Analytics is coming

Healthcare is about the least analytical industry nowadays. Just 2 years ago, the New England Journal of Medicine did a survey of 3000 ambulatory practices. So as a Family Doc, this data is applicable to my practice. The survey found around 20% of practices had an EMR of some sort. But only 4% of clinics had a comprehensive EMR like e-MDs. So at some level, anyone at the 2010 User Conference is probably representing an innovative or early adopter practice. Being here means your organization is ahead of the curve.

With all the focus on Health Information Technology (Health IT), that early mover advantage won't be around for long. Why is there such a focus on Health IT anyhow? It's because anything with Mega or Giga in it is cool. No, wait, that's just me. It's because Health IT can be a multi-positive. We're so used to thinking of our healthcare problems as a zero-sum. What's good for a patient must be bad for the insurer. What's good for a drug company is bad for the hospital. And so on. But Health IT could be a multi-positive: good for both patients and doctors and insurers and hospitals and labs.

It's not the computers, though. **Analytics is the secret sauce** to Health IT. Analytics can make a win-win scenario. Analytics can enable better decisions and better insights.

That means (as of 2008) 1 out of 25 clinics even has a system in place that could truly take advantage of analytical thinking. And of the clinics who do have comprehensive systems, how many really use the mounds of data they have for insight? For seeing what really is happening in their business? Or how they could improve their care?

Put another way: Exploiting analytics today is a rare opportunity. Analytics is coming. It's relentless. No matter whether you love or abhor technology, it is everywhere. But your practice could innovate now with relatively little work. It's an opportunity too good to miss. Too good for "I'm too busy" or "Maybe Later."

This is more than "Running Reports." **This like the difference between herding cows and herding cats**. Cows are predictable. Cats, well. e-MDs ships with a number of reports and using them is definitely a first step. But medicine is not so organized that you always have the report you need out of the box. Reporting requirements change. Codes change. You'll need to be able to analyze yourself. There's no royal road to analytics here. It takes time, focus, and practice to take advantage of analytics to make better decisions.

- **Harvard Business Review:** http://goo.gl/EqwZ
- **NEJM:** http://goo.gl/dXoM

Analytics is the secret sauce

More like herding cats

Let's brainstorm for a while here. Without getting caught up in the 'how you do it', what types of things might you want to know? What kinds of decisions could you better make if you had the right information at your fingertips?

Bill— Why aren't we earning as much this year? If we focused on the 99213 versus 99214 ratio, how much could we improve our bottom line? Which Doc does the best job of getting his well-child visits? How will this new RVU schedule affect us?

Chart— What are the most common drugs we prescribe? How do we actually practice our preventive visits? How accurate is our new MA's vital signs?

What do we prescribe most?

DocMan— Who's best at scanning in the clinic? Which clinics should we talk to about improving their sending of records (because they lag so long between date of service and when we receive them?)

Flowsheets— What Coumadin patients are overdue for an INR right now?

Order Tracking— Which doc needs more assistance so he can get his labs reviewed quicker? Which nurses are best about notifying patients of labs — what are their best practices?

Schedule— How long does it take to get in to a doc? How many patients actually see their own doc? Who are our 'frequent-flyers'?

What's our continuity?

Taskman— Who is the bottleneck in the clinic?

My analytic approach involves three major steps:

- Dump data into a flat file with Crystal Reports
- Dice with a small subset of 'power tools' from a spreadsheet
- Design a visualization so it's more usable.

Dump, Dice and Design. I'd say, it's especially important to mentally separate these processes as a beginner. When you do, you tend to be able to adjust for mistakes and changes more easily. And the separation will reduce your stress/overload with all the power in these tools.

