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Information Systems and Healthcare XXXVIII: Virus Outbreak—Online GP Consultations Escalating Healthcare Costs

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Abstract:

This article presents a study on the impacts of the uptake of online doctor consultations in Denmark. Drawing on a typology of e-consultations and online patient fora, we provide and discuss a number of scenarios of the financial and managerial impacts of the uptake of e-consultations for the period 2009–2013. The study is based on quantitative data from the national statistics database for the period 2003–2008, and qualitative data from interviews with key actors in the Danish national healthcare system. Findings indicate that the digitalization of consultations and the lack of substitution between e-consultations and physical and phone doctor consultations leads to increases in total costs, not reductions. The results call for further research on the emerging adoption of user-centered platforms, such as Web 2.0 applications, in the healthcare area.

Keywords: nation, industry, economic, political, simulation, secondary source, interviews, policies

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I. INTRODUCTION

The digitalization of healthcare services faces major challenges with the development of exchange and integration of health data in terms of adoption in an extremely heterogeneous setting, with the switch to end user/patient-centered electronic patient record (EPR) systems. Further challenges are posed by the development of mobile applications [Burgess et al., 2008; Wickramasinghe and Goldberg, 2005] and with the adoption of interfacing with Web 2.0 applications.

There are, however, strong institutional powers in place [Sherer, 2010] with strong policy commitment to use IT to facilitate the increased provision of better healthcare. With high policy attention and a medico/IT-sector that continuously fosters a wide range of embedded applications, communication platforms, and stand-alone devices, there is a powerful climate for substantial investments. On the demand side, there are large groups that demand more diverse online consultations, greater temporal flexibility in services, and new types of interactions between patient-driven communities and health professionals [Moon and Fisher, 2006].

At the political level, priority is given to citizen-centric services. At the same time, reforms that are decided on and implemented from the political side have the opposite effect: decentralization and budget atomization of health professionals. This may lead to declining incentives for impact measurement. A number of reform initiatives lacking consistent goals make before- and after-measurements of impact difficult. Moreover, public financial control results in a lack of efficiency incentives, as the unused parts of a budget generate savings, but not benefits, for health professionals.

This article presents a study on the impact of the adoption of online general practitioner (GP) consultations in Denmark, analyzing the challenges faced by the health sector with the increased digitization of consultations. This study thus attempts to open a path for research on challenges of user-centered applications for interaction with public services, such as Web 2.0 platforms.

Impact measurement of e-healthcare is one of the most debated and controversial evaluation fields [Baker et al., 2008; Luijsterburg et al., 2008; Myung Ko and Osei, 2004; Andersen and Medaglia, 2009]. The more specific focus on online consultations is, therefore, also challenged by broader issues, such as the clinicians' and health professionals' emphasis on health professional assessment, and long-term interest versus administrative and management considerations regarding payment and priority [Nøhr, 1994; Nøhr et al., 2007; Lehoux, 2006, 2008].

The challenges associated with the conversion to end-user and patient-centered Electronic Patient Record (EPR) systems and the use of interfaces for Web 2.0 applications are equally great. There will be a growth in the demand for different types of online doctor consultations, for greater time flexibility in health services, and for new types of interactions between patient-driven fora and health professionals. Impact measurement of online consultations is particularly challenging in relation to the definition of consultation. According to a narrow definition, online consultations are limited to consultations between the patient and the practitioner through the use of, for example, e-mail. A broader definition includes the use of digital media, including Web 2.0 applications, in the consultation processes. In such a definition, the practitioner may be an important player, but patient networks and patient use of online data are also included.

Although we acknowledge the growing body of e-health literature [Berg, 2001; Lehoux, 2006, 2008], we view our research on online health fora as more related to information systems for the following reasons. The evaluation tradition of healthcare information systems is often artifact-centric [Anderson et al., 1994; Friedman and Wyatt, 2000; Hertzum and Simonsen, 2008] or focused on the evolution of computer use in GP physical consultations and patient record management [Agarwal et al., 2007; Angst and Agarwal, 2006; Bhattacherjee et al., 2008; Rosenstand and Waldorff, 2008; Vikkelsø, 2005], lacking a link to organizational and policy challenges prompted by the increased use of information systems. In the information systems community area, there is a long tradition of studies challenging the often unified utopian view held by consultants and producers of software/hardware: that heavy investments in IT will lead to cost savings and organizational transformations. Information systems research often takes the opposite position: that increases in IT investment will be accompanied by a productivity paradox [Brynjolfsson, 1993], and that we need to pay attention to how institutional and organizational factors shape the idea and orchestrate the implementation. Hence, we need to address the ways that the organization and the various players adopt new technologies, and on how that impacts the likelihood of getting a return on the investment.

We are contributing to this body of knowledge by studying the adoption of IT in a quasi-government sector, in which the objectives clearly are to save costs; however, the organizational incentives, along with what can be viewed as an infinite demand of services, work against productivity to harvesting the benefits of opening up a new channel of interaction.

Administrative-centric research has dominated the e-government field for almost three decades, with a focus on institutional issues [Fountain, 2001], power redistribution between local and central levels of government [Kraemer and King, 2003; Kim and Bretschneider, 2004], and between politicians and bureaucrats [Dutton and Kraemer, 1985]. Moreover, the technology focus for studies on e-government has been on back-office application and front-end Web 1.0 services [Layne and Lee, 2001; Siau and Long, 2005]. The evolvement of the variety of online health fora, some of which use Web 2.0 applications and are created through public-private partnership, calls for research in understanding the information infrastructure in which governments are navigating. In this sense, the proposition of our research is that the online health fora can be seen as a potential indicator of a paradigm shift in e-government research focusing on multichannel interaction. In this new paradigm, it is not a given that government *ex ante* decides the communication platform. This could have immense implications on, among other things, standardization processes, software capabilities, and employee readiness to adopt a myriad of communication tools.

