A High Road to Dutch Healthcare Reform

Chapter · April 2011

DOI: 10.1007/8754_2011_19

CITATIONS
0

READS
140

3 authors:

A. C. M. Dumaij
Delft University of Technology
147 PUBLICATIONS **663** CITATIONS
SEE PROFILE

R. Mooij
TNO
4 PUBLICATIONS **1** CITATION
SEE PROFILE

Jos LT Blank
Delft University of Technology
173 PUBLICATIONS **784** CITATIONS
SEE PROFILE

A High Road to Dutch Healthcare Reform

A. C. M. Dumaij, R. Mooij and J. L. T. Blank

Abstract This study aims to assess the adoption potential of healthcare innovations in their infancy. Such an assessment is useful, since the context of the innovations change rapidly as a result of the health care reform process. Successful innovations comply to a complex system of social, technical, and financial attributes. First we narrow down the vast amount of innovations in healthcare into a review set of innovations and select attributes of successful innovations from literature. Next the compliance of the review set with the attributes is assessed by an expert panel. There exists no metric to objectively measure compliance and empirical data analysis cannot be performed because there are no data. Six innovations with high expectations were assessed: smart homes, eHealth, electronic health records, self management, robotic assisted devices and online health companion contacts. None complied convincingly to all attributes. Innovation in healthcare appears as a multi-level, multi-sector, multi-disciplinary transition and needs both successes and failures to make progress.

Keywords Healthcare · Innovation · Adoption · Reform

1 Introduction

"The flying Dutchman reigns European healthcare as the inequity gap grows". The most remarkable outcome of the Euro Health Consumer Index 2009 report [1] is no

A. C. M. Dumaij (✉) · J. L. T. Blank
Innovation and Public Sector Efficiency (IPSE) Studies,
Delft University of Technology, Delft, The Netherlands
e-mail: a.c.m.dumaij@tudelft.nl

A. C. M. Dumaij · R. Mooij
TNO, Delft, The Netherlands

Commun Med Care Compunetics (2011) 3: 1–14
DOI: 10.1007/8754_2011_19

Published Online: 30 April 2011

doubt the outstanding position of Dutch healthcare, indicating that the ongoing healthcare reform now pays off. The reform creates a strategic role for the health consumer and as such it creates a new model for healthcare delivery. The hypothesis is that the costs of this new model are lower than the costs of supply-driven healthcare, with similar quality of care. The Netherlands started to work on this patient empowerment model early, which now clearly pays off in many areas. However, the Euro Health Consumer Index also shows that there is no evidence to support the cost-reducing hypothesis. Actually, the Netherlands has risen in healthcare expenditure to the highest per capita spend in Europe. The expenditure increased in the period 1972–2003 0.5% faster than other economies and the price grew 1.2% more than the price of gross domestic product (GDP). Growth that will increase to approximately 15% of GDP in 2040 under the present healthcare policy [2].

One of the most challenging trends in today's Dutch society is the increasing incidence and prevalence of chronic health conditions. Expected increases in prevalence of 40% in 2025 based on the medium variant population projection compared to 2003 are no exception [3]. The increases are mainly a result of the ageing population: more people get older and people live longer. Parallel to this trend is a relative decrease of employees available to work in healthcare: there are (relatively) less young people. Healthcare provides 13% of Dutch employment, not taking into account jobs in supply industries (pharmaceutics and medical technology). The number of full time equivalent (FTE) jobs increases at an annual rate of over 3%, implying that in 2020 480.000 extra FTEs are needed compared to the 2010 level of about 1.000.000 FTEs [4]. Satisfaction from working in healthcare is very much under pressure as a result of increasing bureaucracy and work load. The result is obvious: prevention of disease is necessary and integrated prevention and care has to be delivered in a more—economical—efficient way, making optimal use of the self management potential of patients.

As of 2004, the Dutch government has spent hundreds of millions of Euro on research and development programmes to improve quality, safety, accessibility and cost containment in both the cure and care sector. In addition, health insurance organisations, the medical technology industry, the IT sector, and banking are developing private and public–private initiatives to innovate within the new healthcare framework. Despite the numerous innovation developments in healthcare, little attempt has been made to assess the adoption potential of innovations in their infancy. Such an assessment is useful, since the context of the innovations change rapidly as a result of the health care reform process.

1.1 Objective and Outline of this Chapter

This study aims to assess the adoption potential off healthcare innovations in their infancy.

The core of this chapter takes off with an outline of our research method to narrow down the vast amount of innovations in healthcare into a review set of

innovations, to select attributes of successful innovations from literature, and to assess compliance of the review set of innovations with the attributes. Next, an overview is presented of the set of innovations including first evaluation results. The assessment results are presented and discussed.