Dump

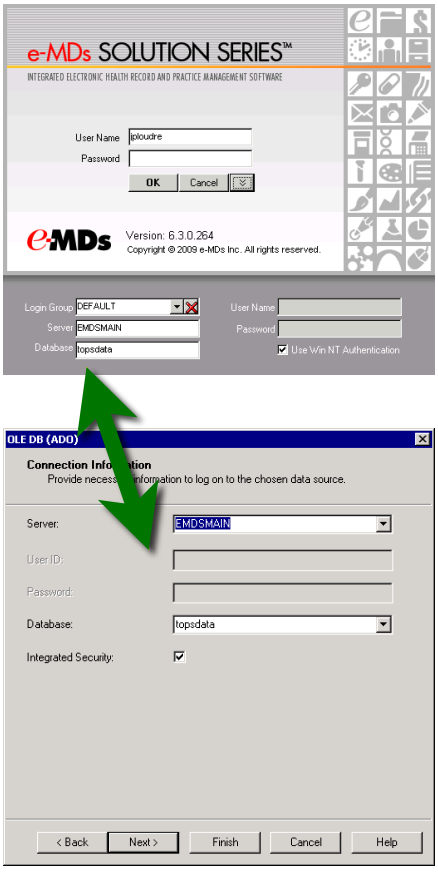
Let's face it: you aren't going to learn Crystal Reports in the next 20 minutes. I was asked to speak at the User Conference after a discussion on the support forum where people were asking about more Crystal Reports training. I'm self-taught on Crystal; it was somewhat painful to learn. I'm not sure it's worthwhile for every organization to have report-writing in-house. But understanding the basics still helps you see what you can do.

So, earlier this year, the FDA announced a new warning on Simvastatin, a popular cholesterol medication. As I read this, I thought, "Maybe I should consider changing some prescriptions." This seems like exactly the sort of thing EMRs were made for. There are close reports but nothing exact so let's do this from scratch.

Before you start Crystal Reports from scratch: I'd get the *Head First SQL*.☙ You could read about half of the book in a morning. By the time it starts getting more complicated, you've probably learned enough of the big picture to do a basic data dump. My clinic bought Crystal Reports XI (for about $500, I can't really tell you pros/cons of this versus other versions.) You'll need to connect crystal to your e-MDs database. In my case, I could use an OLE DB(ADO) connection with info like the e-MDs login expanded to show details.

☙ **Head First SQL:**
http://goo.gl/EIEi

Database Setup:



To figure out which patients are on Simvastatin we'll need to dump prescribing data. I'll generally skip most of the 'slicing and dicing' that can be done in Crystal. It has a host of functions/formulas/sorts/grouping that are tremendously powerful. But getting that to work is several levels more complicated.

When you are looking inside the database, you'll see Tables, Views, System, etc. Hone in on views. **Views are lego-blocks** that you'll snap together into a simple report. The design of SQL databases has a lot to do with performance. A database like e-MDs that has grown over many versions gets pretty complicated to grok. Views are an abstraction of fields that might be spread out over different tables in the database. They connect all the fields that relate to something you might want to know about: a medication, a patient, a provider, a bill.

So let's start by looking in the views. There's:
VIEW_Medication

so I'll add that to my report. As we look through the field explorer we see: **Medication_BrandDescription_Generic** and **Medication_Form**

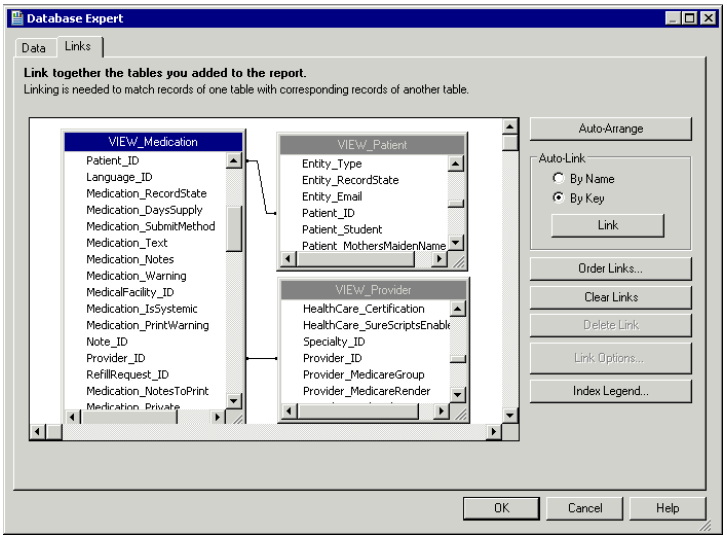
If you browse the data you see generic drug names and doses (reading fieldnames carefully & browsing the example data is how you find your way around). So let's add those to the report.