Exploring this possible shift, this article presents four ideal types of digital health fora and consultations:

I. E-consultations, where neither the content nor the nature of the consultation are changed, but the booking, change, re-booking of appointments, or answering of very specific questions occur online

II. Patient fora, where it is patients who set the agenda, but with the possibility of involving health professionals

III. Health professional fora, where it is health professionals that provide content and the agenda, and it is public authorities that pay for the operation of the online community

IV. Patient focused fora, where health professionals take part in the establishment and running of the community on an equal basis with the patients

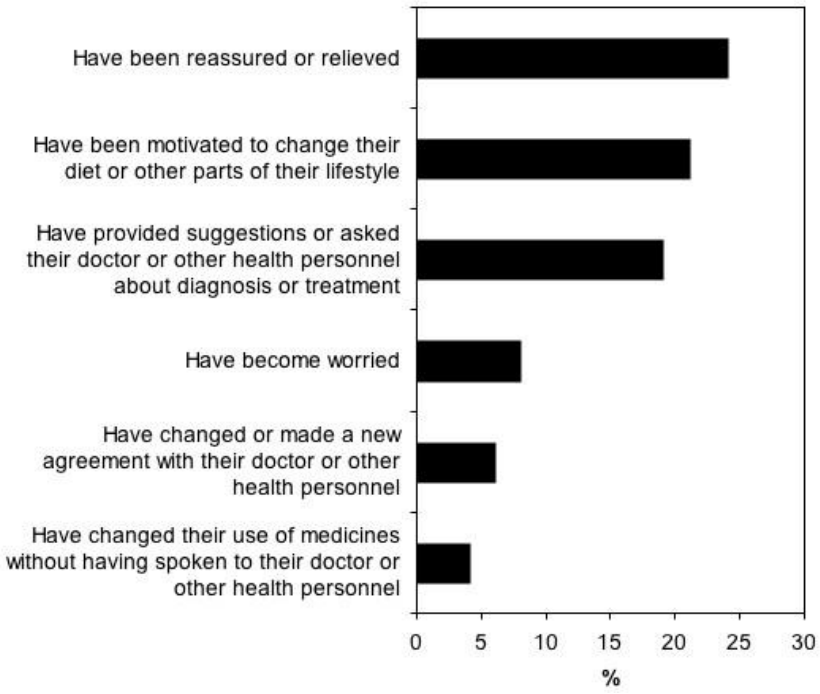
The article includes five sections. After the introduction, we highlight a typology of emerging digital channels of interaction between doctors and patients and among patients in online fora, and sketch the challenges in impact measuring. Section III presents the case of e-consultation implementation in Denmark and provides an outline of the evolution of online consultations in general practice in the period 2003–2008. Denmark represents an ideal case for investigating the management impact of IT in the healthcare sector, being a country with both a very high level of public expenditure in the healthcare area, and a ranking among the top countries in the world in IT readiness and diffusion. In Section IV we discuss five scenarios of the impact of the uptake of e-consultations for the period 2009–2013, based on projected data from the period 2003–2008. We also discuss limitations of the study, and possible alternative scenarios for the development of e-consultations. The concluding section summarizes the findings from the study, and outlines possible directions for further research in information systems, e-health, and e-government.

This study has been conducted as part of a national health IT network involving industry, healthcare providers, and researchers. Within this network one of the subthemes has been the management and impacts of health IT. As part of the four years the network has been funded, we have held a range of conferences and workshops with participants from the Danish General Practitioners' Organization, the Danish Regions Association, Medcom (a network funded by the Danish Ministry of Interior and Health, the Board of Health, the Danish Regions, the National Association of Local Authorities, the Ministry of Social Affairs, the Danish Pharmaceutical Association), CSC Scandihealth (the leading provider of healthcare IT products and services in Scandinavia), and Rigshospitalet (a hospital organized under the Capital Region of Denmark, with around 8,000 staff members). The typology of the health fora presented in Section II was developed after a series of workshops on impact analysis and experiences using online health communities. The format of the workshops has been a mixture of roundtable discussions, mind mapping exercises, and presentations/discussions in lecture halls. We have collected and analyzed media coverage and interviews with general practitioners using media databases (GPs) and gathered and analyzed quantitative data on GP consultations and expenditures from the national health insurance database. Since GPs (and not the patients) in Denmark get reimbursed from the government for the costs associated with online, physical, and telephone consultations, there is a high incentive to report all activities that can be reimbursed. There is, therefore, a high degree of data validity in the data used for the scenarios presented in this article.

II. TYPOLOGY AND EXPERIENCE FROM ONLINE HEALTH FORA

The use of e-mail consultations supplementing or replacing traditional consultations should be read in conjunction with the rest of the emergence of digital health fora. In relation to the primary objectives of this study—to identify impacts and management challenges—there are the privately funded fora outside the health management framework, which affect public health services. The development of massive and commercially-driven platforms can develop into either further pressure or a legitimacy failure for the Danish healthcare system. The digital health fora open up people's eyes to new therapies, whereas resources and budgetary prioritization are closely coupled with the traditional Danish healthcare system.

