Rapport
2010:08

eHealth and Patient-Centered Care Processes in Japan: Pre-Study

Public opinion among Japanese on their health care system is overall positive but with a clear worry over the future. Japanese Telemedicine and Robotics stand out as application areas – but it is in Medical Informatics the most interesting changes as well as greatest impact on the health care system takes place.

tillväxtanalys

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Foreword

This pre-study was initiated by Monica Winge, VINNOVA and the Tokyo and Washington Offices of the Swedish Agency for Growth Policy Analysis (Growth Analysis).

There is great confidence that the Internet and new e-services will be able to contribute to improvements in health care and enable the formation of innovative new care concepts (Andreasson & Winge 2010). This is despite the fact that IT-companies have so far not succeeded in delivering the effective, flexible IT services currently required by health care. Future needs and requirements will only increase. Swedish health care has an internationally high profile and this also applies to our capacity to use IT in surgical procedures and making them more efficient. A combination of health care and IT has long been considered an opportunity for Swedish companies and organizations to progress on the international market.

For this to become reality, further understanding of historic and recent advances in eHealth in an international perspective is beneficiary. Furthermore, health care systems differ substantially even between similar developed countries. The advances in eHealth need to be put in context of local conditions to make judgments on successful factors and generalizations.

This pre-study gives insights from one specific market – the Japanese health care system. The aim of this pre-study is to describe initiatives for eHealth, specifically those initiatives aiming at patient-centered processes, and map some of the most important actors in Japan. Similar reports are in the pipeline for the USA. Of special importance is to identify which initiatives, topics, and actors that should be studied further in a more comprehensive study.

Two master thesis students hosted by the Growth Analysis Tokyo office, have been of great help when finishing this report: Ted Saarikko, University of Gothenburg, Department of Applied Information Technology, and Anders Olofsson, Department of Information Technology, Uppsala University.

The report has been prepared by Dr. Niklas Z. Kviselius and Naito Shigeyuki at the Growth Analysis Tokyo office.

Östersund, June 2010

Dan Hjalmarsson

Director-General

Sammanfattning

eHälsa och patientcentrerade processer i Japan: en förstudie

Japansk sjukvård är av hög standard med vissa tydliga kännetecken: höga egenavgifter, extremt många sjukhus, universell tillgång till vård och service utan grindvaktsmekanismer (nödvändighet att patient går via primärvård). Och framför allt - Japan spenderar på grund av ett antal sociala faktorer ovanligt lite på sjukvården.

Detaljstyrning av avgifter är en central mekanism i det japanska sjukvårdssystemet vilket hjälpt till att hålla kostnader inom sjukvården nere. Detaljstyrningen har dock en baksida och det är att den kan leda till minskad innovationskraft. Det japanska hälso- och sjukvårdssystemet står framöver inför kapacitetsproblem på grund av en krympande och åldrande befolkning. Den allmänna opinionen bland japaner vad gäller deras hälso- och sjukvårdssystemet är överlag positiv men med en tydlig oro för framtiden.

Japansk telemedicin och robotik sticker ut som applikationsområden inom eHälsa, men det är inom medicinsk informatik de mest intressanta förändringarna liksom största påverkan på vården äger rum. Medicinsk informatik i Japan har långsamt rört sig från ren bokföring till mer patientcentrerade applikationer. Elektroniska patientjournaler och datoriserade orderhanteringssystem står nu i centrum för japanska investeringar inom eHälsa.

Trots höga ambitioner är datoriseringen av vården i Japan försenad och Japan släpar efter många utvecklade länder. Anledningen är framför allt höga initiala kostnader. Där adoption av elektroniska patientjournaler skett är resultaten positiva. Standardisering och konsolidering krävs i Japan liksom på andra marknader och öppna standarder kan vara en väg framåt.

Sex konsekvenser för Sverige och för fortsatta studier:

1. Närmare undersöka om specifika japanska kontrollmekanismer för kostnader kan införas i Sverige, men med stor hänsyn tagen till risken för negativ inverkan på innovationskraft.
2. Informera svenska företag verksamma inom eHälsa om att den stora japanska marknaden fortfarande befinner sig i en investeringsfas med avseende på eHälsa-tillämpningar i stor skala.
3. Fortsätta lära från de bästa exemplen på implementerade japanska eHälsa-tillämpningar. Dessa finns i ett fåtal större sjukhus och även enskilda kliniker.
4. Följa upp möjligheterna till att i Sverige införa en Hälsoteknikercertifiering.
5. Följa förändringar i japansk lag vad gäller patientdata för att hitta den rätta balansen i sekundär användning av kliniska data för evidensbaserad medicin.
6. Studera och dra lärdomar från den omfattande förebyggande vården i Japan inklusive årliga hälsokontroller för att skifta från reaktiv till mer förebyggande vård. Speciell uppmärksamhet bör ägnas åt att lära sig vilka incitament som fungerar.

Summary

Japanese health care is of high standard but with some distinct features: high co-payments, extremely many hospitals, universal access and service without gatekeepers. Foremost – Japan spends exceptionally little on their health care system due to a number of social factors.

Micro-management of fees is a central mechanism of the Japanese health care system. This has made the Japanese government able to contain health expenses at a low level – Japanese health care is lean.

But there is a backside to this micro-management and that is a lack of innovation. The Japanese health care system faces the problem of overutilization because of shrinking and ageing population. Public opinion among Japanese on their health care system is overall positive but there are worries regarding the future.

Japanese Telemedicine and Robotics stand out, but it is in Medical Informatics where the most interesting changes as well as greatest impact on the health care system takes place.

Medical informatics progressed slowly from accounting towards patient-centered applications. Electronic Health Records (EHR) and Computerized Physician Order Entry systems (CPOE) are at the center of Japanese eHealth investments.

Despite the ambition, health care information computerization in Japan is behind schedule and Japan is lagging behind many developed countries. Health care information computerization in Japan is behind schedule because the introductory costs are high. Where adoption of Electronic Health Records has happened, positive results are abundant.

Standardization and consolidation is needed in Japan as elsewhere and open standards may be a way forward.

Six implications for Sweden and for future studies:

1. Investigate closer if selected Japanese cost control mechanisms can be introduced in Sweden, but with close attention to risk of reduced innovation.
2. Inform Swedish eHealth companies about the large Japanese market, still in a process of adopting eHealth application on a large scale.
3. Continue learning from the top examples of running Japanese eHealth applications – these are found in a few major hospitals and also individual clinics.
4. Follow up on possibilities to introduce a Health-technician certification. The key notion is that medical systems should be developed in cooperation with medical professionals, not by IT-professionals working alone.
5. Monitor changes in Japanese law for privacy of patient data in order to strike the right balance of secondary use of clinical data for Evidence Based Medicine practices.
6. Study and implement lessons from the extensive preventive care and checkups in Japan in order to shift from reactive to preventive care. Special attention should be given to learn what incentives that is most likely to work.

Table of Content

1 Introduction

The World Health Organization defines eHealth as "…the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research..." (WHO 2007)

Few if any areas have like health care been identified as a primary target for IT-investments. It has for decades been obvious that the vast and complex information flows in health care can be made more effective with the help of computerization and IT.

Despite advances recent years we are still far from having reached the potential of IT in health care, you may even argue that results have been disappointing.

Recent thoughts on patient-centered care in relation to IT have risen the question if we have gone about these IT-initiatives the wrong way, perhaps with too much emphasis on the care giving organizations (technology-driven with macro perspective) and too little on the patient (operation-driven with micro-perspective).

Patient centered health and social care concept is among other things characterized by (Andreasson & Winge 2010):

- The patient/user and relatives being more involved in and able to influence the health and social care required – all to create more value for the patient.
- Health and social care planning leading to efforts to meet individual needs.
- An increasing amount of health and social care taking place in or near the individual home.
- More emphasis on preventative health and social care efforts.
- Various professions collaborating across health and social care organizational boundaries.
- Implementation of an organizationally-independent and process-orientated workplace.
- Information technology becoming a facilitator and value-creator for the patient/user.
- Introduction of mutual and more standardized funding of the operation.
- New types of reimbursement system, with reimbursement given according to health and social care results achieved.

In several of these specific areas Swedish health care policy makers, medical- and IT-professionals have lessons to learn from other markets.

This pre-study on Japan contains four sections: Background on the health care system, Initiatives in eHealth, Policies for eHealth, followed by Implications for Swedish actors and/or for further studies.

2 Background on the health care system

2.1 Health care of high standard: many hospitals, universal access and service without gatekeepers, but high co-payments.

Health care in Japan is generally of high standard as indicated by the highest average life expectance and lowest infant mortality rates in the world. Japan's universal and egalitarian health-care system helps keep its population healthy at exceptionally low cost.

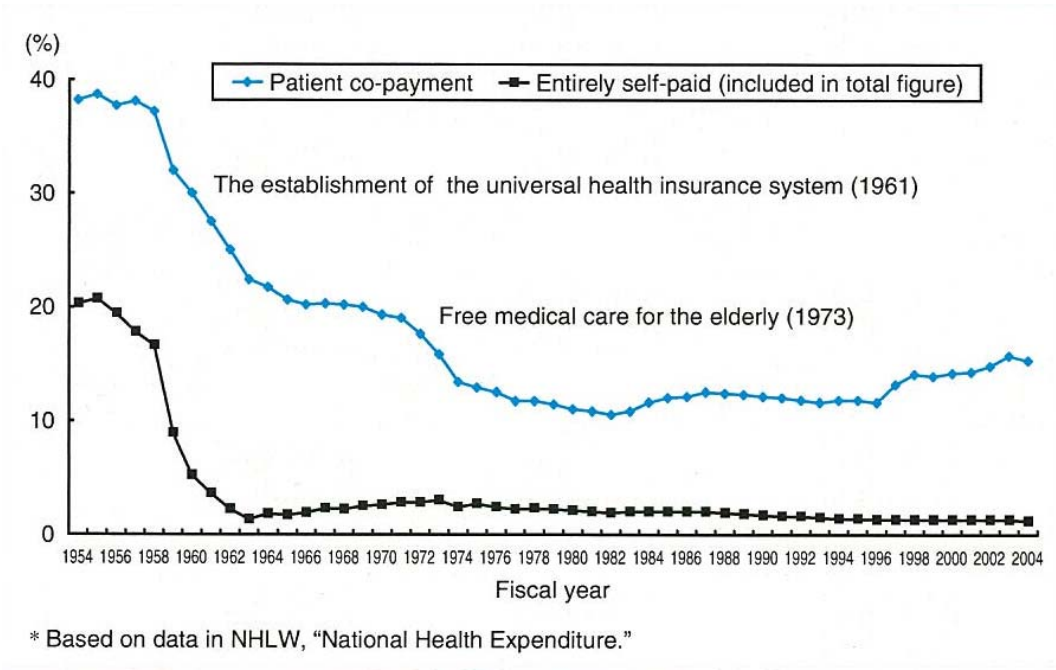

Figure 1: Timeline of the emerging Japanese health insurance system and its share of patient and entirely self paid co-payments. Source: JMAJ (2007)

The Japanese government began providing health insurance in 1927 and in 1961 coverage was extended to the entire population – see Figure 1. In the years since, the differences among the insurance plans were decreased. It is still a social insurance system in which nearly everyone is mandatory assigned to a specific plan via employment or place of residence (Ikegami & Campbell 1999, 2004).