But to get a list of *my* patients, I'll need to add some different views. I'd really like the patient's name, DOB and the prescribing doc (since I'm just doing this for my personal practice.)

What we need to do is to join the view to others to look up that info. So back to the database and add: **VIEW_Patient** and **VIEW_Provider.**

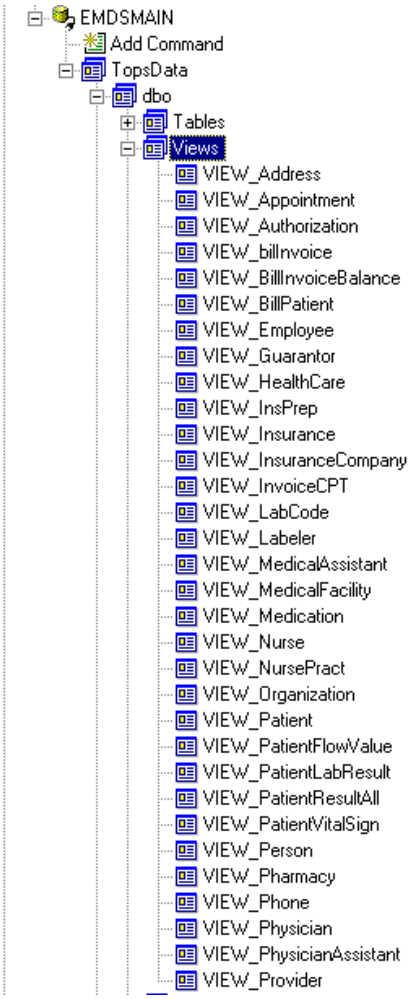
I knew I could join to those pretty easily because the medication view has PatientID and ProviderID fields.

In my crystal report it automatically generates a bunch of Joins shown as lines in the links tab. Although these auto-links are generally a timesaver, here it's important to have only the Joins that you actually need. Unnecessary links can reduce your search results (if it didn't match completely it wouldn't be there). There's a logic here to joins that will understand if you've learned some SQL basics in *Head First SQL*. It should now look like this:



Back in the report designer: Let's add the patient's name and the prescriber's name. Once you've confirmed that that data looks right, then you're done with making the report. I'd export

Views are your legos:



the data into a Microsoft Excel (data only). This is making a **flat file**☙ (one line is one record and every thing is lined up vertically in columns.) Setting things up in a flat file will make your spreadsheet analysis easier by allowing you to apply a formula to every record.

☙ **WhyFlat File?**
http://goo.gl/OskR

(I would add just a bit of dicing into this report. I'd use the Record Select Expert to select records that only show Simvastatin, have 80mg, and have me as the provider. And generally anything named **___ Expert**☙ in Crystal might be worth looking at. As you get more experience, they are surprisingly usable. But for now grouping/sorts/formulas/crosstabs/etc will probably take you more time to figure out than it's worth.)

☙ **Crystal Report Experts:**
Database Expert
Select Expert
Section Expert
Group Expert
Group Sort Expert
Record Sort Expert
CrossTab Expert

The harder approach to dumping starts with a built-in report that almost does what you need. Say you wanted to run a report for your catchment area to figure out where you should focus on your referral network. There are reports that have patient lists but none that will be easily organized by zip code, say. The **Patient Master List** has patient info but you need to add a column for zip codes.

