# Big is beautiful: electronic patient records in large Norwegian hospitals 1980s – 2001

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**Summary**
The introduction of electronic patient record systems (EPRs) has for many years spawned aspirations of improved quality and efficiency of health care delivery. Among general practitioners, EPRs are already in widespread use in most Western countries. Establishing EPRs in hospitals, especially the larger ones, has nevertheless proven notoriously difficult. The increase in organizational, institutional, political and technological complexity has been seriously underestimated. This paper describes and analyses the prolonged efforts – spanning close to two decades – of developing and using EPRs in the large, university-based hospitals in Norway. The investments involved were considerable, implying that a crucial aspect of these efforts has been the way alliances have been forged with public institutions and agendas. We analyze this process, focusing on the difficulties of legitimizing evolutionary, small-step approaches compared to bolder ones.

**Keywords:** electronic patient record systems, evolutionary approach, large hospitals, development strategies

## 1 Introduction

Reforming the health care sector, especially larger hospitals, is a high priority in all Western countries. It has, however, proved painfully cumbersome. As a result of the perceived lack of success by other means, the development, and subsequent introduction, of electronic patient record systems (EPRs; or synonymously computer based patient/ health records, CPRs) has for many years represented a promising opportunity for implementing changes in work routines and organization.

The experiences with EPRs in Western countries are at first glance confusing and beg many questions. EPRs are in common use within primary health care. Estimates vary, but around 90% of general practitioners in Norway are regular users of EPRs. When one attempts to introduce what is seemingly the same technology into a different social, technological and institutional setting – in large hospitals – the outcome is dramatically different. Despite a series of heavily funded national and international initiatives, the outcome has proven discouraging. Oddly enough, there does not seem to have been any systematic, comprehensive and critical evaluation of these efforts (although more narrow or restricted ones exist; see [1-5]).

This paper describes and analyses the prolonged efforts, spanning close to two decades, of developing and using EPRs in the large, university-based hospitals in Norway. The DocuLiveEPR system developed in the Medakis project is used to a notable extent. Three of the university hospitals, Tromsø, Trondheim and Bergen have deployed the system quite extensively and have almost completed the implementation whereas at the National hospital and Ullevål (the largest hospital in Northern Europe) only 15% and 30%, respectively, has been completed.

Diffusion does not automatically translate into actual use. The users are primarily physicians and secretaries. The university hospitals together have nearly 6000 defined users of the DocuLive EPR with nearly 1400 concurrent users on a normal working day. The DocuLive project has been reasonably successful in developing and diffusing the system. In terms of organizational changes, comparable to the initial ambitions, however, there are very few results. Basically, the secretaries use it as a word processor while the physicians use it predominantly to read patient data and to sign previously dictated documents [5].

The EPR efforts in Norway may be considered as negotiation processes involving a number of independent, and partly competing, initiatives with a varying set of allies. Based on a historical reconstruction, our aim is to unpack the dynamics of these negotiation processes and analyze how one modest and evolutionary initiative "lost" to a bolder and more ambitious one. More specifically, we analyze the way evolutionary approaches struggle to be perceived as legitimate and viable alternatives. In addition, we analyze implications for local control stemming from the vendor's recent emphasis on transforming the Norwegian-based solution into a "global" solution.

## 2 Research method

This study belongs to an interpretative approach to the development and use of information systems [6,7]. This study is shaped by our analytic affinity with science and technology studies (STS) in general, and actor-network theory (ANT) in particular [8,9] as ANT is the backbone in our reconstructing and sense-making of the advancing historical events.

We rely on four types of data: participant observations, interviews, informal discussions and electronic and paper based documents. The participant observations were conducted over two periods in 2000 and 2001 by the first author at the University Hospital of Tromsø resulting in 57 hours of observations in 7 wards. During these periods, questions were posed in order to clarify and elaborate observations. The extent and format of these obviously varied with what was possible without intruding too much on the ongoing work. 9 semi- unstructured interviews were conducted during the spring of 2000, each lasting at least 2 hours and 8 interviews during the spring of 2001. In addition, during 1999 - 2001, both authors were engaged in more informal discussions with approximately 25 actors involved in the Medakis project.

We have had access to a number of electronic and paper based documents. We have gained access to two comprehensive archives belonging to two of the key actors among the policy and decision makers (Norwegian Research Council and KITH (Center for IT in Health Care), a publicly owned agency aimed at establishing IT related standards in Norwegian health care). In addition, we have had access to contracts, memos, specifications and documentation within the Medakis project. We also have access to the electronically based collection of drafts and reports within the CEN TC 251 activities within EPR.