A major EU funded study has investigated the use of the Internet for health purposes by Danes [Voss and Ravn, 2007]. The study included 1,000 randomly selected Danes aged fifteen to eighty. It was found that a total of 60 percent of Danes use the Internet when seeking health information. As Figure 1 indicates, 25 percent of Danes experienced being positively reassured after reading about diseases on the Internet. This is in contrast to 8 percent who became worried, and 3 percent who, after having been on the Internet, changed their medication intake without first consulting a doctor, and 8 percent who visited their doctor via the Internet [our translation, Voss and Ravn, 2007].



Source: Voss and Ravn [2007]

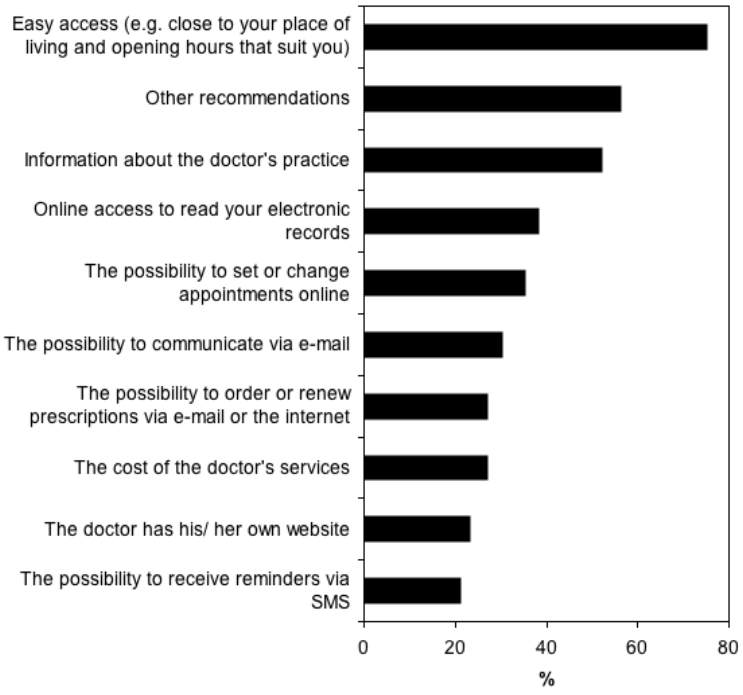
Figure 1. Effects of the Use of Health-Related Homepages Percentage of Respondents (n = 1000)

One possible interpretation of the study is that the Danes do not use the Internet to replace visits to their local doctor, but that they use the Internet as a complementary service and for a more challenging and improved dialogue with their doctor. A series of articles have confirmed these results in the Danish magazine *Ugeskrift for Læger (Doctors' Weekly);* for example, General Practitioner Henrik Dibbern, from the Danish city of Otterup in Funen, purports: "The net increases the amount of things the patients want me to look at. Patients are rarely guided by a concern to go online. It is rather the case that they have one concern as they go online, which becomes two as they shut down the computer" [B.T., November 14, 2008].

Figure 2 reports on the importance that patients attribute to different features of a doctor's service.

It is striking to see how much relevance is given by prospective patients to the availability of digital channels of communication with their doctors, even against economical consideration. The presence of most of the features provided by digital channels—such as online access to electronic records, online appointment booking system, e-mail communication—is considered by patients to be more important than the cost of the doctor's service itself.

The establishment of patient networks by the Danish Regions is an attempt to tackle these developments, and to have a Danish presence at the new online health fora. In 2007, the Danish Regions established the first six patient networks under the Danish health portal: Sundhed.dk. One of the initiators of this was former patient, Katrine Kirk, who, through the course of her own disease (cancer), participated in an international e-mail group for cancer patients. Through the launching of the platform, the government's quality reform committee and the Danish Regions both created opportunities for increased dialogue between themselves and the patients, and connected health professionals to each of the six networks.



Source: Voss and Ravn [2007]

Figure 2. Change of Doctor and Use of Online Communication "If You Change Your Doctor, How Important for Your Choice are the Following?" Percentage of Respondents (n = 1,000) Who Responded "Very Important" or "Important" on a Scale with Five Response Options

In Table 1 we propose a classification of different types of digitally-enabled channels of interaction between doctors and patients, with respect to types of citizen involvement, and finance and governance models.

Table 1: Online Health Fora: Financial Model and Citizen Involvement

		Citizen involvement	
		Individual	**Social network**
Finance and governance model	Tax payer-financed e-fora	Online one-on-one consultations between patient and general practitioner (type I) (e.g., e-consultations)	Health fora with involvement of citizens/ patients and assigned health professionals to perform quality assurance of the content (type III) (e.g., Sundhed.dk patient fora)
	Commercially financed e-fora	Patient-led health fora with no or ad hoc involvement of health professional (type II) (e.g., Web 2.0, Facebook groups)	Health fora with permanent involvement of health professionals to consult and perform quality assurance of the content (type IV) (e.g., Netdoktor.dk)

Each of the four categories of online health fora features different characteristics concerning financial impacts, management challenges, types of measurements required, and impacts on citizens. As an example, the Danish health portal, Sundhed.dk, is a technical platform aligning communication within the healthcare system such as:

- Appointments with doctors
- Patient fora

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- Practice declaration
- Public health insurance
- Medication profile
- Dialogue with patients
- Practical information
- Laboratory test results
- Medicines directory
- General information

The portal aims at ensuring consistent patient treatment and improving patients' ability to take care of their health. As of January 2008, the portal had just under 300,000 users, many of whom had visited the portal several times. However, the impact of Sundhed.dk on citizens should not be measured only by the number of visitors to the portal, but also by the extent to which patients are more informed, know where to go for the health services, and by the amount of time freed for those working daily in the health sector. The other types of health fora included in Table 1 are all driven by new technologies and other financing mechanisms.