In general, this involves adding couple lines to the SQL command in the report. If you can write these couple lines☙, then you're solid! But if you aren't accustomed to SQL, you should either be motivated or consider hiring it out. In this case, I can join to the **VIEW_Address**. Again, Views are the lego blocks and where you should start.

☙ **SQL Code to add Zip Code:**

```
SELECT
...
addr.Address_ZipCode as 'Zip'
...

FROM
...
JOIN VIEW_Address addr on
(a.Entity_ID = addr.Entity_ID)
...
```

A problem with the built-in reports is usability. They were designed to be flexible and general. This results in too many parameters and makes them slower to use. You might think it's not that big of a deal. Remember, these reports don't do actual patient care. This is an add-on to our real job. Reducing friction means we're much more likely to fit it in when we're busy.

If you have the crystal reports skill-set, you ought to clean things up to match your purpose. Less 'Swiss-Army', more '8 inch Chef'. So I'd recommend making the report single-purpose. Hard-code☙ any initial parameters you can (do you need all facilities if you only have 1 facility? Do you need to select dates or could you code it to be the last 12 months, say.) In patient master list, for example, we don't want to set the gender or the facility or the DOB every time we run the report. For many purposes, the right number or parameter to enter for a report is ... *zero*.

☙ **Hard Code Parameters**

```
SELECT @DOBStart = '1/1/1850'
SELECT @DOBEnd = getdate()
SELECT @FirstVisit = '1/1/1850'
SELECT @LastVisit = '1/1/1850'
SELECT @Gender = '%'
SELECT @Provider = '%'
SELECT @MedFac = '%'
```

Dice

Juice Analytics❧ is a company who's blog taught me much of what I now use in my analytics. These are professional analysts that do things that I will never have time/energy/expertise to do. It's their full time job. In health care, this is a detail (an important one) but it's not why we come to work — we come to take care of patients. Juice Analytics emphasizes one tool.

❧ **Juice Analytics:** http://goo.gl/JSHD

Spreadsheets. The data functions in spreadsheet programs are wonder tools that allow tremendous analytics. Spreadsheets are a 'lowest common denominator'. Most people doing analytics probably already know how to use a spreadsheet somewhat. So using a spreadsheet for slicing and dicing data will probably get you up to speed quicker than in Crystal Reports.

(Juice Analytics focuses on Microsoft Excel. I will, too, since that's probably what most e-MDs users will use. But it's worth it to know that this power doesn't require the price-tag — you could go open source with OpenOffice and do this.)

Say we're wondering about the continuity❧ at my clinic. Are patients getting in to see their personal physician? If you think of raw data, we'll need appointment data. We'd need data from **VIEW_Appointment**, **VIEW_InvoiceCPT**, **VIEW_Patient** and **VIEW_Provider**.

❧ **Continuity at *Institute for Healthcare Improvement*:** http://goo.gl/fKim

So we would dump this data: Patient Name, Date of Birth, Date of Service, Diagnosis, CPT, Visit Provider, Patient's PCP.

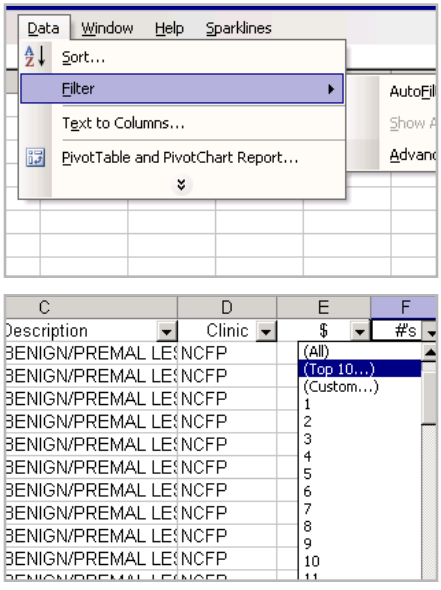
In Excel, you would open up the flat file you made in Crystal Reports. (If you have Excel 2003 or earlier, there's a chance your reports might sometimes be too big — it can only handle 64K rows. Newer versions can do up to 1M rows.) You might want to do some basic edit to make it a perfect flat file database (one row, one record, all columns line up, headers in the first row. Hide/Delete Unnecessary columns.)