Benefits are essentially the same for all insurance plans (connected to a large firm employment, smaller firm employment or self-employed/retired) and include all approved curative medical and surgical procedures, pharmaceuticals, long-term care, dental care and some preventive care.

Japan's financing system is a hybrid between a social insurance model and a tax-based model but it is standing out because of its high co-payments. Co-payments are 30 % defined as a percentage on total cost of treatment, irrespective of how expensive the treatment is. There are a few exceptions for example for lower co-payment for elderly. No other country has a standard co-payment rate as large as in Japan.

Japan has twice the hospital density compared to other developed countries and these hospitals are not empty – see Figure 2. Patients can choose between over 9 000 hospitals.

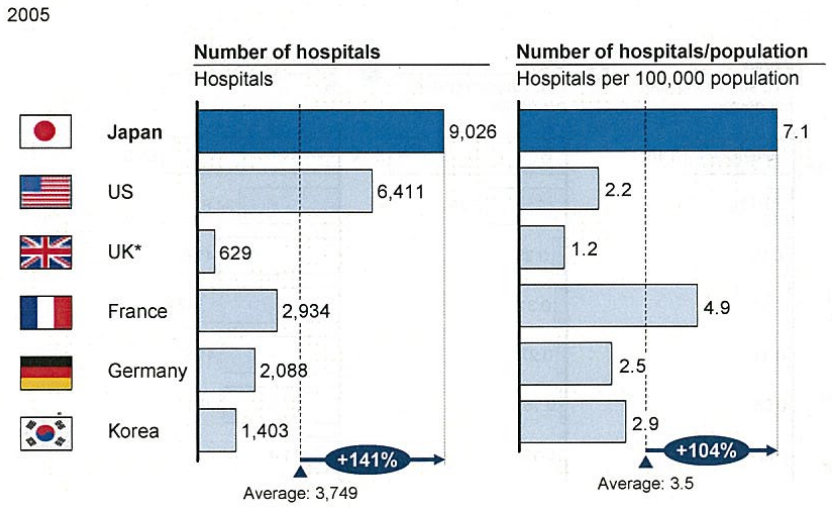

Figure 2: The number of hospitals in Japan twice as high as in other OECD countries. Source: McKinsey (Nov 2008)

There is a large share of private institutions, in fact a larger proportion (and number) of privately owned medical institutions than most developed countries. However these are overwhelmingly dependent on the public fees as regulated by the National Health Insurance and prevented to pay dividends (McKinsey Mar 2008).

The majority of hospitals are relatively small facilities owned and operated by individual physicians. Nearly all of these got started as expansions of private practices. They rely on outpatient primary care for a large proportion of their revenues and have much larger outpatient departments than possibility to hold inpatients (Ikegami & Campbell (1999, 2004).

The system is truly of universal access and without the gatekeepers found in most developed countries' health care systems. Any medical institution receiving reimbursement from Japan's National Health Insurance (NHI) program is open to any patient seeking treatment. Without a gatekeeper system anyone can go anywhere with his ailment – slight or severe – and the waiting times to see a doctor are short compared to any country (McKinsey Nov 2008) – see Figure 3.

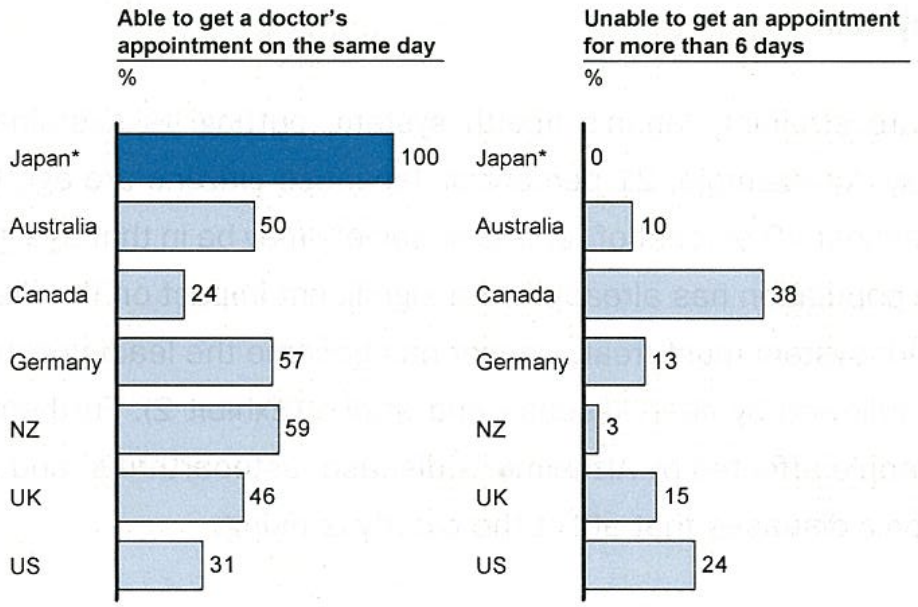

Figure 3: Getting a doctor's appointment is quick in Japan. Source: McKinsey (Nov 2008)

However, the large hospitals have become more popular with patients – for reasons of prestige as well as at least perceived higher quality, particularly for difficult surgery and other sophisticated treatments. This can mean longer waiting hours at the best hospitals and has triggered another peculiar inefficiency.

In response to this, many small hospitals and even office-based physicians have purchased expensive machines, to the extent that the diffusion rate of CAT (Computer Aided Tomography) and MRI (Magnetic Resonance Imaging) equipment is the highest in the world (Ikegami & Campbell (1999, 2004). CT scanners are four times as many (per capita) as most other developed countries – see Figure 4. Additional reasons for this overinvestment are that coordination of purchasing of this type of expensive medical equipment is not centralized; the government does not control capital expenditures in medical practice.

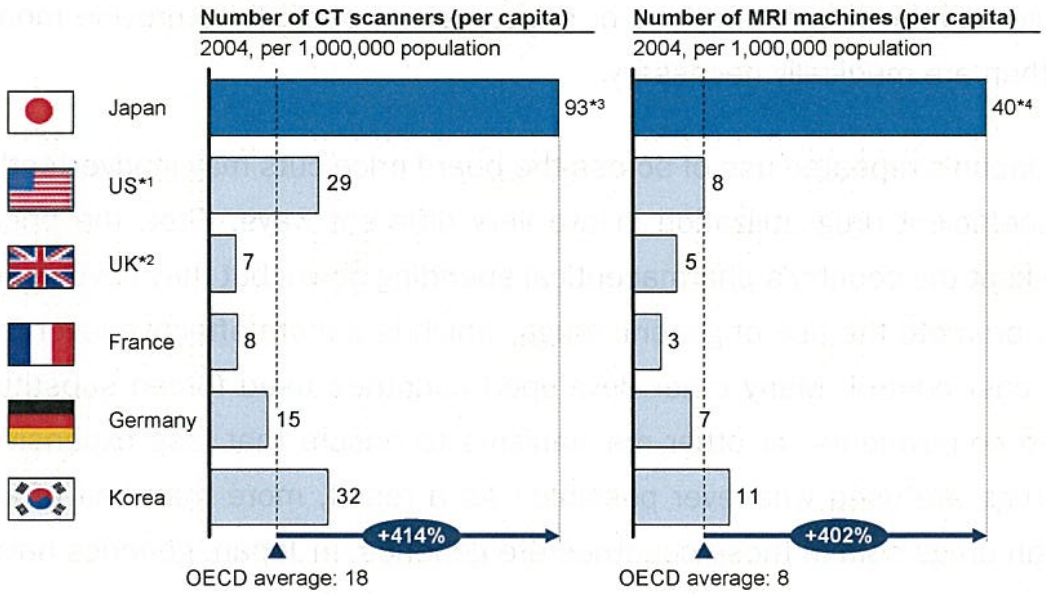

Figure 4: Japan has substantially higher number of expensive diagnostic equipment (CT scanners, MRI machines). Source: McKinsey (Nov 2008)

2.2 And foremost – exceptionally low spending on health care due to a number of social factors.

Ikegami & Campbell (1999, 2004) has pointed out that Japan was able to achieve a great expansion of health care followed by imposing an effective system-wide cost-control without major structural reform.

Japan spends 8 % of GDP on health care, see Figure 5, if counting only medical care provided by Japan's universally accessible National Health Insurance system (NIH) then estimates are as low as 6.6 % of GDP (2005) (McKinsey Mar 2008).

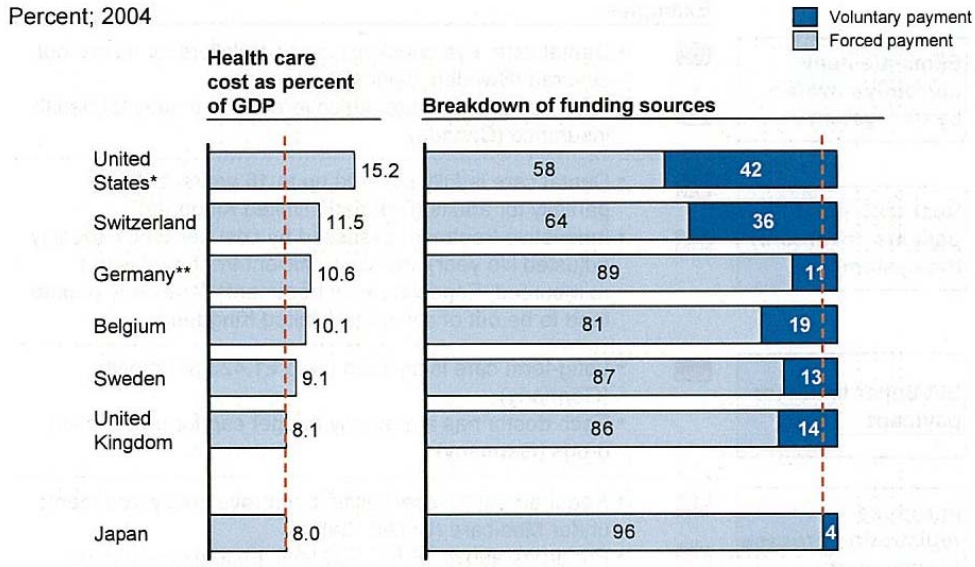

Figure 5: Health care cost as percent of GDP and breakdown of funding sources. Source: McKinsey (Mar 2008)

Here we also see that Japan has a low rate of voluntary payment compared to OECD countries.

