

Future of Health Technology Symposium

Presentation by:

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Gianfranco Zaccai:

I just want to say I'm neither a rocket scientist nor a brain surgeon. But what we do at Continuum is sort of the realization that you really need a lot of different kinds of brains looking at the same problem from different perspectives. Usually most problems are more complicated and more complex that neatly fits in any one discipline, although from the standpoint of doing research, there's some sort of functional benefits from looking at things that way.

When I was asked to speak, I thought a little bit about what constitutes better health care? Is it eliminating medical errors? Certainly that's something that we're concerned about as designers working in the field. Is it really about helping people to heal faster? Is it about lowering overall costs? Is it about keeping people healthy? Is it perhaps even making people happier? Or is it all of the above? And I'd like to suggest that it's really all of the above. We live in a very complex world, and we need to think about things in a very holistic way. And you know this information better than I do but there are a lot of issues right now that have a major implication in health care. Certainly errors from a variety of areas constitute pretty much a pandemic I would say and are the 8th leading cause of death in the United States, and they're very expensive, seventeen to twenty nine billion dollars a year. It's been said that at least a quarter of these errors are preventable. It's also been mentioned that one of the major areas of errors is erroneous or improperly filled prescriptions and that this should be done electronically. So there's an opportunity for technology that both is sometimes the cause of medical errors and also a way of solving medical errors to play a role.

So it's important that when we look at the future of health care, we also look at the details. The devil is in the details and the execution of innovative ideas and technologies in such a way that they actually are used in a reliable and predictable way. So the importance of human factors is well understood, but not necessarily well applied. And part of that is because we tend to think of people acting in a rational way, but people don't necessarily act in a rational way. For example I noticed this story of a patient that was diagnosed with high cholesterol and he was taking a lipid lowering drug, and when his cholesterol went down he stopped taking it. And then he had chest pains and had to have open heart surgery. This turned out to be Bill Clinton. So not necessarily a person who was not intelligent or well educated. And then there's this other case of a man who was diagnosed with asthma and was prescribed an inhaler and the doctor couldn't figure out why the medication wasn't working. He had shown the person how to use it, you know, how to make the puffs, but he didn't show him that he had to do it in his mouth. So the patient was spraying the inhaler and trying to sort of breathe the air. These are real problems that exist. So cause of medical errors are very complicated;

there are lots of different areas, and lots of rich opportunities for us to make some improvements.

There are certainly problems in communications. There's a big problem in the fragmentation of health care. People make mistakes when they're tired, and we have a lot of overstressed health care professionals, and a lot of physicians and nurses who are feeling burnout. There are also manufacturing errors, there's equipment failure, there are diagnostic errors, and there's poorly designed buildings and facilities. All of these and probably many more constitute to this very large problem of medical errors.

I'd like to point out that we don't necessarily have to look at high technology to start chipping away at the problem. There's also some solutions that are not rocket science and don't require any kind of artificial intelligence and other sophisticated systems. As an example I'd like to point out this new container or labeling system that Target has introduced for drugs from their pharmacy. Now this is one of those simple solutions that you say why didn't someone think of this earlier? A container that has a flat surface so you can read the damn label, so when you put the container in a drawer you can read the top of it and see what the medication is. In fact the whole system allows you to deal with either liquid medications or pills, allows you to use some color coding, allows you to read the contents and the warnings. Not rocket science, but it can make a significant -- solutions like this; simple solutions can make a significant difference in the quality of health care.

But I think we can do a lot better than this. We certainly need to look at how we can remove errors, remove problems, and remove mistakes. Perhaps we can do even better which is that we should take for granted that we should have fail safe systems. But we should look at the human condition and see if we can actually elevate people by providing some element of joy in what they do. In the past - this was my own naive view of the past by the way - the past is not what it used to be as someone has said. I think in the past, the perception was that technology was not very good. But there was kind of a human connection between patient and doctor, which was very good. So the family physician was the trusted advisor, it was the family friend, someone who had the time to devote to the patient. So, poor technology, nicer relationships. I think currently we have much better technology but perhaps that kind of human connection has been eroded for a variety of reasons. I think in the future the opportunity really is to create flawless technology; to worry about all the details that make something break down, but then to also go beyond that and think about what could be delighting to people. And delighting to people meaning patients and caregivers. I think in order to do this we really need to understand deeply what the issues that people are facing are.

How many of you know of Patch Adams? Any of you see the film a few years ago? Robin Williams? Anyway I met Patch Adams a few years ago and he's an interesting guy and I think he has an interesting theory which is, laughter is the best medicine. I'm not sure it's the best medicine but I think it's a useful component of medicine. The idea of integrating joy and laughter and a positive attitude while delivering all of the things that technology can deliver is extremely good. So Patch has started the Gesundheit