Now it's time to do our dicing:

AutoFilter

AutoFilter turns your flat file dump into a 'Live View'. It allows simple selecting and sorting. If you're interested in a subset of the list, this could potentially be your whole report. It's also handy for exploring data.

AutoFilter



Formulas

Some simple formulas can really dice your data. In general, I think you can do almost everything with some simple logic and lookups. The main trick is to actually know what you want. If

you can write it out accurately in a sentence then you can probably figure out how to do it in Excel (or have someone do it for you.) The hard part is understanding what it ought to do — that takes business or medical insight. By combining and nesting the logic you can make custom bits of power that chew through your flat file.

Logic

You'll need to use the basic logic functions if you want to summarize your flat file into something useful. If we are going to get continuity data, we'll need to know if an appointment was done by the patient's personal provider.

AND, NOT, OR, IF, =, !=, >, <, >=, <=, True, False

Tip: Creating a formula that evaluates to 0, 1, or nothing let's you quickly summarize in a Pivot table (Averages only count cells with numbers.) By making some rows 'nothing' in your formula, you can use summarizing things like count and average when we get to a Pivot Tables in a moment.

If you have an interest, there's a satisfaction for combining these together to make your formula. If you don't do a lot of Excel, each of these could probably be done on **fiverr.com** for $5. Generally I'd focus on horizontal analysis here. Not how it will get summarized.

Continuity Formula:
=IF(E2=D2,1,0)

In English:
If the doc in the visit provider column (E2) is the same as the patient's personal provider(D2), it is a continuity visit(1). Otherwise, not(0).

Formulas for O/1/Nothing:

```
=IF(OR
    (C2=99213,C2=99212,C2=99
    214),IF(C1=99214,1,0),"")
```

In English:
If this visit (C2) was a problem-based visit (99212-4), we'll count 99214's.

Lookups

Lookups are vital for non-mathematically grouping. Say we thought that family docs who did OB had worse continuity—always being interrupted to deliver babies. You make a simple table on another worksheet of docs and whether they do OB or not. You could then use a lookup to do a non-mathematical calculation. Putting the lookup on a new worksheet helps keep your flat file clean. And will make it simpler down the road when you need to change things or add columns

These Lookups open up a whole new world of analyzing that's beyond purely math or logic.

Lookups:
=Lookup(D2, H1:H21, I1:I21)

In English:
Lookup this provider (D2) in the list of Providers (H1:H21) and find whether they do OB (I1:I21).

PivotTables

Once you done your dicing, you put it all together with a PivotTable. The PivotTable will take the data and summarize it. PivotTables are ridiculously powerful — you could summarize 30K rows into 10 with a PivotTable—in 20 seconds. Once you grok pivots, you'll start thinking, "If someone would just give me the raw data, I could do the right report myself." This is probably the most underutilized feature of Excel.

Watch: PivotTable Screencast

Design

We've talked about dumping the data into a flat file with Crystal Reports. We've diced that flat file with logic and lookups. And summarized with a PivotTable.

The last step is to design the 'dashboard' or 'printout' that will be actually used. The geek in me prefers electrons to atoms. I like spreadsheets. That means you should be thinking the opposite if you want things to fly in an organization. You're aiming to be inclusive here — not self-select the geeks in your organization. If you decide to send your spreadsheet, a lot of people just won't open it. To be inclusive, you'll want something tangible.