However, a platform such as Sundhed.dk increasingly faces the competition of the privately funded and operated fora, and of patient-driven fora that often use Web 2.0 applications, such as Facebook. These health fora do not aim at minimizing online traffic and interaction, but at maximizing them. The underlying business logic of Web 2.0 applications and that of the majority of private health fora is to reach a high volume of traffic and a high turnover ratio. This stands in direct contrast to the Danish health sector on the Web, which similarly deals with the improvement of health, but in a cost-minimization approach. One can well imagine that the massive use of Web 2.0 and of public health fora could ultimately help reduce the information needs of the public sector; however, existing data suggest the opposite.

III. UPTAKE OF E-CONSULTATIONS (2003–2008)

Starting April 1, 2003, Danish GPs have been reimbursed by government for each consultation conducted via e-mail. At the national level, approximately 4,000 private GPs gain most of their income by cost reimbursement from central government. In the past, the strategy has been to have as much as possible of the patient contact to take place with GPs at the local health centers in order to avoid costly treatments at the hospital. In line with this, more diagnoses and follow-up treatments after hospitalization are carried out by GPs. As a result, there has been a shortage of supply of GPs and a constant problem of finding qualified GPs. E-consultations are thus now seen as a cost saver, but also as a way of re-allocating some of the work from morning telephone consultations to e-mail consultations. Moreover, e-consultations are seen as a more time-independent service in comparison to physical and telephone consultations, given their asynchronous nature.

To stimulate its uptake, the cost reimbursement from the government to GPs for e-consultations (DKK 49.68) is about double that of telephone consultations (DKK 24.84), whereas the cost reimbursement for physical consultations (DKK 126.86) is about four times that of telephone consultations. Since January 1, 2009, it was made mandatory for all GPs in Denmark to offer e-consultations.

In Figure 3 we provide a visualization of the mechanism of reimbursement for the different types of GP consultations in Denmark, according to Danish national regulation. The GPs send electronic invoices to central government in Denmark for the three types of consultations analyzed in this article. Thus, the GPs are operating as private companies, having the costs for the consultations reimbursed directly by government. Citizens do not need to have a private health insurance coverage plan to use the three types of consultations, nor do they need to pay the GPs directly.

In order to access e-consultations, citizens can use Sundhed.dk (a government run platform) or Min-laege.dk (a private intermediary). By using the entry point of Sundhed.dk, patients can book an appointment for physical consultations, renew their prescriptions online, or have an e-consultation. While this article focuses solely on e-consultations, it is important to stress that there is a substantial use of the other two e-features.

Table 2 shows the figures of consultations in general practice in Denmark for the period 2003–2008. The table includes daytime consultations, daytime telephone consultations, and e-mail consultations. It does not include evening and night consultations or home visits. The total number of consultations is, therefore, larger and more costly than what the data portray.

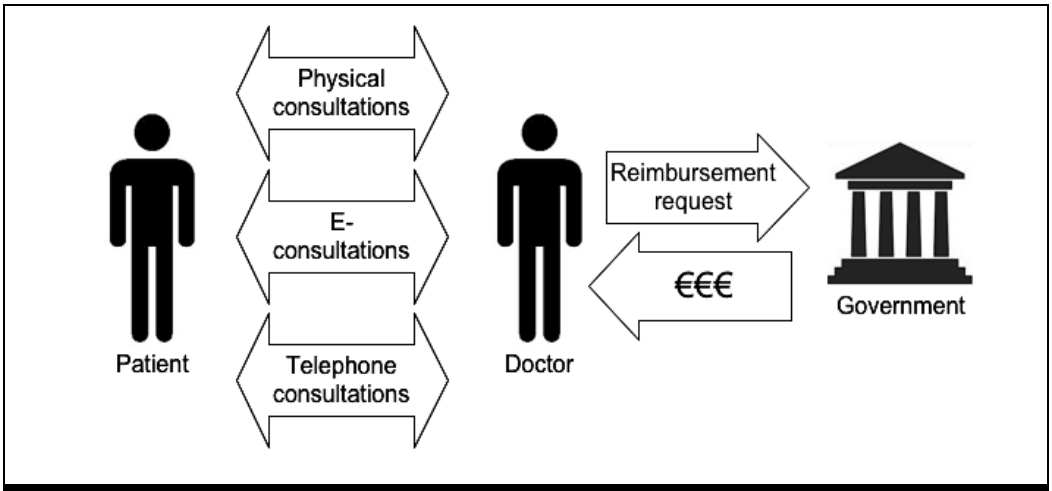

Figure 3. The General Practitioner Consultation Mechanism in Denmark

Table 2: Physical Consultations, Telephone Consultations, and E-mail Consultations by General Practitioners, 2003–2008, N

	2003	2004	2005	2006	2007	2008
Daily consultations	17,150,715	17,709,558	18,151,210	18,580,394	18,616,650	19,151,421
Telephone consultations	13,846,538	14,224,338	14,591,803	15,066,019	14,778,738	14,840,136
E-mail consultations	10,971	61,716	192,614	470,845	802,581	1,284,336

Source: Danish Public Health Insurance Statistics, Statistics Denmark

While in 2003 there were approximately 17 million physical consultations and 14 million telephone consultations, these figures rose by about 11 percent for the whole period to 2008. This growth was only marginal, however, when compared to the growth of e-mail consultations in the same period. While in 2003 these were around 11,000, they reached 1.2 million, in 2008. With the government decision as of January 1, 2009, that all GPs must offer e-mail consultations, there are good reasons to believe that the figures will greatly increase in the coming years.