Before moving on it is relevant, in order not to give the wrong impression for policy recommendations, to further look into the reasons for these low spending figures. Looking solely in the book-keeping, Japan's health care system appears to be a tremendous success. However, deeper analysis shows that the system can only claim partial credit for the health of the Japanese population. Japanese traditional diet is very healthy, many Japanese exercise regularly and the frequent health checks (not paid for by the health care system but by employer or individually) lead to early detection of many serious conditions. The Industrial Safety and Health Law oblige all workers to undergo annual health checkups in their workplaces (Kudo et al 2008). Many companies in Japan provide annual health checkups for employees. Japan has low levels of expensive social phenomena like crime, divorce, teenage births, drug use, HIV incidence and so forth that raise medical costs (Ikegami & Campbell 1999). A large homogenous middle-class of course dampens the negative effects of poverty on health in a nation.

These are factors partly out of reach for governmental policy. Judgment of the health of the health care system based on life expectancy, as the only parameter, would lead to the wrong conclusions.

2.3 Micro-management of fees is a central mechanism.

There are however strong and quite unique policy designs at play in the Japanese health care system which have been successful in containing cost. The spending control in Japan is made possible through a tight system of micromanagement of fees. While medical providers are allowed to expand services, the tariff of services and drugs is fixed by the government.

The Japanese public medical system currently allows for about 5 400 procedures, each of which is strictly regulated in terms of price and method in order to qualify for government reimbursement. Every two years there is one big negotiation between the government, which represents all the health insurers, and providers, mainly doctors rather than hospitals or pharmaceutical companies. The negotiation produces a gigantic "fee schedule" that sets the price for each procedure, test, medication and device throughout Japan. Health care providers charge exactly that amount, no more and no less (Campbell Oct 2009). This bible of reimbursement for certain procedures and drugs of course make it possible to quite directly curtain cost. Fees are usually based on frequency of use. The fee of a very common test may for example increase in order to control over-usage.

As some cases in point, despite major advances in technology for diagnostic tests during the period 1979-93, their average unit price has remained the same. Similarly, to encourage hospitals to shorten their average length of stay, basic hospitalization fees are progressively decreased so that after 90 days the per diem rate is less than half that of the first 14 days (Ikegami & Campbell 1999).

The internal details in revision of the tariffs are complex (a full description is provided by Campbell 2004) and include political decisions based on the overall macro economic situation, a revision of drug prices based on a market price survey, and then individual revision for each documented procedure.

2.4 This has made government able to contain health expenses – Japanese health care is lean

As a result, hospitals and manufacturers have been forced to become more efficient and the Japanese health care system is arguably the most cost-efficient in the world (Ikegami 2008). The tight control of fees has made possible to contain the cost increased at a rate of around 2 percent per annum – far below other OECD countries.

This can be observed in hospitals, where quite few back office workers, such as secretaries or assistants, are employed – quite a contrast to corporate life in Japanese larger companies. Experts have estimated that there are just about 50 % of clerical staff/supporting personnel compared to the USA (Kaihara 2010). It should also be added that health practitioners like nurses and physical therapists can not to the same extent as in other countries relieve physicians from some tasks due to that they are not allowed to by Japanese law. In total this has lead to quite over-worked medical doctors.

2.5 But there is a backside to this micro-management: lack of innovation as well as other unforeseen effects

As described the Japanese health care system provides universal service – each institution provides the same treatment and service to patients with the same ailment under a scheme of universal fees – NHI dictates reimbursement rules and fees which institutions cannot alter.

The downside of this is that there is no possibility to provide premium medical services or differentiated treatments. Nor are “mixed treatments” possible, any kind of reimbursement is revoked as soon as any part of treatments is charged outside what NHI has defined as reimbursable. In this situation there is of course hard for a hospital to calculate a positive return on investment on an expensive EHR system, even after so many positive effects are documented. Payment by a one-price-for-all fee schedule gives few financial incentives to improve quality, and tends to discourage entrepreneurship and innovation.

From a viewpoint of continuous innovation this may be unfortunate in the long run. E.g. research on truly innovative drugs in Japan has been discouraged because their prices will probably be cut before their expensive investment can be recovered (Ikegami & Campbell 1999). Advances in treatment – including new drugs, medical devices and procedures are in Japan not introduced until several years after other developed countries. For example, new drugs are launched in Japan on average 7.3 years after they are launched in the US and EU (McKinsey Nov 2008). Reasons can be overworked physicians not having any time over for clinical trials or investigate new treatments as well as the fragmented hospital system which makes it hard to disseminate info on new advances.

Also the dependence of physicians to prescription and services reimbursements by the government as their main source of income is set up to allow doctors to over-prescribe (up to 50 % more prescriptions compared to the U.K., for example) as a way to make extra cash.

There are also a number of laws governing hospital management that could have long-term negative effects including prohibition of for-profit hospital ownership. At large, hospitals are frequently not run as sound commercial operations and many are in the red.

Some worrying data has emerged in the last years questioning the quality of Japanese health care. For example studies show that a Japanese patient is more likely to die from a heart attack or stroke than in other similar countries – see Figure 6 – taken as evidence that Japan does not always provide best-practice care or at least varies considerably (McKinsey Nov 2008).

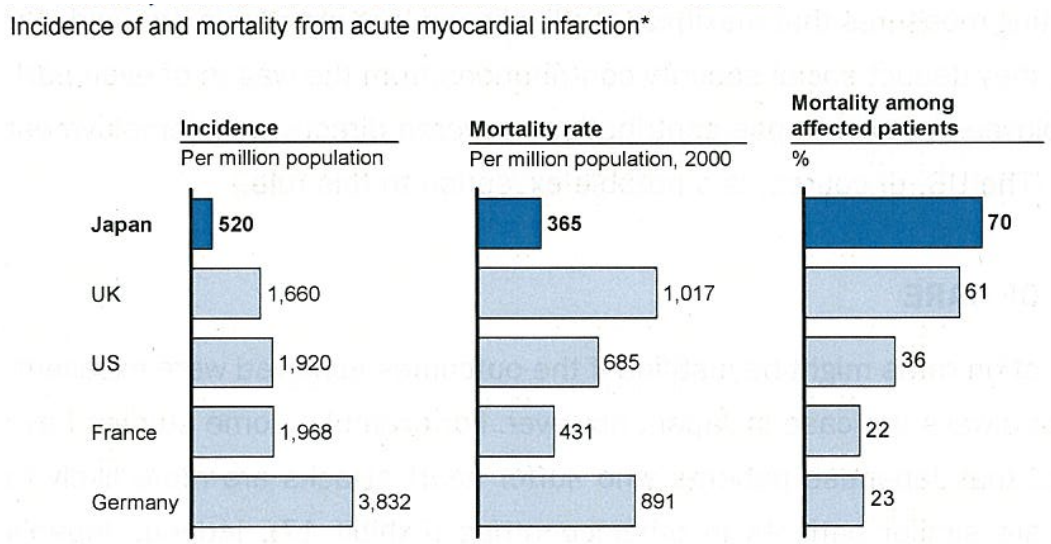

Figure 6: Japanese suffer from relatively few heart attacks, but Japanese heart attack victims are more likely to die. Source: McKinsey (Nov 2008)

Again one important factor can be lack of specialization on procedures due to hospital network fragmentation. Many hospitals in Japan are small and lack specialized care units (like for intensive care and stroke units).

2.6 The health care system faces the problem of overutilization because of shrinking and ageing population

Additional to the potentially negative long-term effects of rigid centralized governmental cost-control, the overall pressure on the Japanese health care system is just increasing.

The perhaps most dramatic reason is risk of overutilization in the future due to macro demographic and lifestyle trends in combination with a stagnant economy – see Figure 8. The population is getting older and smaller – see Figure 7.

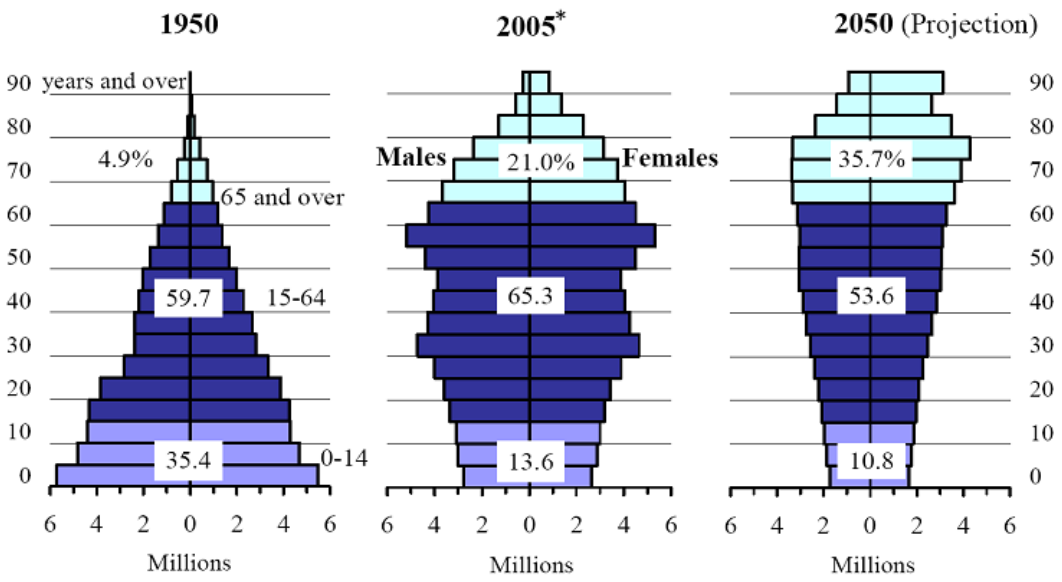

Figure 7: Japanese population is ageing and shrinking – every third person over 65 in 2050. Source: Statistics Bureau, Ministry of Health, Labor and Welfare.

Behavioral changes also are contributing due to that younger Japanese have adopted a more Western diet leading to more obesity and diabetes.