2 Research Methodology

First, a selection of innovation projects for the review is based on the following criteria:

1. The project has started in the Netherlands after the onset of healthcare reform in January 2006;
2. The project has intended impact at organisation (meso) level and as such makes use of technical and social innovations (micro) within the limits of the healthcare system (macro);
3. The study of the project examines the adoption of the innovation taking place in the healthcare-providing organisation;
4. The project aims to positively effect productivity, quality of care, or quality of labor;
5. The study is empirical in nature and demonstrates quantitative analysis.

Keywords to derive at these projects and studies are like (in Dutch translation and synonyms) healthcare, cure, care, chronic disease, improvement project, transition experiment, innovation, acceleration, breakthrough project. Search strings are constructed from these keywords. The search strings are fed into the internet search engine Google with constrained to Dutch websites. Also a structured public database with innovation descriptions is consulted [5].

Secondly, we draw attributes of successful innovations from healthcare innovation literature [6]. These attributes consist of the standard innovation attributes [7] extended with financial [8] and organisational [9] attributes. Compliance of the innovations with the attributes is given on a three-point scale (green: compliant; yellow: undecided; red: non-compliant) by an expert panel. The panel consisted of a total of eight experts from the field of general medicine, geriatrics, diabetics, nursing, human–machine interfacing, psychology, finance and accounting, computer science, and health policy. All experts have at least 12 years of experience with innovation in healthcare. The compliance assessments were performed in a session with all experts present after discussion until consensus is reached. Innovations with many green labels are expected to be adopted more rapidly than other innovations. Since none of these innovations exist for more than 3 years on a reasonable scale, no empirical analysis can be performed. The list of attributes is shown in Table 1.

Table 1 Innovation attributes with factors that influence success and failure of diffusion [6]

Attribute of innovation	Factors for succses and failure
Relative advantage	User ability to self-reliant use
	Ethics of diffusion
	Clinical relevance
	Degree of user reward
	Convenience to the patient
	Following on demographics and geography
	Societal impact of diffusion
	Urgency of diffusion
Trialability	Effects of diffusion
	Market intelligence
Observability	Participation of the innovator's network
	Promotion and publicity
Compatibility	Willingness of the professional to adapt behaviour
	Fit with conception of the job of the professional
	Unambiguous objective of the innovation
View of opinion leaders	Perceived support of colleagues
	Perceived support of other professionals
	Perceived support of management
	Perceived support of board of directors
	Willingness of the user to adapt behaviour
	Responsibility of the professional over the innovation
	Formal support by opinion leaders within the organisation responsible for diffusion
Public information	Visibility of outcome
	Scientific standards used
	Focussed target group
	Evidence supporting outcome
Homogeneity of groups	Unambiguous requirements of the patient
	Patient support
	Patient satisfaction
	Patient control over healthcare delivery
	Patient usability
	Unambiguous requirements of the professional
	Unambiguous requirements of the social network of the patient
Standards, roles and social networks	Legal framework supporting diffusion
	Comprehension of diffusion procedures
	Presence of similar innovations
Technical fit	Supporting logistic information systems
	Open technical standards
	Standardisation of technology
	Reliability of technology
Adjustability	Degree of adjustability to the patient's situation
Financial fit	Budget for diffusion
	Materials and equipment
	Pay-back of budget for diffusion
	Market stability during diffusion

(continued)

Table 1 (continued)

Attribute of innovation	Factors for succes and failure
Competition	Time available to the innovators
	Ownership
	Contribution to efficiency in healthcare
Support organisation	Size
	Structure
	Limited staff turnover
	Number of staff
	Limited administrative load
	Involvement of diffusion co-ordinator
	Experience
Co-operation	User involved
	Professionals involved

3 Innovations

3.1 Aging in Place

Aging in place is a widely recognized social trend requiring healthcare and social support to the elderly [10]. Here we find a kaleidoscope of social and technical innovations under the umbrella terms ambient assisted living and smart homes [11]: screen-to-screen consultation (camcare), assistive devices (to navigate through traffic to put on elastic stockings, to prevent decubitus, to stimulate motion, to wash with dry hand, to prevent falling, to comply to medication prescription, to plan healthcare delivery, etc.), home access management, and also means to stimulate self management and patient empowerment, automated time registration of care delivered, nursing home expertise delivered at home and further differentiation of jobs and responsibilities, involvement of informal care providers, and so on. Van den Broek et al. [11] observe the following about:

- Primary stakeholders (the end users); a general reluctance to use technology, unclear evidence of real benefits of ambient assisted living; an inability to use the appropriate technologies;
- Secondary and tertiary stakeholders (the service providers and industries that supply goods); misunderstanding of the requirements and objectives of devices and services; the lack of standards and references for technological design; the partial broadband coverage in geographic areas;
- Quaternary stakeholders (working in economical and legal context of ambient assisted living); diversity of social, welfare and healthcare systems in Europe, lack of visible value chains, lack of standards and certification, funding and reimbursement of services.