Like Crystal and Excel: Let's face it, you aren't going to master data visualization in 20 minutes either. Luckily, this is much more amenable to a hobbyist approach than Crystal Reports or Excel. A little web surfing hobby could develop into a decent understanding of some sophisticated approaches. You could do worse than start with *Juice Analytics* again❧.

❧ **Juice Analytics Calendar:**
At end of this document.

Here I'll just highlight a few techniques I've used repeatedly: Sparklines, Conditional Formatting, Normalizing.

Access @ NCFP (through 5/19/2010)

	Panel*	Continuity		4w Availability	
Benson, David B			77%		71%
Benson, Jennifer K			75%		74%
Bylund, Erik R			82%		82%
Dubek, Martin			77%		84%
Estep, Leslie A			86%		69%
Estep, Roger P			87%		80%
Gamson, Jonathan C			79%		67%
Hansom, Janet G			81%		71%
Kutzke, Dianne L			56%		78%
McConahey, Joseph K			74%		
Meyer, Anita M			70%		64%
Muller, Lucia C			73%		63%
Ploudre, Jonathan K			82%		78%
Traylor, Guilford H			83%		56%
Winkes, L Sloane			80%		61%
NCFP Clinic	15190		78%		**72%**

Sparklines

These are small word-like graphs. They show data compressed into a small space.

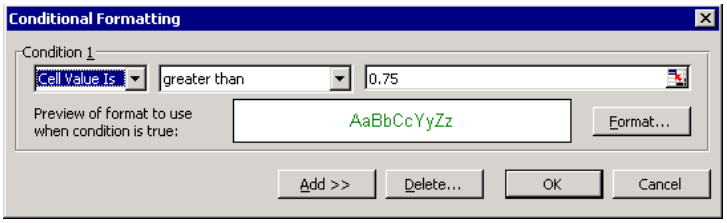
These allow a lot of data density without turning this into a 20 page report. If you pick the right sparkline and benchmark, your audience will adapt quickly to their use. **In my Access Dashboard, there are 224 separate results.** With some basic bars and sparklines, they become scannable and people can focus in on their own interpretations. If you spent a couple minutes with the report, you could mentally do dozens analyses in your head. Sparklines are included in Excel 2010 but I've been using a free add-on☙ to do it in an older version.

In my access dashboard, I use a sparkline for 12 months of continuity data. I also use simple bars to show panel size and next 4 week availability.

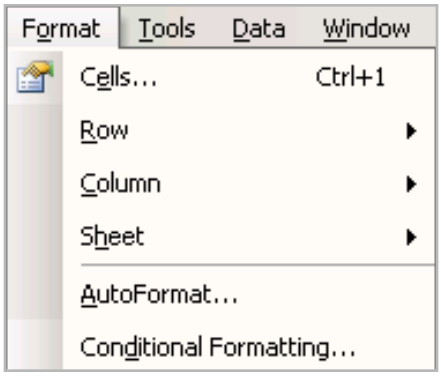
☙ **Sparklines in Excel:**
http://goo.gl/6pgj

Conditional Formatting

This is the way to add formatting in a logical manner (like in your dicing above.) If it's in the right range, let's make it green. Or bold the biggest number. This will help you direct attention to highlight good results or things that need improvement. You can uses complicated formulas, if you need to.



Conditional Formatting rocks!



Normalize Results

If there's any mental calculation that people make as they scan your data, you want to build that in. So instead of 'panel' in my access dashboard, you see panel adjusted for full time equivalent. That adjustment allows people to scan up and down to see who's really the biggest panel and should close their practice. In my access dashboard I use a lookup to normalize for the doctor's full time equivalent so that panel sizes can be compared. When you normalize results, you make it simpler for people to digest your dashboard. In availability, I calculate a % Free instead of counting slots. % is comparable and is normalized for full time equivalent.