E-consultations can be used to give a concrete answer when there is no need for discussion, but they can also be used to enable patients to provide their medical history (their sleeping problems, for example). An e-mail is automatically stored in the patient's electronic record so that the patient does not need to repeat the description the next time he has a consultation.

On an annual basis, the National Board of Health refunds the expenses of about 1.2 million e-consultations, but it is not known whether this has a reducing impact on telephone consultations, nor is it known how many people still engage in personal consultations. Some doctors are highly skeptical toward e-consultations. They want the patient on the telephone so that they can hear whether he/she is in an acute or not acute condition; they feel that such information gets lost through e-mail.

In 2007, the cost of consultations amounted to almost 350 million euro,[1] whereas online consultations amounted to approximately 5 million €. Table 3 provides an overview of the number and cost of consultations in the year 2008. It should be emphasized that the total number of consultations is considerably greater since, for example, home visits and ancillary services outside the public consultation were not included.

IV. IMPACTS OF THE UPTAKE OF E-CONSULTATIONS (2003–2013)

Various interviews in the mass media during the period 2003–2009 have addressed whether or not the number of online consultations will increase due to time savings, a simpler service, reduced transport demand, and increased availability. According to General Practitioner, Yves Sales (member of the main board of Medical Association), the uptake of e-mail contributes to time savings. “It's really good that more patients choose to use e-mail because it

[1] All expenditure figures are converted from Danish Crowns (DKK) to Euro, using the conversion rate as of 23 March 2010.

Table 3: Consultations by General Practitioners Proximity, Number of Consultations, and Costs of Consultations, 2008			
Proximity		**Consultations (N)**	**Cost of consultations (million €)**
Physical	Daytime	19,151,421	315.30
	Nighttime	938,069	24.65
Telephone	Daytime	14,840,136	49.96
	Nighttime	1,645,846	21.51
E-consultations		1,284,336	8.65
TOTAL		37,859,808	420.07
Source: Danish Public Health Insurance Statistics, Statistics Denmark			

saves time that the secretary may use for other purposes. And it is a good service to patients who only have to know the results of a test or to renew a prescription. They avoid the hassle of calling" [B.T., May 16, 2006]. The chairman of the Danish patient organization, Karsten Skawbo-Jensen, expressed similar enthusiastic expectations: "It's very nice that patients now have the opportunity to communicate with their doctor online. Not least because previous studies have shown that 27 percent of those calling the doctor give up because they cannot get through to him/her on the telephone. However, obviously e-mail consultation can never replace the thorough examination or interview with the doctor face to face" [B.T., May 16, 2006].

Table 4: E-consultations: Enquiries, Patient Profile, and Time Consumption				
	Practitioner			
	1	2	3	Total
Enquiries				
Number of enquiries	235	1,109	235	1,579
Number of patients	80	360	75	515
Number of enquiries per patient	2.9	3.1	3.1	3.1
Number of enquiries per 1.000 patients	120	230	134	191
Patient profile				
Average age (year)	47.1	48.3	41.9	47.2
Lowest age (year)	9	5	1	1
Highest age (year)	76	88	70	88
Men/women ratio	1.2	0.8	0.9	0.9
Time consumption				
Average time consumption on answers (minutes)[1]	2.50	3.20	0.53	2.54
Note.[1] In the calculation of the average time consumption, direct time spent on e-mail consultation and time spent on ordering of medicines are included. The time spent on log-in and log-out are not recorded.				
Source: Kjær et al. [2005]				

If we assume that online consultations can result in a saving of two minutes per physical consultation, due to better knowledge of the patient's situation, a total of around 30 million minutes could be saved. Such savings are interesting not only as a reduction in health costs, but also for tackling the issue of doctor shortage.

An article published in the Danish magazine *Ugeskrift for Læger (Doctors' Weekly)* by Kjær et al. [2005], reports on time consumption and a number of qualitative effects of e-consultations that were investigated (see Table 4). The researchers involved in the study logged the e-mail communications of three GPs. The three GPs performed 1,579 e-mail consultations over a period of twelve months, corresponding to 191 consultations per 1,000 of the total number of patients. One of the main conclusions was that e-mail consultation "works best if the doctor and the patient know each other." In addition, the study identified a significant variation in average time consumption for answers to e-mail consultations and online orderings of medicine, ranging from 0.53 to 3.2 minutes.

As this data is from the early days of online consultations, we acknowledge that current use of templates can now lead to even more significant time savings. Given such an assumption, there will thus be a continuous growth of the use of e-mail consultations with GPs, and in other parts of the health system. However, scenarios for the future

development of consultations and for the budgetary implications of such projections are associated with high uncertainty.

Taking this uncertainty into consideration, we have calculated the figures for the three types of consultations based on different assumptions on the growth rate for the period 2009–2013. This has enabled us to draw different forecast scenarios concerning both the number of consultations and overall costs.