## 3 Reforming health care through industrialization (1980s – 1992)

Norway in the early 1980s was experiencing a period of relative economic stagnation. As a result, the Norwegian Research Council[1] attempted to play a more proactive role in launching initiatives that were identified as having potential for commercial exploitation. IT in the health care sector was identified as one such area and thus a NOK 80 million research program was established. The health care sector was, from the point of view of policy makers in the research council, a largely backward sector where organizational reforms were rare or absent. In forming the large research and reform program "IT and health care", crude estimations of efficiency gains were presented to

> "save 10% nurses' time, 10% of the physicians' time and 20% of the secretaries' time...then the hospital will save about 4,2% of the total labor costs".

This was to take place by altogether eliminating the highly entrenched paper based work routines:

> "To make a media change from a paper-based patient record to an electronic-based patient record".

The ideas of reforming health delivery at the largest hospitals through the establishment of EPRs were first picked up by the National Institute of Public Health (NIPH),[2] an Oslo-based center, which at that time focused heavily on the use of IT in health care. In collaboration with Norsk Data, the flagship of the Norwegian IT industry (but nonetheless in a desperate search for supplements to their mainframe based portfolio), they initiated the NORA project aimed at designing EPRs. The research council was generous in sponsoring this work as NORA was perfectly in line with the ambitions of dramatically reforming, if not revolutionizing, health delivery. It aimed at replacing the paper-based patient record by making a complete electronic version; "a Rolls-Royce in the first round" as a lobbyist put it.

[1] Norwegian: NFR, initially NTNF

[2] Norwegian: Statens institutt for folkehelse

## 4 The battle of systems (1992 – 1996)

The research council was not satisfied with the progress on the NORA project. As a response to this, together with Norsk Data's mounting problems, a new company called InfoMedica was established aimed at delivering IT solutions to the health sector. As one of the seniors at the research council recalled:

> "According to my predecessor, it was them who had created InfoMedica, i.e. it was the program board's intervention that resulted in the establishment of InfoMedica."

The responsibility for the NORA project was now transferred to InfoMedica. From the start InfoMedica was generously supported, effectively consuming a significant part of the research council's new program on IT and health, about NOK 15 million a year during 1990 - 1992.

Unfortunately, the results continued to lag behind expectations. In 1992 the research council's money was spent and InfoMedica had no real interest in continuing the project. Thus the NORA project was up for grabs, and without much ado, Siemens acquired it for a symbolic price. The product was now renamed DocuLive EPR.

During this period, an alternative EPR project called Medina emerged. This project had started off more modestly and was rooted in some of the university hospitals. Previously, these hospitals had explored the usefulness of templates in the production of text. Medina was intended as a supplement to the already existing paper-based patient record. This was a pragmatic approach that would give them a solution in 1-2 year's time. The primary aim for the hospitals was to create a tool that could help them in their daily clinical work, that is, to improve the production of text and even to automatically generate discharge reports. As a result, the initial primary target group became the secretaries, who were explicitly identified as the "easiest" user group to deal with, compared to nurses and physicians. Another important feature was that as this project was anchored in the university hospitals this gave the hospitals ultimate control of design- and implementation strategy.

The Medina-project was formally established in 1992 including three of the five university hospitals in Norway together with KITH and GPI[3], the industrial partner. SND (a public agency aiming at supporting regional industrial initiatives) supported the project with NOK 1.7 million. Medina explicitly adopted a bottom-up, not a top-down, approach. It aimed at supplementing and augmenting the existing work routines rather than radically changing them. The Medina project regarded the electronic patient records as just one element in the total documentation constituted by the patient record both in terms of paper documentation and other information systems [10]. In addition, there was a very conscious aim to postpone major organizational changes as long as possible. For instance, Medina focused primarily on secretarial work and text processing (not images, ECG, and so forth). As captured by the later vendor's roadmap, this translated into:

> "aim[ing] especially at the secretaries' need for document-production support. (...) the system presupposes the establishment of an on-line communication for retrieval of information from the current PAS-system" (vendor's Roadmap, 1996)

The situation in the mid 90s was characterized by two alternatives: Siemens' DocuLive and GPI's Medina. They were significantly different along key dimensions such as: level of ambition (bold versus modest) and public funding (massive versus moderate). At this time it also seemed clear that two fronts had appeared in the Medina project. The two university hospitals in the north (RiTø and RiT) were strongly united while the third (Haukeland) now turned to the National hospital as an ally. The two fronts were characterized by different objectives and strategies.