Pitfalls

So we've dumped data with Crystal, diced with with Excel, designed a dashboard to show the results. We're done, right? Actually this misses the key problem with analytics. To this point, we've been pretty tech-heavy. These are power tools and wielding them gives us the superpower of analytics. But analytics isn't a technical skill. It's a sociopolitical process. If you want to make a difference, the tools will *never* be the deciding factor. The tech is actually the simple part. The pitfalls are elsewhere.

Biases

There are certain types of mistakes that we make over and over. We think we're cranking out a great report when we're really wasting time because we've got the wrong starting point.

Measurability Bias—Not measuring things outside the database. Example: Looking at time it takes for a receptionist to schedule an appointment when you really need to know if the receptionist smiled and made eye contact.

Countability Bias—Not only do we favor things we can easily measure (above) we also favor the things that are countable.Qualitative issues are ignored (even if they are measurable.) Lookups are a tool to avoid this. Not everything needs a summary — who needs to count overdue well child checks? You just need the list and to start calling.

Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted.
— Albert Einstein

Average Bias—By focusing on averages for summarizing, we miss outliers. Often improvement opportunities might be best seen in outliers. If you were trying to reduce complaints about waiting for visits, you'd get much farther with an simple AutoFilter for visits that last more than 2 hours than by comparing the average wait time of 2 docs. What's the real reason behind your mega-long visits? Or in my catchment area example: Would it ever make sense to consider the 'average zip code'. You know: Zip 99287.3?

Healthcare Bias—We think in our terms. But we should be using patient-centered benchmarks. At some level, good medicine is what patients say it is. If you look at the most respected (at least by google rank) site for ranking doctors, HealthGrades.com, you see a focus on important parts of your practice that you might systematically miss. You need to see things through your patient's eyes.

* **Time Spent with Patient:** Do you feel the physician spends an appropriate amount of time with you?	* **Recommend to a Friend:** Would you recommend your physician to family/friends?
Scheduling Appointments: Ease of scheduling urgent appointments when you feel ill:	* **Level of Trust:** Do you trust your physician to make decisions/recommendations that are in your best interests?
Office Environment: Office environment (cleanliness, comfort, lighting, temperature, location):	* **Helps Patients Understand Their Condition:** Does the physician help you understand your medical condition(s)?
Office Friendliness: Friendliness and courtesy of the office staff:	* **Listens and Answers Questions:** Does the physician listen to you and answer your questions?
Wait Time: Once you arrive for a scheduled appointment, how long do you have to wait (including waiting room and exam room) before you see this physician:	

Healthgrades.com:
How much of patient perspective is in your e-MDs database?

Systems

As I said, this is a sociopolitical process. If we are going to take advantage of our current head-start on analytics, we'll need to understand the sociopolitical side of innovation. Again, it isn't technical innovation here — you aren't creating a new algorithm for data analysis. You aren't writing your own program. It's making behavior change at your company — getting people on board, getting people to look at data. Your version of Excel or Crystal just won't matter.

Analytics Cowboy—If you're the lone person doing it, you're in trouble. It takes a team, different stakeholders. You can't do it by yourself. You'll need to be inclusive.

Breathing Room—If your organization doesn't make breathing room, none of this will matter. Make space to think about and act on analytics. If you can't convince other people to pause and think, all the work is wasted.

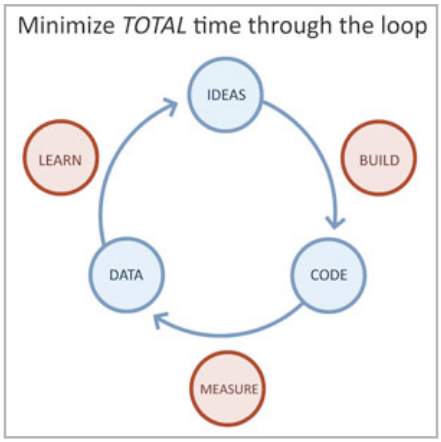
Boyd's Law—Frequent Data beats Better Data. A killer report that gets reviewed once a year will never work as well as a basic report that was reviewed monthly. Faster iteration gives you more opportunities to change/improve. You could call this nimble or agile or flexible. This ability to change quickly is a hallmark of success in our current healthcare environment. Healthcare isn't static and the faster you change, the better off you'll be.