Institute, let me show you the website. (Video). Now he's been trying to get funding for a hospital based on this notion of providing laughter and enjoyment. It's sort of a utopian idea. But it's interesting that in the little bit of reading I've done on the subject, it seems as though the VA hospital system has been able to introduce at least a few of these concepts into its system. Who would have thunk it? So I was reading this article in Business Week that the VA Hospital was reinvented in every possible way in the mid 1990s. Dr. Kaiser, then VA's Health Secretary installed the most extensive electronic medical record system, blah, blah, blah, and most critically instituted a culture of accountability and quality measurements. Our whole motivation was to make the system work better for the patient. So as a result the VA Hospitals outranked private sector hospitals in patient satisfaction. Very interesting. Despite the fact that the VA Hospital spends an average of \$5000 per patient versus the national average of \$6300. And the staff is happier. I would maintain that a lot of the reason for the cost reduction is because the staff is happier. Because I think what Dr. Kaiser did was he stepped back and looked at the entire eco system of health care within the VA system. So the staff is happier because the bureaucracy has been reduced. So the staff can do more of what they went into medicine to do, which is to treat patients and less to deal with the bureaucracy that burdens their lives. For example, Dr. Sanderson's able to spend more time with patients because he spends less time record keeping than his counterparts in private practice. It lets him focus on preventative care and diabetes prevention. The VA scored very high in the Ram Study of Diabetes Care; 70 out of a 100 versus 57 for the private sector.

There's this weaving together of technology and sensibility and sensitivity for human connection, and technology seems to be used not as an end in itself, but as a means for allowing the human connection to come to the foreground. So they talk about record keeping and accessing data. In fact, I read recently that the VA patients were the only ones that were able to access their medical data after the Katrina hurricane. The other hospital systems were not connected in a national database. Again technology, prescriptions are delved out by robotic devices. One reason the organization is able to hold co-pays at eight dollars. So it really is about people, as well as technology. Here's Robin Williams. (Video).

So how do you dive into people? Everyone is used to looking at lots of data, lots of demographic data. I'm not sure we're used to understanding our type of people that represent larger numbers in this data. You know, really listening to what people say, and also listening to what they don't say or can't say.

What I wanted to show you – there's a limit to what I can show you because most of the work we do are for clients and they own the material that we have. But let me show you a little project that was done actually in 1999 about the future. It was envisioning the future by trying to understand how people really interact with the health care system in a real way. So we spent a few weeks, this was a pervasive computing event at IBM. We spent a few weeks trying to understand people. (Video).

She actually talked also about having had a stroke in the past and how frightening that was and how frightening it is to live alone after recovering from a serious medical problem. But she's fortunate that her son lived downstairs, so her son was really part of her health care system. Not just her physician, not just her hospital, but her son. He keeps tabs on me, I think it's good.

Here's another person, different issues, a 14-year old student. (Video)

So this boy is 14, kind of a crucial age. So he used to go into his doctor with his mother. He doesn't do that anymore. His mother is part of the care giving system. He wants her to know some things about this health, not everything. For example I think he had sprained a finger or something and he was afraid if she knew about that, she wouldn't let him play basketball. So the idea of control of, having access to information, having other people to help you in making sure that you get good health care, not necessarily professionals, but being able to control the access to the information is important.

Here's the boy's mother. (Video).

This woman has obviously something she worries about. She had a knee problem. She didn't want to do too much research about her own health care problem because she didn't want to know more than necessary. She wanted the doctor to tell her. But her mother, I believe, had breast cancer. She did a lot of research about her mother's condition. (Video)

So this notion of the personal relationship with your physician actually underlies the conversation of all of these people. She is very explicit about this, and she also regrets the fact that one of the small community hospitals was closed and merged with a larger hospital. As a result, efficiency may have been improved, maybe technology had been improved but the kind of human relationship was degraded from her point of view.

And here's her physician. (Video). So this physician talks about information overload. As it turns out we discovered that most physicians when they see their patients for their physical, review their charts and their files maybe four or five minutes before they see the patient. There's a lot of information to process, if they had the information accessible to them, you know, with a bunch of paper trails.

Now in Boston and I assume in other areas of the country, some hospitals have grouped together to computerize and share data, but it's still far from perfect. But there's also this concern about patients having access to information but maybe having access without appropriate filters.

Here is - I love this guy's name, Dr. Love. (Video). So this was eight years ago. Just taking that information which is not in great depth, but it's just kind of a panorama of some of the issues that these people are dealing with. One could imagine, and one did imagine, a system which could be a pathway for appropriate innovation, not just innovation because something is technologically feasible or possible, but because it's the right innovation to do. So innovation that would further the personal relationship

between health care providers and their patients. This was something that was expressed by both patients and professionals. Systems that would reduce the information overload, not by reducing information, but by distilling it and making it more accessible. Even the doctor's benefits of having more information, but not the burden of that information; both the burden of inputting data and the burden of receiving and analyzing it. And in order for this to be accepted, there would have to be a lot of care about personal control and privacy issues, because that could really block a system in a fatal way.

So how do we personalize data collection, how do we create a better communication between patients and doctors, how do we increase useful information, reduce overload, enable communication between family members and other care givers because we're not just dealing with professionals in care giving, but there's this informal non professional system which is vital. And how do we use this information to also empower and educate people to take better care of themselves? So this is again just at a very early conceptual level. But the idea would be that one could take and collect data, and we've seen some presentations this morning that shows how you can take the noise out of the data and extract what's really important so you can get meaningful information, not just information overload. Not just from one source and not just from one visit a year, but from people's health clubs, from people's homes, from their cars. We know that there's technology being developed to insure that people that have had too much alcohol can't start their cars. Why not be able to measure other parameters in a vehicle? Certainly the informatics that are going into vehicles are certainly making that not only feasible, but right around the corner.