As a means to break the tie the hospitals decided to extend the project to include all of the five university hospitals into one common project. The project name was changed from Medina to Medakis since the National hospital at that time was working on an activity management system (Akis). 'Medina' + 'Akis' were melt into 'Medakis'. A strong political pressure contributed also to the extension of the project. The situation in the mid 90s was influenced by the efforts of the Ministry of Health and Social affairs' minister (Gudmund Hernes) to streamline the health sector. One objective was to promote more collaboration within the health regional clusters (health regions) and thus regional committees within each region were

[3] Gallus Plessner Industries

established. A lot of public funding was allocated to these areas. Thus, in order to get funding, a joint EPR project was crucial, as pointed out by a manager of one of the former industrial partners:

> ”there was considerable political pressure towards the hospitals to enforce collaboration in order to get funding”

Accordingly there was a strong incentive to find a uniform solution as the Ministry took it for granted that uniformity was an important means to achieve more collaboration. However, the major challenge still remained – the choice of a vendor, Medina or DocuLive. This became a materialization of the strategy of the north-south block as a project member from the north block recalled:

> “Haukeland and the National hospital wanted to go straight ahead to Siemens and DocuLive, but the rest of us had various degrees of objections”

The reason was that these hospitals considered GPI both to be too small to manage the joint project as well as a vendor that lacked ambitions. With that, the hospitals agreed to invite a bid for tender. Before the bid for tender was closed, however, Siemens “strengthened their position” by buying Medina from GPI. In other words, Siemens acquired their only serious competitor. As a Siemens leader expressed it:

> “If the Medina project had slipped away to one of our competitors while we held on to DocuLive we would have got more fragments in the market – a market that already was too fragmented and too small for doing something.”

Obviously, this was a big risk, which Siemens recognized:

> “[In this phase], I believe that the hospitals felt that we overruled [them] (...) and that it was the ‘power’ and the ‘capital’ that was in control – because after all Medina was their project and their initiative”

As a carrot in this process, Siemens suggested a unified requirement specification. This point was crucial in order to get the contract. Nonetheless, it provided the hospitals a lot of freedom in shaping it, because, roughly speaking, they could dictate the unified specification

themselves. Another factor that enabled Siemens to persuade the hospitals was that Siemens presented a development plan – a merge-plan - that stated that the functionality of DocuLive 2.1 and Medina 4.0 should be merged into one product. The plan spelled out a step-wise integration of the two earlier, independent initiatives. In this way, Siemens managed to present themselves as enrolling everyone's interests. The contract between Siemens and the University hospitals was signed in May 1996. The Ministry of Health and Social affairs supported the project with NOK 20 million. Siemens was also able to get NOK 1.6 million from SND that had been set-aside for the second phase of Medina.

## 5 Going global (1996 – 2001)

Having gained control of the Medakis project, the next task for Siemens was to deliver what was promised in accordance with the uniform requirement specification. A key ingredient here was integration of DocuLive and Medina, both in terms of functionality as well as design approach, together with keeping the university hospitals satisfied. These challenges were significantly underestimated. A major point that hampered the deployment in the hospitals was that "considerable adjustments had to be done for each hospital, a process that took more time than estimated". This resulted in 1997 in a delivery "crammed with errors" which the hospitals were close to rejecting. Payment was at one stage held back. Siemens, for their part, felt that the hospitals did not adopt a sensible tactic because, as a manager in Siemens argued, "situations do not improve whenever payment is retained".

In this phase, according to Siemens it was the "responsibility of the vendor to define what the merge should contain – and then, in the final phase, the hospitals should be included in further development of the product" (developer 1). However, the implications of not including the hospital appeared to be an insufficient strategy as one of the developers recalled:

> "When we delivered something to SiA[4] we knew the outcome because we had continuously discussed with the users (...) But I would never have felt sure [of the outcome] if I was supposed to develop something without presenting it before delivery" (developer 2)

[4] The Central hospital of Akershus, a middle sized hospital in terms of size and functionality

The leadership in Siemens now argued that a merged version of the functionality in Medina and DocuLive 4.0 was beyond their scope

> ”DocuLive 4.0 [the merged software] had not the possibility to do what each of them did separately (...) If we should include everything in 4.0 we would be making a 4.0 as a 5.0 before we made 5.0. Then we would be doing the job twice. That means that a part of the functionality will not come before 5.0” (Siemens, project leader)

Obviously, the task appeared far more complex than anyone had predicted and Siemens had difficulties in delivering what the hospitals expected.

In an effort to get out of a cramped situation, Siemens has recently aimed more explicitly for a “global” product, which means an even greater level of ambition. The objective is now to make DocuLive a “global” product in the world market. Siemens has lately acquired a major US based company (Shared Medical Systems) within the health market and is currently one of the largest vendors within health care and IT. DocuLive EPR (or Common EPR as it was renamed) has been incorporated as their major application in this portfolio. A part of this global effort has also been to align Medakis with another large Siemens EPR project in Sweden (Melior).