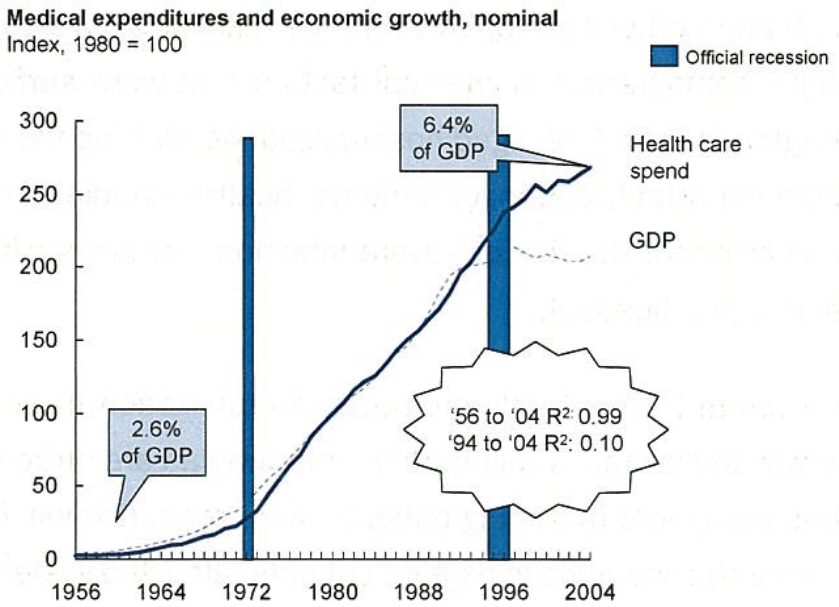

Figure 8: Economic growth in Japan has slowed down and leveled out while health care cost keeps rising. Source: McKinsey (Nov 2008)

There is also a growing number outside the insurance system. In Japan, retirees, self-employed and unemployed must buy health insurance by themselves – these are about 40 % of the population.

Projections show that medical health care spending will increase from 6.6 % in 2005 to 10.2 % of GDP in 2020. This relatively large increase in such a short period risks damaging Japan's competitiveness due to high labor costs as well as prove fiscally unsustainable (McKinsey Mar 2008).

This increase is projected also for other OECD countries – see Figure 9.

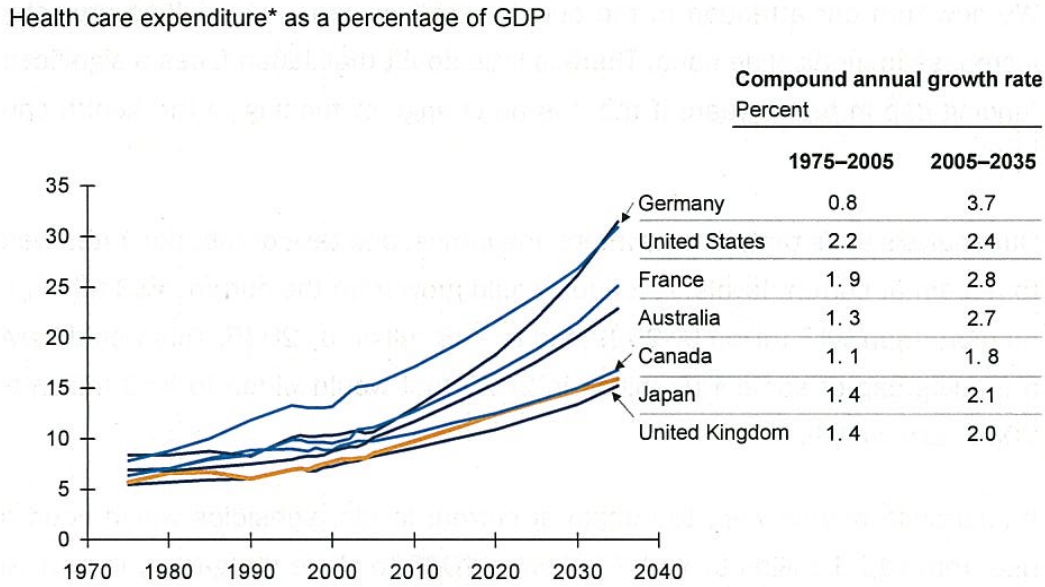

Figure 9: Developed countries are facing rising health care cost. Source: McKinsey (Mar 2008)

This would mean that the household income spent on medical care would have to rise dramatically.

In 2009, after 54 years (except for two brief periods 1947-1948 and 1993-1994) the ruling Liberal Democratic Party of Japan (LDP), was defeated by the Democratic Party of Japan (DPJ). With a harsh fiscal situation the new government under Prime Minister Yukio Hatoyama started a process in which each ministry's budget was subjected to rigorous public scrutiny in order to find savings as well as change a number of policies. It is too early to see if and to what extent Japanese policy on health care in general, and eHealth in particular will change. However, with the election of a new government in September, 2009, both the cost containment policy and the favoring of clinic doctors are apparently being reversed. The hospitals claim that they have been starved for funds. However, exactly how the additional funds should be allocated still remains uncertain.

2.7 Public opinion on the health care system overall worries for the future but overall positive

Let us wrap up this section with a recent comprehensive study on the Japanese public opinion of their health care system by Health Policy Institute (2010). The results can be summarized as:

- Approximately 60 % of the public are satisfied with the current health care system.
- Nearly 80 % of the public are worried about the future of the health care.

- More than 80 % of the public are dissatisfied with the decision-making process and understandability of the health care system, while the majority is satisfied with the medical services and treatments.
- Anxiety about health care is most prevalent among people in their 20s and 30s and has not decreased much over the years.
- The public is evenly divided between those who prioritize economic growth and those who prioritize social security. (High income/asset population tends to prioritize economic growth, whereas low income/asset population tends to prioritize social security.)
- The majority of the public support the sharing of individual medical information.
- Approximately 40 % of the public are interested in receiving remote medical care. (The dominant reason for not being interested in remote medical care is doubt about accuracy of diagnosis without face-to-face consultation.)
- Slightly more people oppose promoting health care efficiency through limiting patients' access to care at large hospitals.

2.8 Summary

Japanese health care is of high standard but with some distinct features: high co-payments, extremely many hospitals, universal access and service without gatekeepers. Foremost – Japan spends exceptionally little on their health care system due to a number of social factors.

Micro-management of fees is a central mechanism of the Japanese health care system. This has made Japanese government able to contain health expenses – Japanese health care is lean.

But there is a backside to this micro-management: lack of innovation as well as other unforeseen effects. The Japanese health care system faces the problem of overutilization because of shrinking and ageing population. Public opinion among Japanese on their health care system overall worried for future but overall positive.

3 Main activities in eHealth

3.1 Telemedicine and Robotics stand out – but Medical Informatics is where most interesting changes and greatest impact on health care system take place.

European media reporting as well as some academic interest in eHealth on the Japanese market has been colored by quite spectacular examples of future oriented technology (AALIANCE (2009). In line with Japan's strengths in robotics and (mobile) telecommunication two application/research areas has got attention: Telemedicine and Robot Care.

Health care applications delivered via telecommunications or "telemedicine" can be applied to almost any medical field from telepathology to telesurgery in order to help eliminate geography as a barrier to receiving quality health care services (Castro 2009). Hasegawa & Murase (2007) found that Japan has implemented over 1 000 telemedicine projects. These projects have principally focused on teleradiology (37 %) and home telecare (33 %). Most telecare initiatives (70 %) have been implemented in rural areas – where these benefits are most clear. Researchers point out that home telecare projects provide an important alternative to hospital-based care for Japan's ageing population. Current applications include home telemonitoring allowing patients to submit test results from home to their care provider over the Internet (Castro 2009). Especially diabetes patients have been targeted with applications monitoring daily blood glucose measurements, resulting in a decrease in required hospital visits. Not only is this a convenience to the patient, it also leads to better medical outcomes.

Looking into robotics and health care, Japan with 44 per cent of the world's industrial robots is clearly applying that expertise to health care. A promising research area within cognitive/companion robotics focuses on how robotic creatures can be used with patients suffering from e.g. Alzheimer's disease and other types of dementia by stimulating interactivity for example with animal-shaped robots like the PARO robotic baby seal (Yonemitsu 2002). Cognitive and emotional interaction between older people and animal-shaped robots is being investigated e.g. at the National Institute of Advanced Industrial Science and Technology (AIST) in Japan (Wada 2008). A complex technology roadmap on robotics, including service and personal robots, is included in the Technology Roadmap for Japan, edited by NEDO (New Energy and Industrial Technology Development Organization), Japan's largest public R&D management organization for promoting the development of advanced industrial, environmental, new energy and energy conservation technologies (NEDO 2006). The area of Robotic surgery is also gaining traction where remote surgery, minimally invasive surgery and unmanned surgery are starting to enter the main domains of health care.

In Japan the term "eHealth" is not so frequently used but in policy material as well as among practitioner's instead more specific applications (like telemedicine and medical informatics) are discussed individually.

Although Telemedicine and Robotics already show tangible results, with more pilot experiences consistently piling up, it is the area of medical informatics were the most immediate and far-reaching benefits of IT in health care can be found. This goes for Japan as in other markets. The following sections will target history, present and future of medical informatics as the most important part of eHealth in Japan, and also give special attention to initiatives aiming for patient-centered health care.

3.2 Medical informatics progressed slowly from accounting towards patient-centered applications.

Medical informatics can generally be described as the intersection of information science, computer science, and health care. Tools include not only computers but also clinical guidelines, formal medical terminologies, and information and communication systems. Two central artifacts in practical applications of medical informatics of today are Electronic Health Records (EHR) and CPOE (Computerized Physician Order Entry systems).

In Japan patients pay 30 % of the health care bill out of their own pocket and 70 % is covered by representative insurance body if, and only if, all documents are submitted correctly. Complex accounting is performed on a monthly basis at each health care institution in order to get reimbursements from the National Health Insurance. This has created the need for integrated computerization. The complicated claim (reimbursement) process was an early driver for the introduction of IT in Japanese health care. This has evolved into efficient order systems that are present in over 90 % of hospitals. But patient care was not the main concern from start. One expert interviewed claimed that still less than ten major hospitals in Japan use IT to a larger extent with the main purpose of improving patient centered care, e.g. secure drug administration (Kaihara 2010).

This trend towards more patient-centered IT investments is illustrated in Figure 10.