In Figure 4 we present two forecasts on the growth of the number of consultations in the period 2009–2013 based on data from 2003–2008. The first forecast is based on a scenario of static growth, in which the number of consultations grows every year at the same rate as recorded in 2008. The second forecast is based on a scenario that we label "radical substitution," in which telephone and e-mail consultations grow steadily at the same rate of 2008, while physical consultations decrease by the number of new e-mail consultations every year—that is, all e-mail consultations replace the physical consultations.

As the figure shows, in the period 2009–2013 very little growth of the number of physical and telephone consultations are expected, potentially reaching around 22 million and slightly more than 15 million units by 2013. On the other hand, e-mail consultations, assuming that the average growth rate since 2008 will be maintained, could reach almost 13.5 million units by 2013.

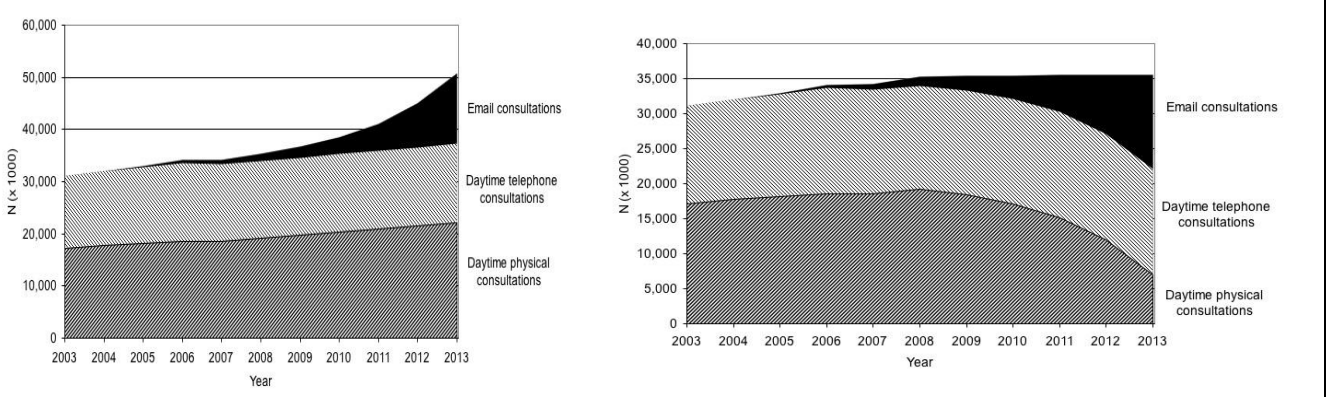

Figure 4. Growth in Number of Consultations, 2003–2013: (a) Static Growth and (b) Radical Substitution Forecasts

The "radical substitution" scenario can be argued to be one among those that policy makers in Denmark have ideally aimed for in enabling digital channels for GP consultations. From a citizen/user perspective, in fact, e-consultations can be seen as a time-efficient and practical way to engage in dialogue with GPs (e.g., receiving feedback on health test results, renewal of prescriptions, etc.) when physical presence is not required. From a government point of view, the digital channel option can be immediately translated into cost savings, given that e-consultations are around 2.5 times less expensive to reimburse, and less time-consuming.

Figure 5 depicts the impact of the growth forecasted in the radical substitution scenario on costs to be borne by the national health system in Denmark. Based on the cost per unit of each consultation as of January 1, 2009, and on figures from the Danish Statistical database of total expenditure for each type of consultation for the years 2006–2008, we have calculated the expected cost for each type of consultation for the period 2003–2013. We assume the cost per unit will remain the same for the period 2009–2013. The figures for the cost per unit of consultations in the period 2006–2008 were obtained by dividing official data on total expenditure for each type of consultation by the number of consultations. The expenditure for the period 2003–2005, for which no data was found, was obtained assuming a growth rate based on a four-year moving average of the series of cost per unit 2006–2009.

The figure shows how substantial cost savings can be achieved if all the increase in the uptake of digital channels of consultation takes place in complete substitution of physical consultations. While expenditure for e-consultations would reach around 90 million € in five years, increasing approximately ten-fold, by 2013 the overall cost of consultations to be borne by the national health system would decrease by 28.5 percent, compared to that in 2008.

The scenario of radical substitution between digital and physical consultations can be encompassed within the policy objectives of the introduction of e-consultations, and therefore can be considered as a benchmark for assessing

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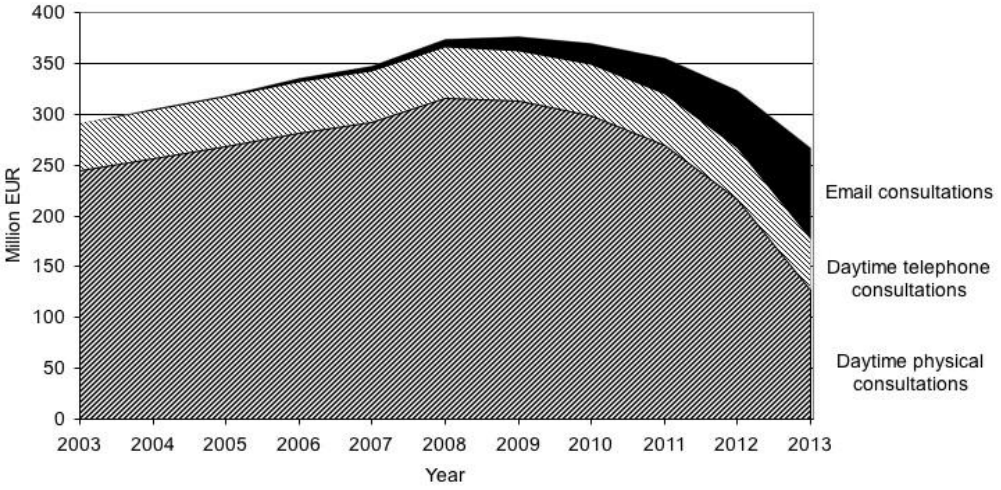

Figure 5. Expenditures for Consultations Provided by General Practitioners Based on Radical Substitution Forecast, 2003–2013

alternative scenarios. However, it is to be acknowledged that such a scenario is not only one among many possible scenarios, but also that it is hardly based on existing trends.

