinghamheartstudy.org/

[vii] SNOMED: Systematized Nomenclature of Medicine: Clinical Terms is a comprehensive clinical terminology, originally created by the College of American Pathologists (CAP) and, as of April 2007, owned, maintained, and distributed by the International Health Terminology Standards Development Organization (IHTSDO), a non-profit association in Denmark. The CAP continues to support SNOMED CT operations under contract to the IHTSDO and provides SNOMED-related products and services as a licensee of the terminology. *http://www.nlm.nih.gov/research/umls/Snomed/snomed_main.html*

[viii] Several university groups, including the team at NYU lead by David J. Rothwell, MD, Richard Wheeler, MD, and Ngô Thanh Nhàn, Ph.D. (see A Medical Logic Lexicon, New York University Computer Science Department, http://cs.nyu.edu/~nhan/fcompling.html) and the group at SUNNY lead by Werner Ceusters MD, Ontology Research Group (http://www.referent-tracking.com/RTU/?page=index) are working on this subject: parsing natural language into discrete information that can be queried and transmitted to different health information systems. The technology is far from practical yet, but when it becomes practical, then Praxis EMR will be ideal for it because it is based on free text.

[ix] Sensitivity and specificity are statistical measures of the performance of a binary classification test, also known in statistics as classification function. Sensitivity (also called the true positive rate,

or the recall rate in some fields) measures the proportion of actual positives which are correctly identified as such (e.g. the percentage of sick people who are correctly identified as having the condition), and is complementary to the false negative rate.
http://en.wikipedia.org/wiki/Sensitivity_and_specificity

[x] For those of you interested in querying medicine using SQL, read Viescas and Hernandez, SQL FOR MERE MORTALS, http://www.amazon.com/SQL-Queries-Mere-Mortals-Manipulation/dp/0321444434

[xi] ADO: Active Data Objects (Microsoft) comprises a set of Component Object Model (COM) objects for accessing data sources. A part of MDAC (Microsoft Data Access Components), it provides a middleware layer between programming languages and OLE DB (a means of accessing data stores, whether databases or not, in a uniform manner). ADO allows a developer to write programs that access data without knowing how the database is implemented; developers must be aware of the database for connection only. No knowledge of SQL is required to access a database when using ADO, although one can use ADO to execute SQL commands directly (with the disadvantage of introducing a dependency upon the type of database used).
http://en.wikipedia.org/wiki/ActiveX_Data_Objects

[xii] SQL "Structured Query Language is a special-purpose programming language designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS)."
(http://en.wikipedia.org/wiki/SQL)

[xiii] Reynolds, Clayton; *How to get things right using an EMR: a checklist for healthcare, CANADIAN HEALTHCARE TECHNOLOGY; Feb 2015, page 14.*

[xiv] http://en.wikipedia.org/wiki/Hawthorne_effect

[xv] http://www.himss.org/News/NewsDetail.aspx?ItemNumber=2878. Technically, the HIMSS Davies award is given to the physician client who uses the EHR and not to the EMR itself. Experts sent a team to the clinic that investigated the results, and stated that initially they could not understand how this very high score could be accomplished.

[xvi] http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Data-and-Systems/ICD-Coding/ICD-10-Changes-from-ICD-9.html

[xvii] for more information read this. http://en.wikipedia.org/wiki/Public-key_cryptographyIf you understand the logic, you were undoubtedly a Math major!

[xviii] If you go to Google and type "Practice Guideline Algorithm", then select "images", you will see thousands of different medical algorithms to choose from. Still, you or your clinic can create your own.

[xix] David M. Studdert, LLB, ScD, MPH; Michelle M. Mello, JD, PhD, MPhil; William M. Sage, MD, JD; Catherine M. DesRoches, DrPH; Jordon Peugh, MA; Kinga Zapert, PhD; Troyen A. Brennan, MD, JD, MPH, Defensive Medicine Among High-Risk Specialist Physicians in a Volatile Malpractice Environment, JAMA. 2005; 293(21):2609-2617. doi:10.1001/jama.293.21.2609

[xx] Weed, Larry, MD, Medical Records that Guide and Teach (see
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2911807/)
http://imed.stanford.edu/curriculum/session17/content/NEJM%20-%20Medical%20record%20that%20guide%20and%20teach%20(Weed%20-%201968).pdf

[xxi] 1997 Documentation Guidelines for Evaluation and Management Services.
http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNEdWebGuide/EMDOC.html

[xxii] http://www.washingtonpost.com/business/how-health-care-reform-is-changing-our-health-care-system-in-charts/2012/03/22/gIQAJK6RUS_gallery.html

[xxiii] http://en.wikipedia.org/wiki/Empiricism

[xxiv] For a fascinating and controversial philosophical discussion on this process, read Michel Foucault's *The Birth of the Clinic.* http://en.wikipedia.org/wiki/The_Birth_of_the_Clinic Foucault is not a physician, but a philosopher. His historical inquisitions are very thought-provoking.