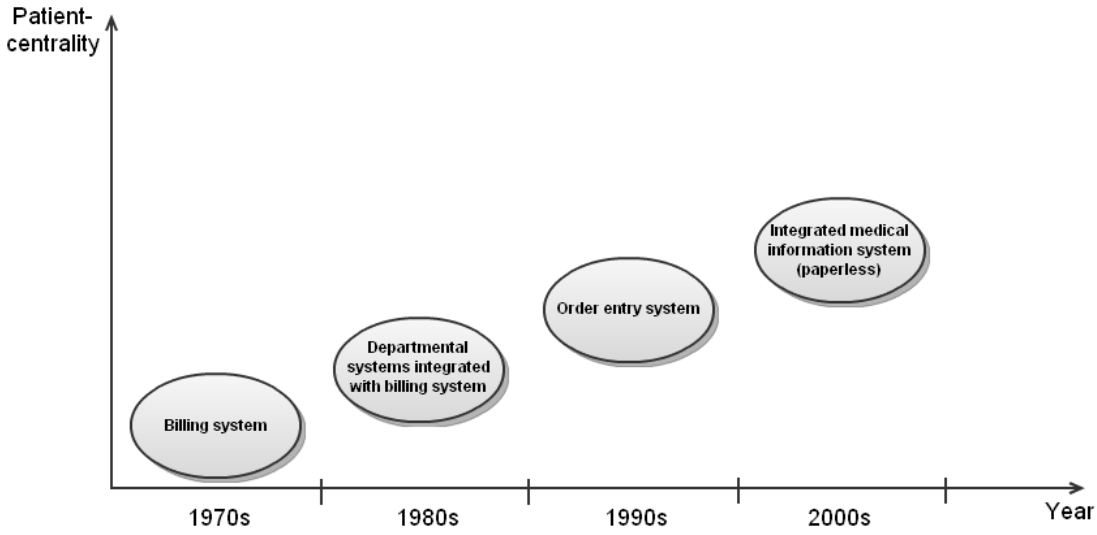

Figure 10: Trend in IT systems in Japan health care institutions towards patient-centered applications. Source: Adopted from Kameda (2010)

This trend in health care applications is parallel to a shift in the acceptance of medical informatics as an academic discipline. Medical informatics (医療情報) is attracting a younger generation of scholars and researchers. The field is in itself not recognized as an "authorized medical discipline." It is however strongly patient-oriented (Kano 2010).

3.3 Electronic Health Records (EHR) and Computerized Physician Order Entry systems (CPOE) are at the center of eHealth investments.

An electronic health record (EHR) (often also named as synonym Electronic Medical Record – EMR) is a systematic collection of electronic health information about individual patients. Its digital format makes it possible of being shared across different health care settings, e.g. by being embedded in network-connected enterprise-wide information systems. EHR may include a whole range of data including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, and billing information. EHR initiatives can be seen globally in all developed countries and the potential benefits are well documented.

Four broad groups of EHR can be identified, with different needs and perspectives (Colombo et al 2008):

- data access in the daily clinical practice;
- decision support systems;
- clinical trials, association studies, translational research;
- administration and management;
- document management and cooperative work support.

Computerized physician order entry (CPOE), is a process of electronic entry of medical practitioner instructions for the treatment of patients (particularly hospitalized patients) under his or her care. Instructions can then be communicated over a computer network to the medical staff or to the departments (pharmacy, laboratory or radiology) responsible for fulfilling the order. CPOE is claimed to decrease delay in order completion, reduces errors related to handwriting or transcription, allows order entry at point-of-care or off-site, provides error-checking for duplicate or incorrect doses or tests, and simplifies inventory and posting of charges (Wikipedia 2010).

As described more in detail under section 4 "Japanese eHealth Policy" the introduction of EHR into all levels of the Japanese health care institutions has been a top priority since the 1990s. The EHR has become a sort of symbol in policy for conveying the ambition of computerization of processes in health care institutions of all sizes.

3.4 Despite the ambition, health care information computerization is behind schedule and Japan is lagging behind many developed countries.

Tables 1 and 2 show a recent international comparison on the adoption of EHR where Japan turn out as a laggard. Only 10 % of hospitals as well as primary care physicians are using EHR. In 2001, the Ministry of Health, Labor and Welfare formulated the Grand Design for the Development of Information Systems in the Health care and Medical Fields – see more details in Section 4 Japanese eHealth policy. The Grand Design stated a numerical target for EHR to at least 60 % of Japan's hospitals with 400 or more beds by 2006.

Table 1: Use of EHR in selected countries by primary care physicians. Source: Castro (2009)

Country	Percent of Primary Care Physicians Using EHR Systems
Australia	79
Canada	23
Denmark	95
Finland	99
Germany	42
Japan	10
The Netherlands	98
New Zealand	92
Sweden	100
United Kingdom	89
United States	28

Table 2: Use of EHR in selected countries' hospitals. Source: Castro (2009)

Country	Percent of Hospitals Using EHR Systems
Australia	< 10
Canada	< 10
Denmark	35
Finland	100
Germany	< 5
Japan	10
The Netherlands	< 5
New Zealand	< 1
South Korea	9
Sweden	88
United Kingdom	3
United States	8

The low results for Japan should however be considered in the light of the previously described fragmented and decentralized landscape of health care institutions in Japan. Yasunaga (2008) found that although only 10 percent of hospitals had adopted an EHR system (Feb 2007), the rate of adoption was higher at public hospitals and university hospitals. But even the percentage for hospitals with 400 or more beds was just 31.2 %, illustrating that the government's target had not been reached. Since 2007 adoption of EHR has increased and some experts estimate that 20-25 % of hospitals now use EHR (Kimura 2010).

CPOE (Computerized Physician Order Entry system) on the other hand has a wide adoption in Japan despite earlier hesitation. More than 80 % of large hospitals (with 400+ beds) use CPOE and the figure can this year be closer to 100 % (Kimura 2010).

Hidden in this statistics are a number of high-profile cases spread out in Japan, where truly innovative and comprehensive usage of integrated health care information system with new applications relating directly to a patient-centered design philosophy can be found. Some of these cases will be described briefly in the end of this section.

3.5 A number of Electronic Health Record solutions exist – export is limited

Previously predominately university hospitals developed health care information systems in-house, while today most health care institutions buy commercially available solutions. Dominating information system developers in the Japanese health care market are Fujitsu, NEC, Hitachi, NTT Data, IBM Japan and Toshiba. Smaller firms, like Osaka-based Software Service, exists and are then typically supplying more standardized systems without tailor-making to fit a special hospital's needs.

Experts observe that Japanese medical informatics companies generally are unwilling to make the investment to export their solutions. US companies are increasing their market-shares worldwide. Efforts underway from government and (interested) medical professionals to introduce "exit-clauses" into contracts with health care information system providers. Local dealers are however reluctant to accept this as they stand to gain by either keeping customers by locking them in or charging data-conversion fees of millions of yen (Kimura 2010).

3.6 Health care information computerization is behind schedule because the introductory costs are high

There are several reasons to the low overall adoption of EHR in Japan but the main reason is high cost. A study, by Yasunaga et al (2008), shows that high cost was stated as reluctance to EHR in 82 % of hospitals. Stated benefits were improvement of inter-hospital networks, and time efficiency for physicians by around 45 % and 25 % of hospitals, respectively.

The high levels of investments required to introduce EHR, and the then necessary information systems, into health care forms a substantial barrier. EHR does not – in itself – bring any revenue to the caregiver. Qualitative improvements are difficult to argue and prove. Even more so if there is no clear image of the current quality of care. In Japan there is not, in the same way as e.g. the US, strong incentives to argue for certain technical investments leading to improved documentation which can be used in litigations.

Next to cost, several other reasons have been put forward both from a perspective of care takers and care givers. From a patient's perspective, as noted previously, the Japanese health care system allows for free access to hospitals. A patient may choose different health care providers for different ailments. A possible inhibitor for national EHR may be patient's objections to all hospitals/clinics having access to their complete medical history. Information integrity and privacy is a big concern in Japan. Patients are more open to their medical data being used (anonymously) for research such as evidence-based medicine.

Still some medical professionals are unwilling to go 100 % paperless due to inconvenience (paper easier to handle than PC) and reliability (a system may go offline due to power outage or malicious software.) Therefore hybrid systems are sought in many cases. Age is perceived as an influential factor in an individual's use and attitude towards IT in general and also for EHR adoption in Japan. Younger doctors/nurses are generally more IT literate. They are also more positive to paperless systems. Also, in smaller health care clinics, a single doctor handles a patient throughout his life - often the case in Japan - and arguably the need for efficient documentation decreases.

3.7 Where adoption of Electronic Health Records has happened, positive results are abundant

At least three main results of increased adoption of EHR in Japan are expected: 1.) decrease of medical errors, 2.) better resource planning, and 3.) provisioning of clinical data for evidence based medicine.

Decrease medical errors: One potential benefit of using IT in health care is educing medical errors. A study by the Institute of Medicine in US (1999) estimated that between 44 000 to 98 000 people in the United States die every year as a result of medical errors. There is little question that more progress is needed to improve patient safety. One reason is the ability to share data between departments in a hospital where radiology can access the same data as surgery.

A variety of IT-based applications can improve patient safety by providing feedback to medical providers on potential hazards and best practices. Among these are computerized physician order entry (CPOE) systems. In many developed countries, the adoption rate of CPOE in primary care practices corresponds to the adoption rate of EHR systems for the simple reason that many EHR systems include this functionality (Castro 2009). However not in Japan where, as we have seen, CPOE enjoys much higher penetration.

Medical errors have increasingly been discussed openly in recent years. Some experts state that Japanese hospitals have used CPOE to make orders and messages promptly delivered to destination departments driven by crowded hospital/clinic situations and lack of medical staff (Kimura 2009).

> ***"Until recently Japanese physicians think that clinical data belongs to them. I want to change this view – clinical data belongs to the patients, to the common good."***
> *Masanori Akiyama, M.D., Ph.D., Professor, Tokyo University Policy Alternatives Research Institute.*

Resource planning is connected to integrating CPOE and EHR to a supply chain control system.70-80 % of Japanese drugs are identified by a barcode system, which is not regulated but "recommended" from the government. This opens up possibilities for tracking drugs and other articles in the logistics chain inside and outside the hospital. Hospitals are not to a large extent using such a system yet, much because there is simply no stand-alone solution designed specifically for hospitals and in-house development would imply large investments. Please see more details later in this section on success cases where for example dramatic decreases in hospital stocks of supplies have been shown. It should also be pointed out that benchmarking on resource usage, with other health care facilities only becomes practically possible (on a large scale) without digitalization of data.

Provide clinical data for Evidence Based Medicine: Data collected in EHR can, besides the obvious health care application, also be used for research into epidemiology, health policy and drug safety. Also, improved information quality in primary care leads to cost savings in that fewer referrals are needed. Clinical data can be a valuable resource if used based on collective intelligence, i.e. shared use of the same data for the purpose of finding patterns etc. EHR can be used to match patient data with known risk-factors/risk-groups for various diseases. Experts see this practice increasing over the next 5 years -from hospital level to regional or national level (Ochiai 2010). This will of course require anonymization of patient data.

From a technical standpoint, the massive amounts of storage required to enable an undertaking of this magnitude is huge. Recent advances in cloud computing may solve this problem.

