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Semantic Technology Enables Smart Computers



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As healthcare faces up to the promises and challenges of big data, HealthManagement spoke to Dr. Dirk Colaert, Chief Medical Officer at Agfa Healthcare, on the evolution of healthcare against the background of big data.

Big data is an abstract term, but in healthcare the data represent very personal information. Do you see this as a paradox?

Big data is a buzzword without concrete meaning. It refers to both abstract and personal data, so I don't see a paradox. Very soon all healthcare applications will have to deal with huge amounts of both personal and more generic, abstract data. There is patient personal data, but also data, such as measurements from devices and sensors, that can be about one specific patient. There are also examples of abstract data in healthcare, such as generic medical knowledge - scientific databases, medical articles and clinical trials outcomes. In healthcare abstract big data and personal big data are more complementary.

Some administrators, decisionmakers and physicians are reluctant to recognise big data's potential. How do you demonstrate its necessity in the future of care delivery?

This is like evidence-based medicine (EBM). Sometimes evidence is contra-intuitive. EBM uses an abstraction of the patient, and doctors may think that their patient is a little bit different, and the suggestions given by EBM systems don't apply to that specific patient. What we have to do with big data is to capture contextual information and take that into account in the analysis. Then the suggestions to the healthcare provider will be much more accurate, and the systems and ultimately the decisions we suggest will be better accepted by doctors and healthcare providers.

Which "V" of big data (volume, velocity, variety, veracity, value) do you think is the biggest challenge for healthcare and why?

All of them are a challenge. Volume and velocity are somewhat interdependent; velocity is a challenge, because of the huge data volumes, and speed has always been a challenge for any application used by healthcare providers.

Variety is a challenge, because we want to combine multiple sources of information into a comprehensible view on the patient's record. By definition you will need some semantic alignment of the different sources. This is a problem, because different systems use different ways to store data, and have different standards. This can be overcome, but the semantic underpinning of these standards is still something to be worked on.

Which attribute has the greatest potential for improving healthcare delivery if the challenges can be overcome?

I think variety has the biggest challenge and the biggest potential. Semantic technology can mitigate this variety. Ultimately it will give the doctor a complete view of the patient records, the electronic health record (EHR), which is the life-long capture of the clinical data of a patient. This is needed to organise integrated care. To me, integrated care is the ultimate thing we need in healthcare - organisation across stakeholders, including the patient. It is not only curing diseases, but also preventive medicine etc. Unless we have this global view on the data, we will not get there, but if we get there, and we can cope with this variety, it will enable EHRs and integrated care, which is what we really need in healthcare.

What skills will healthcare IT professionals need for big data?

Healthcare IT professionals should have skills to deal with semantic technologies, standards, vocabularies, terminologies etc., knowledge of clinical data exchange standards and knowledge of patient big data tools, such as databases. They will need to be familiar with more analytical tools, that go beyond the classical dashboard to tools that really let people explore data. They also need medical knowledge. I think IT work will be more and more generic, and the specificity of applications will come from the data and the formalised context. Understanding this context will be very important for anybody in healthcare IT.

Who do you feel should drive the semantic angle?

It is a slow process. Companies do not commit to standards when they are not globally accepted. On the other hand, something is only accepted when companies have made real-life implementations. So this is a chicken-egg situation. We all have to work on it, and authorities could, for example, say, "In the next five years we will expect any vendor or hospital information system to be able to exchange data in this format". We see less appetite for proprietary standards and more openness, but authorities could maybe enforce it more.

Medical technology is continuously improving, but healthcare systems adopt technology at different rates. Will this help or hinder the sharing of big data?

The slow IT adoption in hospitals so far will not help the sharing of big data. We have the technologies, but many are only sparsely implemented. There is still a psychological barrier to sharing clinical data at all, even anonymised. We have to prove, with good news and success stories, that there is additional value in it.

How is the ideal model for cross-border cooperation of big data architects and archives?

Scalability on an international level can only be achieved by ending established approaches. For example, what I would call "All the knowledge is contained here": there are still people trying to put everything in one computer, so they feel safe and in control. This is not sustainable: we have to move to distributed systems, which allow you to collect the necessary data just in time and fit for purpose. Otherwise, we will never achieve the scalability we need on an international, cross-border level. No single database structure, whether it is big data or not, will fulfil the needs of all applications. An operational system storing data in its own local database should be able to fulfil data requests from authorised applications externally. We should have a kind of ad-hoc accessibility of data. For example, "I need data, I know where to find it, I perform this request, I assemble my dataset for analysis for instance, and I don't count on the fact that I have this already on my computer, because I cannot have the whole world on my computer." This is a fundamental change we have to work on. I'm not saying that technologically everything is solved here, but I am sure we cannot solve scalability on an international level by putting everything on one big database. We have to work on distributed systems.

In the future, we will need some smart agents that work as brokers for people who need data and don't know where to find it. There will be broker services alongside security services and real data access services, and they will have to collaborate. Instead of having one application doing all, there will be some kind of collaboration or choreography of these different services working like one system, so the computer will be the network.

Patients are increasingly empowered to be active participants in their care through mobile technology and remote monitoring. Do you see any downsides?

There are downsides, but they probably do not outweigh the benefits. If the patient is part of the whole ecosystem, the data coming from the patient is unsure and not controlled, so people may doubt the value of this data.

Another concern is where the balance is between supporting the healthcare IT environment and "Big Brother". If you connect to the patient's room you can capture data from sensors etc., but then we are close to a "Big Brother" that is controlling everything. We will have to find the right balance there.

The informed patient is not a downside, and health professionals will have to change roles, and be guides in the patient's healthcare.

What can healthcare learn from other industries about the potential of big data?

If I buy something on the Internet, I can see what others have bought. The motivation is commercial, but it brings additional value to the customer. We can translate that to healthcare. Imagine a doctor seeking the best treatment for his patient: the system looks at the data, and presents a list of patients with the same symptoms, the treatments that were applied to these patients and the outcomes. This could help the doctor adapt the treatment if necessary. There are limits to what you can do, but having more information is always a great advantage.

What role will Agfa play here?

At Agfa Healthcare we have a close connection with our customers. We are very aware that healthcare is going towards integrated care. For integrated care, you need EHR that combine data from multiple sources, and you need EBM, looking at and analysing the data. Solutions for integrated care encompass all these technologies from big data, big data analytics and decision support. This will be core for Agfa Healthcare, and we are well placed, because we are so close to the data.

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