In Figure 6 we propose an overview of the overall costs of GP consultations (including physical, telephone, and e-mail consultations) in five different scenarios of growth prediction for the period 2009–2013. In this figure we expand the comparison between the two scenarios of static growth (constant growth rate of the number of all consultations as of 2008) and radical substitution (steady growth of the number of e-mail consultations, substituting physical consultations), as well as calculating the overall costs of three other possible scenarios based on existing trends in 2003–2009. These three scenarios are: growth rates calculated using a moving average based on the previous five years' data; "smooth substitution" between physical and e-mail consultations (e-mail consultations growing at the steady rate of 2008, and physical consultation growth rate gradually diminishing to zero in 2013); and "full substitution" between physical and e-mail consultations (e-mail consultations growing at the steady rate of 2008, and number of physical consultations not growing after 2008).

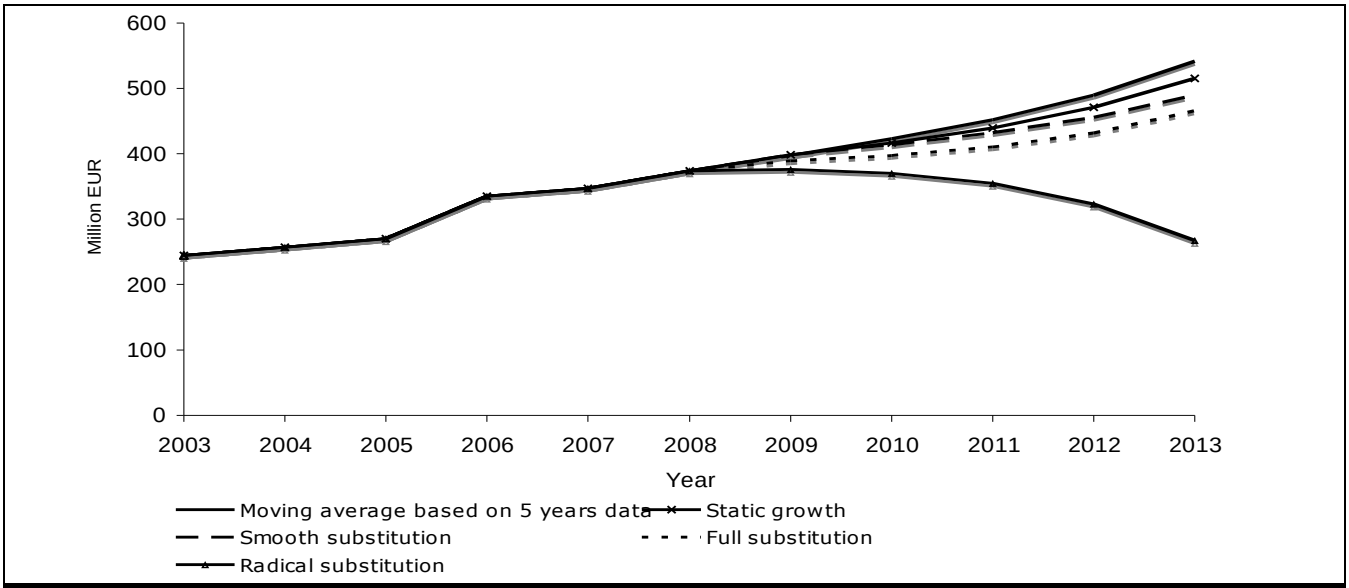

Figure 6. Total Expenditures for Consultations Provided by General Practitioners: Five Forecast Scenarios, 2003–2013

The outcome of this comparison is striking. If we compare the overall consultation costs in the "radical substitution" hypothesis with forecasts based on a traditional moving average method, we can observe a substantial difference in outcomes. Based on the moving average forecast, by 2013 the annual total costs of consultations to be borne by the national health system would be more than 540 million euro—that is an increase of almost 45 percent in five years, and more that 50 percent higher than in the ideal "radical substitution" scenario.

We acknowledge that the moving average method could provide a biased forecast in this case, since the number of e-mail consultations was very low in the first two years of the series analyzed. However, a comparable cost boom (+37.8 percent) is observable in the steady growth scenario as well, in which growth rates remain the same as in 2008.

Even the forecasts that include different degrees of substitution occurring between e-mail and physical consultations provide gloomy scenarios for a cost management perspective. If the substitution between digital and physical channels of GP consultation is to occur in a "smooth" way (the growth rate of physical consultations gradually decreasing and reaching zero in 2013, with e-consultations growing at a steady rate), overall costs for the national health systems would nevertheless be expected to reach around 490 million €, that is +30 percent in comparison to that in 2008. Only a slightly lower increase in overall costs would be reached by 2013 in the scenario in which physical consultations are assumed to stop growing completely after 2008, while e-mail consultation usage would grow at a steady rate. In this "full substitution" scenario, overall consultation costs would increase by about 25 percent by 2013.