Future challenges include managing the multiplicity of systems, large volumes of data, inter-facility linkages, and variation in accuracy and completeness of data, and resolving of ethical/legal issues. From a legal standpoint in Japan, medical research based on health records is problematic due to legal frameworks regarding privacy. One approach discussed for use of medical data in research that may work with current legislation is anonymization performed by a "trusted third party." Better guidelines for the protection of patient privacy must be put in place. As high-speed, high-level searching tools become available, the guidelines Japan now have will soon become outdated.

" The next big change in health care will not be robotics or any other showcase technology, but standardization."
Dr. Sadahiko Kano, Dr. Eng., Professor, Graduate School of Asia-Pacific Studies, Waseda University

Currently in Japan collection of clinical data on a national basis is not possible due to incompatible structures for data storage and standards. However anonymized data from the National Health Insurance can be collected and used as a proxy for research purposes.

3.8 Standardization and consolidation is needed in Japan as elsewhere - open standards may be a way forward

A general lack of standardization of formats and coverage does however present a problem. Campbell & Ikegami (2010) point out that health care universally suffers from low standardization. Not only in terms of IT, but more fundamentally in terms of classification for care and diagnosis. For instance, what is to be considered a normal treatment? What are the causal relationships between diagnosis and different courses of action? It is difficult to standardize IT-support for medical professionals when different areas or fields disagree on fundamental issues e.g. on terminology.

Effective use of information is the key to realizing Evidence Based Medicine. A Japanese unique ID given to every citizen would of course facilitate EMR efforts and it seems that the new government is preparing to take steps towards this end (Kano 2010).

In Japan billing rules are standardized, but they are somewhat flexible (imprecise) in their application. They do for instance not take note of results of treatments, but merely record the number of occurrences.

It is poignant that none of the major solutions for health care information systems at hospitals in Japan (Fujitsu, NEC, Hitachi, NTT Data, IBM Japan and Toshiba) are interoperable. This has two major impacts. First, once a provider is selected moving to another supplier is practically impossible. Second, although intra-hospital communication may run smoothly, inter-hospital communication may be impossible by any means other than a laborious transfer based on paper documents.

Investments in EHR and connected information systems are often undertaken from a local (here & now) perspective. This is a contributing factor to inoperability. Awareness in the issue of interoperability is increasing slowly. Since 2006, through two large Ministry projects to promote standardized export of data in so called HL7 and DICOM formats, two

top HIS vendors (Fujitsu and NEC) are shipping HL7 conformant hospital information systems. With other conformant vendor products, around 50 % of large hospitals have HL7 and DICOM export features. Experts claim that Japan can be headed for the secondary use of clinical data (Kimura 2009).

As in other field of software development, open standards attempt at breaking the lock-in effects derived by selecting a single providers. Open EHR was initiated by medical doctors who realized that proprietary medical systems are a problem both in terms of cost but also lag in development time (openEHR 2010).

One of the core components of open EHR is semantic interoperability which provides archetypes based upon which systems can be built with a shared nomenclature and frame of reference. Open EHR have been adopted by Microsoft in their development of medical software. Open EHR has the potential to reduce IS/IT cost much the same way as Microsoft Office has reduced costs (and provided a de facto standard) for word processing. A Microsoft-monopoly may not be the preferable solution, but it would be an improvement over today's lack of interoperability. Despite interest in the health care market from MS, Japanese software providers appear too busy to take any action towards fending off this newcomer (Kano 2010).

3.9 Success case: POAS at International Medical Center of Japan

POAS (Point of Act System) is a real-time data capturing system developed by Masanori Akiyama, M.D., Ph.D., Professor, Tokyo University Policy Alternatives Research Institute. Trials started at the International Medical Center of Japan in 2002 and have continuously been going on since then. The system is handling more than 360 000 transactions per hour. Trials started with functionality such as collecting of drug consumption data at the point of consumption – i.e. bedside at the patient. Current technology is a wireless PDAs carried by medical staff reading bar codes – RFID trials are under way.

The data is loaded into a full-fledged management system which today is much more than a logistical tool providing recording of a number of medical actions, assists in practical medical treatment to patients, and monitoring patients continuously and in real-time.

POAS has been tested in several hospitals in Japan with positive results. Recorded benefits have been found in risk management (error in medication and mistreatment), hospital management (drug waste decreased substantially), data management (accumulation of anonymous clinical data for clinical research and trials), and distribution management (optimization of supply chain management) – see Table 3.

Table 3: Inventory was cut to a tenth. A cost reduction of 225.5 million yen was achieved for pharmaceuticals and 241.62 million yen for medical supplies. Source: Akiyama (2007)

IMCJ with POAS	925	300	6 800	32	1
A hospital without POAS	1 205	1 900	20 000	300	10
B hospital without POAS	1 203	500	8 000	200	7
C hospital without POAS	1 178	1 000	3 500	65	6
D hospital without POAS	1 154	1 320	7 700	155	2
E hospital without POAS	1 150	700	7 000	108	4
F hospital without POAS	800	600	10 000	300	7
G hospital without POAS	741	500	2 000	300	7
H hospital without POAS	720	2 500	8 000	400	10

Health care staff (physicians and nurses) had a severely negative view on the implementation of POAS. After a brief trial results showed that error in medication had decreased from alarmingly high numbers to zero. This alone overnight convinced the staff about the benefits. Other more long-term effects at the International Medical Center of Japan included a cut of drug inventory to 10 % of previous levels with 4 MUSD in decreased cost (Akiyama 2010).

POAS should not be taken solely as a software system but clearly translates to a real patient-centered view on usage of clinical data. Cost savings may be the driver to adopt this kind of system, but the concept is not only to manage material flows, but also to provide an integrated management resource, a means of correcting errors in medical treatment, and applications to EBM through the data mining of medical records.

3.10 Success case: Logistics at Kanto Medical Center NTT

Kanto Medical Center was established by NTT (Nippon Telegraph and Telephone) Corporation in 1952, although it was not given its current name until 1999. NTT is the largest telecommunications company in Asia, and the second-largest in the world in terms of revenue (2010). For over 30 years it was a private hospital providing health care exclusively to employees at NTT. This changed in 1986 when it, despite still being owned by NTT, opened its doors to the general public.

Kanto Medical Center currently features 665 beds and is staffed by 297 doctors and 670 nurses divided over 20 different wards. It is thus able to handle a vast array of ailments and treatments. Generally, the IT support available to the staff is extensive e.g. with 900 EHR desktop terminals. In 2007, it was nationally ranked #2 in overall care according to a survey covering approximately 8 000 respondents conducted in Japan. IT investments

really took off in 2001. Since then productivity in terms of in-hospital patients treated increased from 9 732 to 13 395 between 2001 and 2004. The size of the staff did not differ substantially during this period. There is approximately 20 in-house IT staff which also serves 5 other NTT hospitals.

Owned by NTT Corporation, a large supplier of medical IT solutions in Japan, Kanto Medical Center is in many ways a showcase for the technical know-how and ambition that NTT possesses. Treatment is safe-guarded by the use of unique barcodes labeling every drug and patient. In administering drugs, nurses use a portable hand-terminal to scan themselves, the drug and the patient's ID bracelet. The hand-terminal then connects to the Hospital Information System (HIS), verifies that the scanned drug is prescribed to the patient in question and responds accordingly. Not only intended to facilitate prescriptions, the HIS is also able to raise the alarm if a drug which is to be administered may have adverse effects if combined with any other drugs the patient is taking. Despite the fact that NTT have several hospitals, there is no information system connectivity between Kanto Medical Center and other NTT hospitals or any other hospitals.

Dr. Chikayuki Ochiai, the Chief Executive of Kanto Medical Center, clearly states that patient safety is the foremost concern in the introduction of IT into health care. But he also points out that IT investments have yielded a drastic improvement in the realm of logistics as well. Tagging supplies with either barcode or Radio-Frequency Identification (RFID) offers increased ability to supervise the flow of supplies. This in turn reduces waste and lessens need for on-site storage facilities (Ochiai 2010).

3.11 Success case: Continuum of care at Kameda Medical Center

Located in Kamogawa City at the southern part of Chiba prefecture in Japan, Kameda Medical Center makes up a 965-bed inpatient facility and a freestanding outpatient facility, with about 375 physicians working on a full time basis. Kameda has a history of over 350 years of medical treatment, ever since it was established in the Edo era. Dr. Takaaki Kameda is representing the eleventh generation of the Kameda line of physicians as the current Chairman of the Board. ”Kameda Medical Center” includes Kameda General Hospital, Kameda Clinic and Kameda Rehabilitation Hospital. One distinct feature of Kameda Medical Center is the emphasis on a holistic perspective called “Continuum of care”, in practice satellite clinics that can take care of rehabilitation, as well as preventative care in the form of gymnasiums. On average 3 000 outpatients' visits per day, many of which are international patients. In 2001, Kameda was placed as #4 overall among the top 100 hospitals in Japan on a Nikkei Business list. In 2009, Kameda became the first hospital in Japan to be accredited by the global standard of Joint Commission International (JCI).

Kameda has a strong patient centered focus as part of their business concept, with patient empowerment and full disclosure as examples of this. Added to this, they pursued objectives about disclosing and sharing of information within the working team, standardization, and improvement of quality of care through database. These factors led to the decision to incorporate IT into their structure. They started collaborating with IBM Japan in 1990 and basically designed a system from scratch. In 1995 they implemented this first generation electronic medical record (EMR) system into their organization. By 2000 they implemented an integrated medical information system and today Kameda is virtually paperless and filmless through a totally integrated electronic medical record system. Besides this, Kameda offer a bedside IT application where patients can access their own medical records, and also, in the vein, a system called PLANET – a web based medical

record, providing patients with access to their medical records anytime and anywhere (Kameda 2010).

3.12 Success case: Health care Information Technologist certification by Japan Association for Medical Informatics (JAMI)

A perhaps unique initiative to bridge the gap often described in eHealth between health practitioners, health care IT practitioners, and IT practitioners is ongoing in Japan since 2003 – see Figure 11. Emphasis is not only on basic knowledge from these three professional areas, but also specific communication skills that can be needed to work with collaboration and coordination.

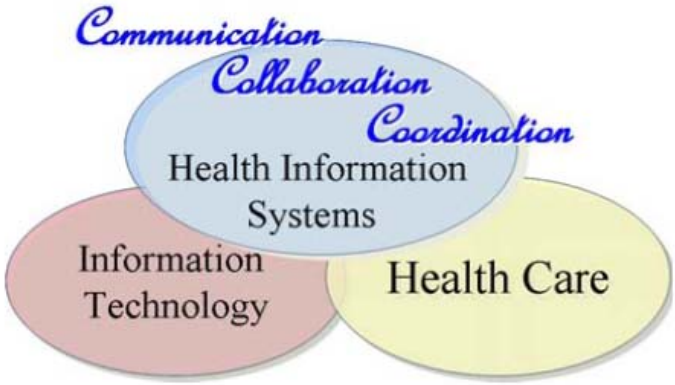

Figure 11: Linking three crucial competence areas for increased success rates in eHealth-projects. Source: JAMI (2009).