The recent strategy of Siemens to use Medakis as an element in their international promotion of EPR has reinforced the pressure for Medakis to subsume other information systems and replace them by EPR controlled modules. A senior manager explained:

> “Instead of having many specialized systems you get a system that contains modules that can be added when needed. In that way you can let go of many specialized systems that have to be mutually integrated (...) [for instance] a PAS-module is planned in the next version of DocuLive EPR”

As a result of the global strategy the five Norwegian hospitals agreed to downplay and marginalize their own role vis-à-vis Siemens in the Medakis project, as was underscored by a hospital project member:

> “Our responsibility is reduced to following up milestones. The only thing we can do now is to wait for results”

Or, as a project leader from Ullevål hospital argued:

> "the hospitals have chosen to let go of control in order to get an international product".

According to senior Siemens executives, the loss in local control that the hospitals have experienced in the Medakis project is more than compensated by the increased resources and attention Siemens pays to Medakis to prepare it for global sale.

# 6 Analysis

## *6.1 Big versus small*

In the initial stages, NORA needed grand ambitions to mobilize support for their EPR-project. There were two obvious reasons for this. Firstly, the Research Council needed means that both could contribute to revitalize the broken Norwegian economy and reform health care. Secondly, as Norsk Data in the early 90s experienced financial difficulties they strongly needed new commercial markets. Consequently, both of them were looking for partners that could fulfil their ambitions. NORA was seemingly capable of filling such a role, and managed to enroll both the Research Council and Norsk Data by leveling up their own goals accordingly.

In the middle of the 90s, two competing projects existed, the grand DocuLive (the former NORA) and the moderate Medina. The contest ended as Siemens flexed economic muscles and basically outplayed its competitor. This acquisition could occur without much ado for two reasons. Firstly, the Ministry of Health and Social Affairs would fund the EPR project provided that the hospitals collaborated on a common EPR. Secondly, two of the hospitals considered the Medina project to be too small and with a vendor that lacked ambitions. The "smallness" in Medina was, for instance, expressed in an explicit focus on secretaries' work, based on the assumption that changes would be easiest there, and the comprehension that after a couple of years' use the EPR would be more attractive for the physicians as the information base would have increased. Another such expression was that Medina aimed for co-existence with the variety of PAS systems rather than aiming for their substitution.

An important strategy for Siemens, in order to match the widespread high ambitions, was to incorporate the existing variety of information systems into an all-encompassing EPR, as it was emphasized in the project documentation:

> "Create a common platform for a multitude of customized EPRs; Powerful enough to support all health-related information and legal aspects; General enough to serve as a basis for a wide variety of hospital information systems" (Siemens, 1997)

It is clear that such a strategy also would suit Siemens' own interests, as an international industrial player, of grabbing the lion's share of the Norwegian EPR-market.

However, the visions of an international product and an all-embracing hospital system are not the end point – the prospects of an Application Service Provider (ASP) model are transparent in the current plans as a hospital manager emphasized:

> "Now, we challenge Siemens to elevate DocuLive to a concern level. We believe in jointly running DocuLive for all our hospitals in the region. That implies that we wish to have the patient record for Odda, Stord and Voss in the same database as Haukeland (...) for us it is essential that the small hospitals shall have the same as the big – in that way we can over time include them in a complete concern".

### *6.2 Local involvement, global reach*

By buying Medina, Siemens had put themselves in an exposed position as regards future negotiations with the hospitals. After all, the local influence in Medina was rather high. Nevertheless, if Siemens could come to terms with the hospitals the position could prove to be beneficial. They managed - but as a part of the deal Siemens had to offer a unified requirement specification almost solely shaped by the hospitals. In other words, Siemens had to tolerate a high degree of local involvement. As a result, this merge-plan constituted a compromise, a boundary object ([9]) that allowed the Medina lobbyists to recognize "their" product as a part of the Medakis project.

The combination, however, of the project's high ambitions and high degree of user involvement proved to be catastrophic. The espoused vision of an equal merger between

DocuLive and Medina never materialized. When Siemens realized that the cost of such a merger were far beyond the estimated benefit, they marginalized the hospital influence by stating that the vendor should decide the integration strategy solely. The hospitals, for their part, accepted to loose almost all local involvement as Siemens promised to put more resources into the project and make an international product out of it.

Already a major player, Siemens has in the last years acquired a number of international companies active within IT and health care, especially in the US. This implies that from a relatively slow start, Siemens is currently strengthening its efforts dramatically within this area. It is, in effect, one of the most influential vendors globally. This change has, from the point of view of the Norwegian university hospitals, primarily been perceived as a higher threshold to implement changes, making local influence more illusory than ever.

## 7 Conclusion

The history of ERPs in Norway has been, and still is, characterized by competing agendas and a range of actors. It is anything but a tidy project with clear goals and well-defined phases. The conditions for small-scale, bottom-up and evolutionary approaches - signaled by the Medina initiative - never succeeded in constructing themselves as a viable alternative to the larger, more sweeping DocuLive initiative, reiterating a more general tendency to privilege the more comprehensive and daring projects.

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