Clearly, the forecast of costs is uncertain, since we have no knowledge, for example, of how the impacts would be spread to the GPs and whether politicians would have the cost rates renegotiated. Although patient-centric health services is the political top priority, reforms in the public sector, and perhaps particularly in the health sector, result in decentralization and budgetary atomization of the health professionals, which can lead to fewer incentives for the reporting of effects. In addition to the atomization, a series of parallel reform initiatives that constantly reshape the health sector make it difficult to make before- and after- measurements in units/structures that can be compared.

In addition to the above-mentioned challenge, the budget of the digital healthcare has been decoupled from direct demand-supply matching. As a result, digitalization in case of cost reductions leads to budget cuts, rather than to increased number of customers, increased revenues or increased marginal earnings per customer. Also, we do not know whether the increased uptake would lead to an increase in general public well-being and, over time, reduce the number of visits to GPs. Related to this challenge is the fact that there is a significant extent of time before the end effects can be measured [Kaushal et al., 2006]. Lastly, results from long impact measurements after implementation may not necessarily help to solve the management problem that they were intended to resolve.

We acknowledge that different scenarios could emerge and that these might not correspond with our forecast based on current trends. Such scenarios could have very different degrees of likelihood, depending on different assumptions regarding the user uptake of channels of doctor consultation over time, and on the degree of substitution that might occur between the channels. One scenario could be that patients in the future will decrease and/or stop the use of e-consultations, as a result of user dissatisfaction with the digital service in the long run. Alternatively, the number of telephone consultations could decrease, either as a result of user dissatisfaction in comparison to physical and e-consultations or as the result of a top-down decision by politicians to terminate the availability of telephone consultations in order to encourage the uptake of digital channels.

V. CONCLUSION AND FURTHER RESEARCH

The rapid uptake of e-consultations has not had a reducing impact on telephone consultations, nor on the number of people that still end up with personal consultations. We do not know much about whether this has improved the healthcare system. The only certainty is that the Danes are using more time to seek information and advice, and to engage in online communities on the Web. Danes are among the most frequent users of Facebook, and certainly rank among the highest in the use of the Internet for health purposes, despite a large public health coverage system. Almost a third of the Danes write messages via Facebook or chat online, and about 20 percent of them read or subscribe to blogs on the web [Danmarks Statistik, 2008]. It is, therefore, not a viable option to ignore this phenomenon and to reduce it to a youth trend or a ripple in the water surface.

While other studies have identified the need for coaching citizens, the main conclusion from this study is that digital tools complement and do not substitute traditional channels of interaction. This calls for further analysis of the user expectations from the new digital media and for new frameworks that take into account these motivators as independent variables. Moreover, there is a need to establish more explicit strategies for how far public healthcare must expand in order to meet a seemingly insatiable need and for an adjustment of people's expectations about what healthcare can offer to the general public.

New media, and especially the Internet, have opened the possibility for citizens to seek information about new treatments and techniques that can improve their health condition. Expectations from the public health system are, therefore, not likely to decrease in the coming years. Internet and Web 2.0 technologies will put further pressure concerning service levels and processing times. The formation of expectations of citizens is linked to absolute ideas

of treatment, while health services need to take money into consideration. Therefore, in the coming years we are likely to see increasing pressure on the healthcare system and its legitimacy will be questioned if this issue is not actively addressed.

On the other hand, there is a risk that the new digital opportunities will result in a growth of health spending, with people becoming aware of diseases through online fora, and subsequently increasing the demand pressure. Health professionals are not only facing monetary considerations, but also uncertainty regarding manpower and the ability to meet new and greater demand for increased quality of healthcare. With the current pressure on health services and the shortage of health professionals, there is a need to proactively highlight the effects of online health consultations and provide input to a use of it that does not cause an increased overall growth in health costs.

Apart from managerial considerations, the increasing growth in investments on online consultations raises a number of ethical issues. First, the issues of security and privacy which emerge in any digital environment are particularly relevant in the types of interactions that take place during medical consultations, where sensitive data is treated and transmitted, and the degree of disclosure of information is extremely important for individuals [Angst and Agarwal, 2006, 2009]. Private health data, for example, can more easily leak out from private to public as the online consultation system and the public patient fora become more and more integrated. In addition, users that access online consultations from the same household computer could potentially see an increase of others accessing their own health record. On the practitioners' side, the less personal nature of online contact could encourage the provision of fewer attentive treatments to patients by making it easier to give standardized, "copy-and-paste" feedback to patients with similar, but not identical, characteristics. This is especially relevant given the nature of the existing funding system which rewards practitioners according to the number of consultations carried out, without being able to carefully monitor the actual content of the consultations at the same time.

This study has dealt mainly with quantitative data, but other emerging areas of research are concerned with whether the new health fora will challenge the Danish healthcare system into rethinking quality objectives and whether the use of social media—Facebook, YouTube, wikis, etc.—will lead to patient-driven assessments and comparisons of services. What governance mechanisms can be designed in order to renew the quality of the use of online media, and what mechanisms of financial management do we have to put in place so that the health expenditure is not further increased due to the new online opportunities? This study has raised relevant research issues not only for the information systems field, but also for other fields, such as public administration and e-health.

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