The Japan Association for Medical Informatics (JAMI) inaugurated the Health care Information Technologist (Health care IT) Certification in 2003, and JAMI Health care Information Technologist Fostering Taskforce (JHIFT) was established. The mission of the taskforce is to cultivate human resources in the field of health care information technology and support career advancement of health information professionals, both in health care sectors and industry in Japan. The taskforce is responsible for providing a comprehensive and coordinated approach to the Certification Program, and for administration and operation of the program. There are sub-committees in charge of curriculum development, examinations, tutorials and seminars, text books and e-Learning, and so on. The activities of the sub-committees are supported by about a hundred JAMI members.

The certification is intended not only for health care professionals but also for people from industry including software engineers, managers, vendors, or others, involved in the fields of health care. Students are also among the expected examinees. The first examination was given in August 2003 where the number of examinees was 3 521 (overall examination pass rate was about 28 %). Since 2003, certification examination is given annually, and as of Nov 2008, a total of 7 040 people are certified as Health care Information Technologists (JAMI 2009, Kimura 2010).

At the time of inauguration of the certification examination, it was planned to start certification for “Senior Health care Information Technologist (Senior Health care IT)” in five years. Senior Health care IT is positioned to be higher than Health care IT. The first Senior Health care IT certification examination was given in 2007. The examination consists of the first-stage and the second-stage, where the former is paper based test and the latter consists of a short essay and an interview.

3.13 Summary

Japanese Telemedicine and Robotics stand out – but it is in Medical Informatics where the most interesting changes as well as greatest impact on the health care system takes place.

Medical informatics progressed slowly from accounting towards patient-centered applications. Electronic Health Records (EHR) and Computerized Physician Order Entry systems (CPOE) are at the center of Japanese eHealth investments.

Despite the ambition, health care information computerization in Japan is behind schedule and Japan is lagging behind many developed countries. Health care information computerization in Japan is behind schedule because the introductory costs are high. Where adoption of Electronic Health Records has happened, positive results are abundant.

Standardization and consolidation is needed in Japan as elsewhere - open standards may be a way forward.

4 eHealth policy

4.1 Oversight: Important policy changes for eHealth

Already in 1993 the Health care Information Systems Advisory Committee, organized under Director General of Health Policy Bureau, Ministry of Health and Welfare (later Ministry of Health, Labor, and Welfare) was established. This was based on the understanding that information systems in health care would act as a social infrastructure.

Table 4 gives a timeline for major policy changes that have or will have impact on eHealth in Japan since 1993. Discussions as for potential changes by the new Japanese government since September 2009 are omitted on purpose due to lack of consistent information at the date of this report.

Table 4: Timeline of Japanese policy changes related to eHealth. Source: Adopted from Kimura (2006), Ministry of Health, Labor and Welfare (MHLW), & IT Strategy Headquarters.

Past major government activities for eHealth (especially EHR) are as follows:	
Health care Information Systems Advisory Committee	Oct 1993
Health care Information System Strategy 21	Jul 1994
New Health care Information System Joint Committee	Nov 1994
Research and Development for EMR (fund 800MJPY)	Jun 1995
EMR was authorized as Formal Document	Apr 1999
HELICS (Standard Board) was established	May 2000
eJapan Strategy	Jan 2001
IT Grand Design for Health care System	Dec2001
Aid Money for EMR Installation (half aid, total fund 20BJP) by MHLW	Jan 2002
Aid Money for Regional EHR (total fund 25BJPY) by METI	Feb 2003
Privacy Law	May 2003 (effective Apr 2005)
Project on Interoperability for Health IT	Jun 2004
New IT Reform Strategy by IT Strategic HQ, Prime Minister's Office	Jan 2006
Grand Design for Informatization of Health care, Nursing care, and Welfare Domains by MHLW	Mar 2007
Priority Policy Program	2007, 2008

Health care IT was then set as a key national priority in the New IT Reform Strategy of 2006. The 2001 IT Grand Design for Health care has laid the foundation to much later policy activities. In the Priority Policy Programs of 2007 and 2008, Ministry of Health and Welfare was told to execute policies based on the Grand Design for ICT in Health care of 2007, to review the achievements of the policies, to manage its advancements on an annual basis, and to reassess the grand design as needed. Several general IT-policy documents have also included strong emphasis on IT and health care. A selection of policies condensed directly from governmental translations into English will be presented in brief in the coming sections.

4.2 2001: IT Grand Design for Health care

Targets

- To provide practical strategies and objectives to achieve annual and numerical targets in order to promote information system.
- To present measures to achieve the objectives set for each phase of information system.
- Lay down an action plan that provides roles and targets for public and private sectors

Target by the end of the 2004 fiscal year:

- At least one institution in every secondary medical area across Japan should have an electronic medical record system.
- At least 60 % of the hospitals should have an e-claim system.

Target by the end of the 2006 fiscal year:

- On a national basis, at least 60 % of the hospitals with more than 400 beds and 60 % of the clinics should have an electronic medical record system.
- At least 70 % of the hospitals should have an e-claim system.

Policies

1. Standardization in health care
2. Infrastructure for information system
3. Implementation of model projects
4. Subsidy for introduction and maintenance of information system
5. Raising awareness

4.3 2006: New IT Reform Strategy

The subtitle for this policy was “Realizing Ubiquitous and Universal Network Society Where Everyone Can Enjoy the Benefits of IT” and ubiquity was the concept that set the tone also for IT health care related content.

This policy aimed at making a structural reform of health care though IT with full online processing of all medical insurance claims and lifetime self health care management (IT Strategic Headquarters 2006).

Targets

1. Drastically reduce health care insurance administrative costs through the complete computerization and online processing of medical insurance claims no later than the beginning of FY 2011 and use databases of medical insurance claim information for epidemiological purposes to promote preventive treatment and streamlining of national health care costs.

2. Build by FY 2010 the foundations for using individuals' health care information throughout their lifetimes, supporting self management by individuals of their health conditions and efforts to maintain and enhance health.

3. Promote remote health care to eliminate disparities in the level of health care among different regions including access to advanced treatments and employ terrestrial digital broadcasting to provide effective instructions and information to patients during emergencies.

4. Clarify the objectives of introduction and promote the widespread use of health care information systems including electronic medical records to enhance the quality of health care, ensure the safety of medical treatment, and encourage greater collaboration among medical institutions.

5. Promote comprehensive and effective computerization throughout the medical, health care, nursing, and social welfare fields.

Policies

1. Use of full online processing of medical insurance claims for medical, dental, and pharmaceutical service to reduce administrative costs and to promote preventive treatment.

2. Develop the infrastructure for using individuals' health care information throughout their lifetimes:

a) Establish systems (categories of data to be collected, standard data formats, management and operational methods, etc.) for the continuous collection and appropriate management of medical examination results in electronic form throughout patients' lifetimes by FY 2007.

b) Start development of the infrastructure for the utilization by individuals and insurers of health care information such as examination results collected in the form of electronic data (databases for managing health care information, functions for accessing one's own health care information using IC cards, etc.) by FY 2008 and promote widespread use by FY 2010.

c) Establish measures for using the collected health care information for the prevention of disease by FY 2010.

3. Realization of effective communications in health care;

a) Expand the scope of application of remote treatment technologies to a greater range of conditions to promote remote treatment services in isolated regions and outlying islands and encourage the development of use environments by FY 2010.

b) Conduct testing of interactive terrestrial digital broadcasting services and IC cards to provide pre-examination health care services such as emergency 21 treatment instructions when ambulances are requested and children's emergency health care consultation hotlines by FY 2007 and put such systems into practical use nationwide by FY 2010.

4. Development of health care computerization infrastructure;

a) Develop indicators for evaluating appropriately the need for and degree of use of computerization.

b) Introduce in most medical institutions with 200 or more beds comprehensive health care information systems (ordering systems, comprehensive electronic medical records, etc.), to increase operational efficiency, enhance health care safety, and provide diagnosis and treatment information (installation at institutions with 400 or more beds to be completed by FY 2008; installation at institutions with less than 400 beds to be completed by FY 2010).

c) At small scale medical institutions where the introduction of comprehensive health care information systems would lack cost effectiveness, use electronic medical records suitable for linking diagnosis and treatment information at low cost to achieve comprehensive health care collaboration by FY 2010.

d) Start the application by system venders of standard data formats and standard data exchange protocols to health care information systems in FY 2006 to achieve linking of diagnosis and treatment information among medical institutions and to lower system costs through the use of multi-vender systems.

e) Promote the utilization of ubiquitous network related technologies such as RFID tags by FY 2010 to achieve high levels of health care safety and higher administrative efficiency at medical institutions.

f) Develop health care public key infrastructure (HPKI) and safe and secure network infrastructure by FY 2008 to achieve safe exchange of and access to health care information including rigorous identification of individuals.

g) Chief information officers (CIO) in medical institution, human resource development.

5. Development of computerization promotion structures and adoption of a grand design for computerization.

4.4 2007: Grand Design for Informatization of Health care, Nursing care, and Welfare Domains

Targets

1. Individuals can acquire and manage their own health and clinical data electronically, and they could utilize the information to manage their health and/or provide health care providers to get proper clinical care. Insurers can utilize insured's health data or receipt data, and provide individuals with the information for proper guidance on their health.

2. Medical institutions will be informatized, and effectively keep and handle clinical information. It will help them provide quality of care. ICT should make it possible to improve the safety and effectiveness of physical and information distribution.

Furthermore, it will lead statistical and epidemiological use of clinical information towards evidence based medicine.

3. Health care and nursing care providers will securely share information such as allergy and/or chronic diseases of patients.

4. Health care institutions will transfer claim electronically, and reduce administrative costs related to this.

Policies

1. Standardization of nomenclature of clinical terms, codes, items, and architecture of various clinical documents to share information among health care providers.

2. Popularization of standard based interoperability among medical equipment and systems. Development of medical knowledge base.

3. Development of secure network infrastructure for clinical information distribution and sharing. Obtaining consensus from consumers and providers to reach the goal.

4.5 2007: Priority Policy Program

Targets

1. Individuals to take control over their own health information and by presenting them to doctors receive care that is particular to their own constitution and medical history.

2. Among different medical institutions, their own health and clinical data should be securely shared, in order for individuals to get seamless clinical care.