[xxv] http://en.wikipedia.org/wiki/Inductive_reasoning

[xxvi] CP Snow, *The Two Cultures* http://en.wikipedia.org/wiki/The_Two_Cultures

[xxvii] Thomas Kuhn, *The Structure of the Scientific Revolutions*
http://books.google.com.ar/books/about/The_Structure_of_Scientific_Revolutions.html?id=xnjS401VuFMC

[xxviii] http://en.wikipedia.org/wiki/Kuhn_vs._Popper

[xxix] We understand that in many clinics, patients are asked to fill out a complex series of

questionnaires that help provide the history. We also know that in other clinics, the MAs are asked to do a comprehensive intake history. Finally, there are interesting applications, such as "Instant Medical History: (http://www.medicalhistory.com/home/index.asp)" that interface with Praxis and provide an additional history for the clinician. However, in the last analysis, one way or another, it is the provider who interprets and selects the history he/she will use to back the diagnosis. The rest of the history, like incoming lab results, just reinforces the perception of the provider.

[xxx] http://en.wikipedia.org/wiki/Ludwig_Boltzmann

[xxxi] *http://en.wikipedia.org/wiki/Holistic_health*

[xxxii] Rudolf Virchow is considered to be the father of modern pathology and the pathological approach to illness we have been discussing. See *http://en.wikipedia.org/wiki/Rudolf_Virchow*

[xxxiii] *http://www.ptcommunity.com/journal/article/archives/2005/9/506/chronic-alert-fatigue-syndrome-your-face-dilemma*

[xxxiv] Sharona Hoffman & Andy Podgurski, E-HEALTH HAZARDS: PROVIDER LIABILITY AND ELECTRONIC HEALTH RECORD SYSTEMS, Berkeley Technology Law Journal, Vol. 24, No. 4, p. 1524, 2009 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1463671 See also a summary of: 8 Malpractice Dangers in Your EHR Medscape Internal Medicine August 2014, http://www.medscape.com/viewarticle/828403?src=wnl_edit_tp10&uac=170671HN

[xxxv] Lauren Block MD, MPH, Robert Habicht MD, Albert W. Wu MD, MPH, Sanjay V. Desai MD, Kevin Wang, Kathryn Novello Silva MD, Timothy Niessen MD, MPH, Nora Oliver MD, MPH, Leonard Feldman MD, How Do Internal Medicine Interns Spend Their Time?, Journal of General Internal Medicine; August 2013, Volume 28, Issue 8, pp 1042-1047

[xxxvi] *http://well.blogs.nytimes.com/2013/05/30/for-new-doctors-8-minutes-per-patient/?_r=0*

[xxxvii] *http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1205599/*

[xxxviii] For an interesting current paper on physicians being forced to choose EHRs against their will, please see Robert L. Edsall and Kenneth G. Adler, MD, MMM EHR Switch Survey FAMILY PRACTICE MANAGEMENT January/February 2015. www.aafp.org/fpm

[xxxix] ibid

[xl] Gawande,Atul A. M.D.A, Haynes, M.D., M.P.H., et all; Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population N Engl J Med 2009; 360:491-499 see also Atul Gawande; The Checklist Manifesto: How to Get Things Right; 2011

[xli] https://www.youtube.com/watch?v=Qxx14RCxblg

[xlii] http://www.amazon.com/The-Checklist-Manifesto-Things-Right/dp/0312430000

[xliii] For a recent paper by the same author see: Reynolds, Clayton, MD, *How to get things right using an EMR: a checklist for healthcare, C A N A D I A N H E A L T H C A R E T E C H N O L O G Y F E B R U A R Y 2 0 1 5. Here Doctor Reynolds links the 3 Rs to the Concept Processor and to Gawande's Checklist Manifesto as a method to improve the practice of medicine via the EMR.*