Actiontastic Benchmarks—Measure what matters and manage what you measure. You have to pick things that you will actually take action on. It's much harder to get your group to manage a benchmark than it is to measure it.

Podcast Hobby:
Consider listening to *Harvard Business Review's* Ideacast, especially focussing on innovation.

Simvastatin Report Failure:
The report as our beginning example would've failed unless I considered who would run the report and how to use the results. Might need a nurse & receptionist involved on this. Not just a cowboy.

Boyd's Law: Iterate faster...



Go Forth!

Tremendous Opportunity, Make Time.

Don't let the tail wag the dog. This isn't a tech issue! Measure what matters. (What matters is not a tech issue.) Manage what you measure. (Managing is also not a tech issue.)

It's a few days of hard work — not a career change into analytics. Don't let it scare you. This is doable or hirable .

30DAYS to context connection

Use this practical guide to engage with visualization and build great context connection skills over the next 30 days.

Juice analytics

		est. minutes 30 0	ACTION, Content, *web address	completion
WEEK 1	Mon		**READ** Is Information Visualization the Next Frontier for Design? http://bit.ly/30Days-InfoViz	☐
			WATCH Hans Rosling shows the best stats you've ever seen http://bit.ly/30Days-Rosling	☐
	Tue		**READ** Business Intelligence isn't a technical problem, it is a Social Problem http://bit.ly/30Days-Problem	☐
	Wed		**READ** Who is Edward Tufte? http://bit.ly/30Days-Tufte	☐
	Thu		**READ** The Economist: New Ways of Visualising Data http://bit.ly/30Days-Visualize	☐
	Fri		**PLAY** New York Times Visualization Lab http://bit.ly/30Days-NYTimes	☐
WEEK 2	Mon		**WATCH** Before trying to communicate information, first understand it. http://bit.ly/30Days-Information	☐
			READ Part 1 Foundation: Guide to Creating Dashboards People Love http://bit.ly/30Days-DashboardLove1	☐
	Tue		**READ** The Best of Business Intellgience: Innovation at the Fringe http://bit.ly/30Days-BI	☐
	Wed		**READ** Think Like a Designer http://bit.ly/30Days-Think	☐
	Thu		**DO** 30 Resources to Find the Data you Need http://bit.ly/30Days-GetData	☐
	Fri		**PLAY** Indexed. Fun with communication of Data http://bit.ly/30Days-Indexed	☐
			DO Create your own visualization http://bit.ly/30Days-ManyEyes	☐
WEEK 3	Mon		**WATCH** Research for Knowledge Sharing http://bit.ly/30Days-Value	☐
			DO Juice Analytics Chart Chooser http://bit.ly/30Days-ChartChooser	☐
	Tue		**READ** The Purpose Driven Design http://bit.ly/30Days-Purpose	☐
			READ Information Software and the Graphical Interface (first 4 sections) http://bit.ly/30Days-MagicInk	☐
	Wed		**READ** 11 Ways to Visualize Changes over Time http://bit.ly/30Days-Time	☐
			READ Designed to be used http://bit.ly/30Days-Use	☐
	Thu		**READ** Part 2 Structure: Guide to Creating Dashboards People Love http://bit.ly/30Days-DashboardLove2	☐
	Fri		**PLAY** Juice Analytics Airline Demo http://bit.ly/30Days-AirlineDemo	☐
WEEK 4	Mon		**DO** Ponder this: How could you understand your life through data? then visit http://bit.ly/30Days-Personalize	☐
			PLAY Visualizing the world's emotions http://bit.ly/30Days-WeFeelFine	☐
	Tue		**READ** 40 Essential Tools and Resouces to Visualize Data http://bit.ly/30Days-40Tools	☐
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