Electronic Charting: Dynamic Representation of Abnormalities and Personal Code for Risk

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1. Abstract

Experiencing different products for Health Record Charting during the last 16 years in the role of the developer (trained as Microsoft Certified Professional Developer), as well as in the role of the end-user (trained as a Registered Nurse specialized in Mental Health and mastered Health System Administration), the writer shares his opinion about crucial components of any Health Record software and particularly of the Mental Health Electronic Charting. The writer called these components: Dynamic Representation of Abnormalities and Code for Personal Risk.

In the writer's opinion, these components are not only essential parts of any proper Electronic Charting, but their presence and use, which were not possible in the paper format, may significantly improve the quality of care and diminish risks.

The writer cautions potentially unaware buyers about different Medical Record database architectures on the market and their impact on these crucial components.

2. Keywords

Electronic Charting Health Record Abnormalities Dynamic

3. Introduction

I used to work in the big Mental Health centre which fully moved to electronic charting in 2000 and it very quickly became apparent to me and to people interested in mental health charting that there are many challenges, as well as opportunities, that this change can bring to our industry. Please, allow me to share some key points I found extremely important for any organisation using an electronic record to manage its Mental Health program, or any other long length of stay program.

Also, many organisations are moving from paper to electronic charting. This article may give some crucial advice before you buy your software for this goal.

There are many well-known benefits about electronic charting: easy access and the ability to share the context, readability of doctors' writing, standardisation of documentation and care plans, real-time documentation and authentication and many other more or less important things.

4. Dynamic Representation of Abnormalities

First, I want to share the most important element that I found must be in any medical record. I call it: *Dynamic Representation of Abnormalities*.

You see, when nurses on the medical/surgical floors change their shifts they pass very specific, objective, standard, and dynamic clinical information about the progress of their clients, like the presence and the intensity (rate) of bleeding, presence of peristalsis sounds, quality of the abdominal wall (soft / hard), VS, input and output and etc. This dynamic data allows for the quick capture of important information that allows for fast clinical judgment about the client's condition. They usually do not pass any information that is not relevant to the particular procedure or diagnosis. It takes about 15 min to go through 20 - 25 medical-surgical clients in this fashion. Also, nurses usually play a very technical and task-oriented role. There are certain tasks to perform in terms of care, but there is no need to read surgical reports or chemotherapy plans or others (I know that many nurses read all these, but you know that this is not a main-stream).

The physician is in charge of the overall care and usually needs to know only abnormal dynamic clinical data, meaning: when things are not according to the established norms and standards for some particular procedure / / treatment. For example: when the temperature, level of pain, WBC or else is higher than it should be for that particular day of treatment. For each surgery or procedure, to my knowledge, there are about 5 to 15 such parameters. When MD is satisfied that the acute phase of care is done and all these parameters show the dynamic

consistency with a recovery pass, MD will discharge the client home for GP care.

It is easy for a clinician to track these parameters, looking for the whole data (normal and abnormal together as we never have a separation between them) because medical or surgical clients stay in the active care (in the hospital) only for 2 to 5 days on average and, therefore, the amount of data is manageable. You are all, probably, familiar with a "temperature graph" - one list that is built to last up to one week and most of such data is registered there. Usually, Intensive Care Units would have much more detailed graphs as there are more parameters to follow. I personally worked with huge paper graphs in a special format that would cover the entire table when I worked in ICU, but this does not change the idea: we were looking into specific numeric, and therefore, objective data to understand the dynamic of our client's recovery. Medical / surgical electronic charting allows us to now present data in a graph format, making it somewhat more visual.

So, about 15 to 20 years ago, software and hardware companies saw the opportunity to sell their products to hospitals and clinics. There we began that journey.

The conversion was relatively easy: one spreadsheet to replace the famous "temperature graph", one to illustrate nursing tasks, one for orders, and one for all labs (and other tests) results. There is some place for a few nursing words usually on the same spreadsheet for objective data ("temperature graph") and this was enough. Remember: nurses are not supposed to write almost at all and physicians may have to make two

to five notes during the client's admission, one note from SW, one from Physio and we did it with one particular file. All notes in one place – one file. I do have a philosophical objection to this structure and believe that a different structure can serve our clients better. For now, let us agree that the overall result gave us what we wanted.

Now... Please, let us look at how our (Mental Health) industry, and, probably, many other medical fields are different from the electronic file described above.