3. Targeting realization of evidence-based medical care with analysis of health care information, nationwide health care information infrastructure to safely facilitate use of health records of citizens should be developed.

Policies

1. A cross-boundary grand design for medical fields.

Promote organized and effective computerization for all medical, health care, nursing care, and social welfare fields.

2. Provide advanced preventive care, and realize high quality medical care, based on analysis of health information.

3. Realize full online medical insurance claims.

4. Realization of effective communications in health care.

Promote collaborative interaction between medical and health care institutions with remote care, telemedicine, etc.

(IT Strategic Headquarters (2007)

4.6 2008: Priority Policy Program

Targets

As a measure, Nationwide Health care Information Infrastructure, to safely facilitate use of health records of citizens, should be developed.

Such an infrastructure will make the following possible:

1) Individuals, to take control over their own health information and by presenting them to doctors, receive care that is particular to their own constitution and medical history.
2) Among different medical institutions, their own health and clinical data should be securely shared, in order for individuals to receive seamless clinical care.
3) Evidence-based medicine (EBM) with analysis of health care information should be realized.

Policies

A. Computerization of medical, health care, nursing care, and social welfare fields

1. A cross-boundary grand design for medical fields.
Promote organized and effective computerization for all medical, health care, nursing care, and social welfare fields.

a. Steady execution and reassessment of the grand design for computerization (Ministry of Health, Labor, and Welfare)
b. Evaluation conducted by Health care Evaluation Committee (Cabinet Secretariat)

2. Support advanced preventive health care by utilizing health information and high quality medical care realized by medical institutions.

Health Information scatters, such as clinical care history, prescriptions, drug history without prescriptions, medical insurance claims, and periodical medical checkup results.

Provide by FY2010, an infrastructure for managing “lifetime” self health care information and support people to utilize their own health information to enhance well-being, and also realize advanced health guidance by insurers. Foster growth of medical information systems such as electronic charts, and significantly promote the advancement of medical quality, the securing of medical safety, the coordination between medical institutions, and the utilization of national health information.

(1) Establish a common infrastructure for the computerization of health care.

(a) Operate the authentication infrastructure for health care professionals. (HPKI: Health care Public Key Infrastructure)
(Ministry of Health, Labor and Welfare, Ministry of Internal Affairs and Communications, and other relevant ministries)

(b) Create a safe and inexpensive large capacity network. (Network security related)
(Ministry of Health, Labor and Welfare, Ministry of Internal Affairs and Communications, and Ministry of Economy, Trade and Industry)

(c) Promote standardization of medically related computerization.
(Ministry of Health, Labor and Welfare, and Ministry of Economy, Trade, and Industry)

(2) Establish medical information systems within hospitals and localities, and promote its interconnection.

(a) Support computerization in medical institutions.
(Ministry of Health, Labor and Welfare, and Ministry of Economy, Trade and Industry)

(b) Promote information linkage between medical institutions within localities. (ministry of Health, Labor and Welfare, Ministry of Internal Affairs and Communications, Ministry of Education, Culture, Sports, Science and Technology, and Ministry of Economy, Trade and Industry)

(3) Analyze health information on a nationwide scale and promote utilization of results.

Establish an evaluation structure and the role of nationwide health information that should be collected. (Ministry of Health, Labor and Welfare)

(4) Promote the collection and utilization of information for preventive health care by individuals.

Establish a system that enables personal management of one's health information to utilize in health monitoring, etc. (Ministry of Health, Labor and Welfare)

3. Realize full online medical insurance claims.
By early FY2011, we will streamline national health care costs by greatly reducing the cost of health care insurance administration as a result of full online preventive care by epidemiologically utilizing the databases accumulated from medical insurance claims.

(1) Promote full online submission and reception of medical insurance claims.

(a) Full online exchange of medical insurance claims between medical institutions, pharmacies and screening and payment institutions.
(Ministry of Health, Labor and Welfare)

(b) Full online exchange of medical insurance claims between screening and payment institutions and insurers.
(Ministry of Health, Labor and Welfare)

(2) Encourage a smooth transition to full online processing of medical insurance claims.
(Ministry of Health, Labor and Welfare)

(3) Install standard codes for billing computer systems.
(Ministry of Economy, Trade and Industry)

(4) Simplification/computerization of the medical treatment fee scale.
(Ministry of Health, Labor and Welfare)

(5) Establish an instant online reference system for the eligibility of insured persons at medical institutions.
(Ministry of Health, Labor and Welfare)

4. Realize more effective communication in health care.
Remote health care will be promoted and disparities in medical standards between localities eliminated, including advanced treatments. Terrestrial digital broadcasting, etc. will also be utilized, to realize effective patient guidance and consultation during emergencies.

(1) Strengthen collaboration between medical institutions and promote diagnostic assistance in the remote health care field. (Ministry of Health, Labor and Welfare, and Ministry of Economy, Trade and Industry)

(2) Utilization of ubiquitous network technology in health care and medical fields. (Ministry of Internal Affairs and Communications, and Ministry of Health, Labor and Welfare)

(3) Promotion of telemedicine for collaborative medical care in regions. (Ministry of Internal Affairs and Communications, Ministry of Health, Labor and Welfare, Ministry of Economy, Trade and Industry)

(IT Strategic Headquarters (2008))

4.7 Comment on policy as tool

Described policies crafted by the Japanese bureaucrats and politicians have most probably acted as guidelines for individual hospital managers as well as other public and private initiatives. What is beyond any doubt is the effect of financial incentives on the health care system in general and also specifically on eHealth.

One major financial incentive structure has been described in this report in the form of the reimbursement scheme of the National Health Insurance. Additionally a number of government subsidies have proven to progress changes into better utilization of eHealth in Japan.

For example, in 2001 Japan initiated the “Grand Design for the Development of Information Systems in the Health care and Medical Fields” through the Ministry of Health, Labor, and Welfare. At that time, fewer than 2 percent of hospitals in Japan used EHR systems. One goal of the Grand Design was to increase the use of EHR systems in large hospitals to 60 percent by 2006.

Although the overall rate of adoption of EHR systems by hospitals in Japan reached just 10 % in 2008, the adoption rate among larger hospitals is significantly greater at 31.2 %. Much of the progress in the adoption of EHR systems among larger hospitals in Japan can

be credited to government subsidies to 249 hospitals, almost all of them large hospitals. Smaller hospitals did not receive government support nor have efforts been made to subsidize these hospitals (Castro 2009, Yasunaga 2007). Currently, providers receive a bonus payment on the order of 25 cents per patient (30 yen) for adopting health IT. As noted earlier, EHR adoption rates among primary care providers in Japan is only around 10 %. In cases where Japan has used incentives it has seen more success.

> ***"2010 is a turning point for implementing effective IT-systems in health care because of the economic downturn."***
> *Masanori Akiyama, M.D., Ph.D., Professor, Tokyo University Policy Alternatives Research Institute*

Like other countries, the economic stimulus packages in Japan following the recent global financial crisis are including investments in health care. For the health informatics domain, there are two large subsidies proposed (Kimura 2009).

One is to provide "last mile" optic fiber network to all hospitals in Japan. Some of Japan's local 9 000 hospitals still only have a slower network infrastructure. The other is to support regional health care allies, for the regional core hospitals to help more local hospitals' activities. Many applicants are proposing various aspects of health care. Some plan prenatal period information sharing, others offer image examination remote reading. Positive outcomes of these projects are anticipated in the coming years.

Some active practitioners in the field of eHealth see the policy changes and reconsiderations in the wake of the economic downturn in combination with the cabinet change in Japan in 2009 as a great opportunity to propel Japan into a leading eHealth-nation. If planned revisions of both the National Health care Insurance system as well as the Medical Health Insurance coincide, then this could create the necessary climate for top-down policy changes in order to really push usage of IT in health care. The necessary technology is there but regulation and reluctance from physicians is hindering adoption of IT.

4.8 Summary

At least since 1993 active policy work has been done for integrating information systems in health care as a social infrastructure. Health care IT was a national priority in the New IT Reform Strategy of 2006. The 2001 IT Grand Design for Health care has laid the foundation to much later policy activities. The wake of the economic downturn in combination with the cabinet change in Japan in 2009 may rattle this clear emphasis, but as for now the continuous policy has been to firmly connect IT and health care, as well as to propel health care as one of the most important application areas for IT.

5 Implications for Sweden and for future studies

Recommendations:

1. Investigate closer if selected Japanese cost control mechanisms can be introduced in Sweden, but with close attention to risk of reduced innovation.
2. Inform Swedish eHealth companies about the large Japanese market still in a process of adopting eHealth application on a large scale.
3. Continue learning from the top examples of running Japanese eHealth applications – these are found in a few major hospitals and clinics.
4. Follow up on possibilities to introduce a Health-technician certification. The key notion is that medical systems should be developed in cooperation with medical professionals, not by IT-professionals working alone.
5. Monitor changes in Japanese law for privacy of patient data in order to strike the right balance of secondary use of clinical data for Evidence Based Medicine practices.
6. Study and implement lessons from the extensive preventive care and checkups in Japan in order to shift from reactive to preventive care. Especial attention should be given to learn what incentives that are working.

Comment on the opportunities for Swedish eHealth companies

Given the provided background and analysis of the Japanese health care system, there should be a number of opportunities for Swedish firms active in eHealth. Not only in providing major solutions to care givers, but also e.g. online services directly aiming at Japanese care-takers which are increasingly demanding online tools and services connected to health care.

A Japanese strong governmental emphasis on information systems in health care as an important part of the social infrastructure, in combination with an already substantial and, due to demographic variables, growing market for eHealth solutions, makes continued future growth in Japan likely. Also the drawbacks have been reported on in this report, e.g. the compliance issues connected to the national insurance reimbursement system as well as sometimes cumbersome regulations. In general, Western firms are reporting on Japan as being a tough market to enter due to the Japanese language and simply very demanding quality expectations. But once successful the profit margins are internationally very attractive.

Looking forward, the knowledge from decades of IT investments in health care in Sweden, and more recently connected to new approaches of patient centered processes in health informatics could be capitalized by Swedish firms in Japan. There is also an outspoken and active interest in the Swedish health care system among Japanese decision makers.

One concrete and recent success case is the Swedish company Sectra, active in medical systems and secure communication systems. The company's systems are already installed in most major countries in Europe and North America. In April 2010 Sectra has also entered the Japanese market through an agreement with Royal Philips Electronics to distribute its picture archiving and communications system across Japan. The agreement actually rebuilds a partnership that ended between the two companies in 2005, which saw

Sectra and Philips work together to become one of the leading picture archiving and communication systems providers in Japan. This example indicate the everlasting truth that internationalization into Japan takes time, and that one way to approach Japan is though a larger existing customer – so called client-following.

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