What if all this information could be not only collected, but also through appropriate artificial intelligence systems filtered and distilled into useful data and stored into, let's call it a vault? A vault in the sense that the patient needs to believe that their personal information is under their control, the individual control, who can then choose to share it with family members or a national database so you can now start to get massive amounts of data that can be analyzed and distilled, and also can be shared with our health care providers. Now not everyone would comply; there are people who have serious concerns about sharing data with anyone, but I would think the majority of people could. So if you had this kind of a system with a vault – you know I'm a designer so I'm a great believer in illustrating things. A vault should feel, even if it's a virtual space, it should feel like this, it should feel like the bank vault, that nobody else is going to get into it to get to my and your information except yourself. And if that data could be transferred with the stroke of a button to the physician so that before they come in they see your picture, they see what you looked like the last time they saw you, and the time before that, and what you look like now, because that kind of physical change is important. And would be able to examine you and have the data that they collect through a variety of tools, be automatically transferred in a wireless fashion to this database. Be able to access other patients – excuse me, other physicians and other medical information about the patient in a very timely way, and also in a very graphical way; being able to see MRI images right in the patient's room, and be able to share the regimen with the patient in a way that's understandable to the patient with potentially

with the idea of a device that the patient could take back with them to help them in following the healthcare regimen.

What I showed you was a two-week hypothetical exercise. But the point is I think that behind it is a real need for reducing this kind of information overload, but increasing the amount of viable, important useful information collected from a variety of different sources and presented in a way that people can actually access and use and share the information between the physician and other physicians, between the physician and the patient, and between other care givers and each other.

So that's a little sampling of how we tried to delve into what people really believe and try to extract from that a kind of roadmap into what would be appropriate innovation. What I want to show you is a couple of examples of this kind of process being applied in a tangible way. The first one is a project that was done with funding from NIH, and it was done together with a physician in Boston, Geoffrey Hart, who is an anesthesiologist. And the idea is that children undergoing an operation or a procedure that requires anesthesia not only have to be sedated because of the pain involved in the process but also because of the anxiety of being separated from their parents, of being in a rather hostile looking environment. And our theory was is it possible to reduce the need for anesthesia first of all by calming the child through other means, and secondly could we use nitrous oxide to deliver anesthesia, and provide a better experience. So this is the product that was the result of that. It's a headset that delivers the nitrous oxide, but not only that, it allows the child to use a Game Boy because that's a great anesthetic; my children use it everyday. So it has embedded technology but as far as the child is concerned, it's a toy. In fact, we also had a theory that having the child be in contact with their parents through a communication system would be good. We discovered that was not the case; that actually increased the anxiety level, but I'm not going to go into that. Probably the parents conveyed their anxiety. So the product was developed and it's undergoing testing right now. It's preliminary, but let me show you some things that I think are pretty interesting. You can see the difference in the way anesthesia is delivered and the speed in which a child comes out of it, and the satisfaction rate. It's very significant. So dealing with the emotional, the psychological aspect of something, even something that really seems to be really cut and dry, and totally based on the physiological need can have significant benefit and can have significant benefit in lowering the cost of the procedure as well. A second case study I'd like to show you again very briefly. If you'd like to have more details on any of this, you can contact me at anytime and I'll be glad to send you this information.

The second deals with diabetes management. This is for a company which was actually venture funded about three, four years ago, and the product has received FDA approval the middle of last year. But again, I won't go into the details but diving deeply into the subtleties of diabetes care, especially for children, Type I diabetics, it's not just what they should do, it's what they do do, and the burden that comes along with doing that. Extracting that information and transferring it into ideas that can be actually executed. What was done for insulin was the development of a wearable infusion pump, and you can see it on the right here, it's about the size of, I don't know a silver dollar. It's loaded

with – it can be loaded for three days with Insulin and it's worn on the abdomen with an adhesive. There's a memory metal engine that drives a catheter to through the skin in a totally hermetically sealed, really reducing the risk of infection environment. And then the insulin can be dosed in a very precise way using a remote controller. The remote controller looks a lot more like a cell phone or a kind of a game boy controller. Again, it uses very low energy; it has to operate for three days. There are no external wires, no external tubing, so not only are you reducing the potential for infection, but you're reducing the stigma that's associated with being a diabetic, especially as a child. The need to go and inject yourself, the need to – if you wear an infusion pump currently, they have external lines and so forth so the opportunity for infection is significant but also having them be visible creates a significant psychological burden.

I mentioned that it delves into details, so the ability to actually use this is really important. I'm not going to go into the details, but usability through the graphical interface are all extremely important, dealing not only with the care givers but also with children and understanding how they process information. But the main objective is this: is to provide the technology but make it be as transparent as possible.

I'm finished. Lots of opportunities and I think that if we strive to delight people rather than just to cure them, we'll do a good job. Thank you.

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