Even though we now have a "scale" or an "inventory" for almost any condition or symptom, for many years we used our extensive notes to document and to pass clinical data about our clients. Taking into consideration the average length of stay in Mental Health - two to four weeks, that data becomes simply not possible to transfer upon the change of shift. You are all familiar with this kind of nursing shift exchange: "calm and quiet, no management problem", which is very typical to our industry due to a huge amount of information that is just not possible to transfer within shift change periods of 30 secs per client. Also, the poor nursing mental health skills and the unhealthy work culture would be responsible for the lack of any further nursing interest in that particular client's case. This is why, even after such insufficient transfer of information, many nurses will not look more for the relevant information. Many just have no knowledge of what to look for, no proper job dedication and no tools to help them look for it, even when they decide to do so. The lack of the proper transfer of information and the lack of the ability to track proper clinical

information to use it for clinical judgement and decision-making is a long-standing challenge that is responsible not only for the long average stay and poor outcomes but also for many critical events when risk factors remain unidentified.

As you can see, the massive amount of information, created by the nature of our documentation (extensive narrative), and relatively long hospital stay prevent us from enjoying such a simple conversion from paper to electronic charting on the hospital level. Sure, all these companies came up with different "blanks" where the clinician (and when these companies talk about "clinician" they talk about psychologists or physicians and not nurses) can easily pull a proper blank for this "scale" or for that "inventory".

This conversion may work well enough for short medical/surgical files but wasn't able (so far) to help us with our fundamental problem: track-ability and search-ability of clinically relevant information in Mental Health.

Attention! This part is important if you did not yet purchase your software. When I faced the problem of converting from paper to electronic charting, two years ago, in St Joe Toronto, I was presented with, as it looked like at that time, a bigger problem. There were no forms and only one form for the nurses. Apparently, St Joe's Toronto bought software (All Script - Sunrise) that poorly supports different forms, but is built more like one big table. *Essentially, the client's file is one big spreadsheet*. This is *very different data architecture* compared to other hospitals uses Cerner's or Microsoft's

database, where, as I mentioned above, there are many different and very custom *adaptive forms filled out by multiple clinicians* that create a single client's file.

Initially, I felt powerless and thought that I would fail, since we all know that our narrative is important to keep “as is”. I was sure, that to really understand the client and all the possible risk factors the clinician has to read the entire book. Imagine: you have to put "Anna Karenina" in the "temperature graph" format. I felt really desperate, until one day I started to write down the objective, numeric, and dynamic clinical data that would indicate the client's progress. However, in our industry, many of the parameters were not registered or standardised yet. I just wanted to see what they are and how many.

Not only this. As you well know, many of our clients are not cooperative enough or have not enough inside to report to us the intensification of their symptoms, or our staff for whatever reason failed to build a therapeutic trustful relationship to make our client share their symptoms. For these cases, objective, numeric and dynamic data that staff can simply observe and record can be also very helpful to flag out a negative dynamic even when the client remains "calm and quiet, no management problem". So, I added these parameters as well. I got many. In fact, a lot, from such parameters familiar to all of us like full Mental Status Exam (including signs for PTSD) to less familiar like the number of seconds the clients delay with their response to the question. Total 50 to 100 parameters. Of course, even if I could find a way for the nurses to record all of this data, who can read and assess it? But…if you

have one open field (computer window) and all the nurse has to do is press the first letter of a chosen standard answer to the question, and then, press “Enter”, then, the focus moves to the next question – this way there are only two buttons to push for each question, 100 for 50 questions, about 90 seconds for the nurse already familiar with that questionnaire. This way *the problem of massive data entry was solved.*

Then, I understood that *what we are really looking for is negative data or negative dynamic. There is no need to read all data!* There is no need to read the full MS. We only need to know what is abnormal and what kind of dynamic this abnormality has - is it less or more? This is why I came up with the first page or *"clinical summary" where all necessary dynamic clinical abnormal information is presented together with its trend* (just by attaching a date and time to the result). The one form or one place for entering information actually helps a lot, as full typical documentation (including suicide assessment and MSE, DASA IV, sleep, appetite, hygiene, passes, group participation, VS and other things) now takes up to 3 minutes or one minute more if the nurse has to document a restraint.

I like what came from this, as *it allows quick documentation using standard assessment and interventions, gives clinicians fast clinical overview of the client's file and allows meaningful and fast change of accountability* (change of the shifts). Due to many reasons, I wasn't able to finish fully what I am talking about in St Joe's, but I left there a working prototype of what I am talking about.

Now, here is the really important part that I promised to share: that success was possible due to that particular data architecture that I thought initially was a negative one, as it allows for easy search-ability. Later on, we found a way to present the information in an easy to read format. This architecture allows not only to search for a specific client's data but easy to prepare mega reports related to a specific result for a particular group of clients (the number of restraints, who and for how long in the hospital for the last 24 hours - this I used mostly in my previous job in St Joe's). The other type of data architecture, that looks awesome building and handling multiple forms, are actually not easily searchable and, therefore, cannot help us with the main challenge of otherwise not-trendable information. This is because *it has a serious challenge to record information fast, navigate between multiple forms, and a serious challenge to recall only negative information, which is key for the clinician capacity to assess it.*

So, please, *be vigilant with what kind of data architecture you buy*. Your medical or surgical programs may well deal with both types, but your longer length of stay programs like Mental Health or certain programs for the chronic clients, probably, will be better with data architecture the one that St Joe's Toronto has. Moreover, you probably will need more powerful hardware (both memory and speed-wise) to handle the architecture with data saved on multiple forms. Multiple form oriented architecture will serve you well if politically your organization oriented to the different important people inside the organization and less on the front-line staff and clients. This is because they will be able to create multiple forms exclusively for themselves

(take credit for, use it to improve their own political power within the organisation, etc.) and just force front line nurses to fill them out. There is a theoretical possibility to build additional internal search engines to search such a form oriented structure for data. I have never seen it yet and for sure *it will require additional serious investment in software and hardware.*

To my understanding, both form-based software providers (Cerner and Microsoft) seems like working hard to develop these search engines to look into these multiple forms and their narrative format information. This is with a hope to create algorithms and to be able to search for specific words that can indicate the risk of violence or suicidality. Here are *few biggest challenges* for such system, even if they finally will come up with proven to work algorithms:

- it would require a significant hardware upgrade,
- due to the lack of a structural input, the text may not contain the necessary information,
- a dynamic representation of the progress broken down by particular parameters will be not possible,
- the problem with massive and time-consuming data entry will continue,
- the challenges around free narrative record (vs structural) will prevent standardisation in recording, assessment and intervention.

This why a careful buyer should cautiously weight what product to buy.

5. Personal Alarm Formula for Risk

The second part (small part) of this article, is the thought about what I call "personal formula for the alarm".

Nowadays, I manage two forensic medium secure units and am involved in other processes in the hospital. This uncovered to me the challenge related to the *very chronic forensic patients* (our length of stay is about two years) who *may deteriorate within a few days or hours unnoticed by the staff* and create a very serious risk for the public and for themselves.

Here is the fully made up example that can illustrate how critical it can be:

A patient by the name of Holeh Nefesh (this is a made-up name and absolutely all other details are also made up), killed his uncle two years ago, using a hammer as he believed that his uncle was an alien who came to kill him. The client was deemed Not Criminally Responsible by the Ontario Review Board and began his treatment in our hospital. He is calm, pleasant and very cooperative, so the staff calls him an "exemplary patient" and very soon his level of autonomy increased to the point where he spent more time near the hammers in our facility. One thing remained constant, though: it was very clear that if and when Holeh's delusions intensify again he will be not able to acknowledge

them, share them with the staff and he will act upon them again and most likely will damage somebody very seriously or terminally.

In our absolutely made up circumstances, when Holeh's nurse is not familiar with him (no primary nursing concept in work) and has low mental health skills, the real assessment is on the shoulder of the physician who can see Holeh once per two weeks for 10 - 20 minutes, it is just a matter of time when Holeh will pick up a hammer and harm somebody.

In this made-up story, this almost happened and just by luck nobody was hurt. One morning, his nurse, who works with him approximately four times per month during the last 6 months, received a transfer of accountability data: "calm and quiet, no management problem", established an MSE by asking: “do you have voices?” and “do you have aliens around”. The client answered twice “No”, and was allowed access to the hammer and tried to kill a maintenance worker.

So, the hospital may review the use of hammers by the clients and some other things, but still will not be able in the future to identify the *main reason for the danger: intensification of the client’s symptoms*. This is despite the fact that the close observation of the case reveals some data that if tracked can actually indicate and flag changes in the client’s symptoms. This data can be a kind of *personal footprint or personal formula for this particular client’s alarm*. Let’s imagine that for Holeh these are: the intensification of headaches, refusal to take medications, longer than usual delay with an answer, refusal to follow

staff direction and speech with less than usual context and less spontaneity. Assuming for many reasons, this wasn't noted by the morning staff when the client's condition deteriorated. I imagine that your organizations also may have these reasons to some degree and this could be a topic for another conversation: poor nursing skills and nursing disengagement, lack of inter-professional approach, lack of a primary nursing team and more.

Despite some organizational challenges, if we could have the capability to register and track all specific characteristics for the client and objective clinical data, so that not only we can track the dynamic for all clients, but we can build a personal formula for the alarm *and the software can alarm the staff or caregivers about the potential danger.*

Well, to make it work we would need a database and electronic record that support structural entrance of information and dynamic representation of abnormalities.

Thank you very much,

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