The Dutch Healthcare Inspectorate concludes that a care provider cannot be replaced by technology, that a careful risk assessment is essential with respect to

technical infrastructure, suitability of the care processes, training and communication of the provider [12]. Also, the inspectorate reports that implementations are rarely evaluated so effects and user experiences cannot be reported.

3.2 eHealth

eHealth is defined as the services that empower the patient to take responsibility in his or her prevention, cure and care of disease or disability by means of information and communication technology. Types of interventions include remote monitoring of chronic heart failure and diabetes, secondary prevention of coronary heart disease, home monitoring of respiratory conditions and online psychological interventions (e.g., drugs and smoking cessation, anxiety disorders). Recent studies of eHealth for the chronic diseases diabetes management (DBM), chronic heart failure (CHF), and chronic obstructive pulmonary disease (COPD) conclude that healthcare expenditure decreases and quality of life improves when used in combination with (electronic) coaching and self management [13–15]. Adoption of eHealth services will be improved when delivered in combination with other online services, like banking, in a public–private business model. The financial structure of healthcare complicates or even obstructs reimbursement of healthcare services. Also, the myriad of technological standards seriously hamper system-to-system interoperability while progress in harmonization of standards is slow [16].

There are a huge number of studies more or less addressing the effects of eHealth. However, there are only a limited number of studies that systematically analyze cost-benefits from empirical studies and also find positive effects on productivity. A systematic review yields that home telemonitoring of respiratory disease results in an early identification of determinants in patient conditions and control of symptoms, positive attitude of patients and receptiveness [17]. Robust study designs are missing and evidence of effects remain preliminary. Remote monitoring of community dwelling patients with CHF has a positive effect on clinical outcomes and secondary prevention [18–20]. Economic data are missing.

3.3 Electronic Healthcare Record

Electronic healthcare record (EHR) is an innovation in the centre of the political arena for over 20 years. The government views the EHR as an instrument to improve efficiency, quality and safety. The healthcare professionals consider it as administrative burden that potentially makes patients more independent of them. The patients are surprised and confused about the slow rate of implementation. Recent pilot implementations at a national scale reveal imperfections that can be fixed from a technical point of view [21]. The Dutch legislator rejected a law for implementing the EHR nationwide, based on potential violation of privacy rights in April 2011.

3.4 Self Management

In healthcare prosumerism is synonymous with an active form of self management, in the literature also referred to as self care [22]. Self management was introduced by Lau who defines it as stimulating the responsibility of the patient with the aim to maximise his or her potential to health and well being [23]. Self management is a new dimension to the concept of patient empowerment in which a patient co-operates with his or her healthcare practitioner to improve health outcomes [24, 25]. It supports the Copernican transition to bring the patient rather than the healthcare provider to the centre of healthcare [26]. The focus being not on applying medical but behavioural interventions. Self management can only be performed when the patient has a sufficient understanding of his or her health conditions [27]. Also, informed decision support or coaching is a critical aspect of self management, regardless of the fact that the support comes from a peer, health companion, practitioner or (medical) device [28–32]. Self management itself is a dynamic process and it affects the utilization of services, patient satisfaction, and health outcomes. Having a valid and reliable measure is important to understanding the effects of self management. However, there is still a lack of a standardized measurement instruments for the empirical assessment of self management in a general patient population. A number of recent initiatives are taking place to develop self management measurement instruments for the general population. E.g., a self management instrument is proposed for the general population covering six domains such as knowledge, access, advocacy, decision making, health status and outcomes, and literacy [33]. Recent studies reveal that most somatic patients choose for self management with support of a health practitioner who is co-operative, empathic and communicative [34]. Operational guidelines for practitioners are available [35] based on motivational interviewing techniques [36].

3.5 Robotic Assistive Devices

Gates predicts an important role for robotics in healthcare due to recent technological developments (faster and cheaper microprocessors, sensors and actuators) and similarities between the development patterns of the computer business 30 years ago and the robotics industry nowadays [37]. Butter et al. extensively investigated contemporary R&D efforts in health and medical robotics and developed a roadmap for the development of robotics in medicine and healthcare [38]. They identified 21 main innovation areas that can be considered key product/market combinations from which six representative areas can be regarded ripe for further investigation and road mapping. A framework to identify barriers to the development of robotic assistive devices is available [39]. Most constraining economic factor is the lack of risk capital. This limited availability is probably a

result of the reserved attitude of financial organisations towards health robotics manufacturers. This attitude is explained by a combination of high initial investment costs and insecurities of getting return on these investments. A possible public intervention to stimulate the development of health robotics is increasing the availability of risk capital. This can be done by stimulating pilot studies to measure the additional value of robotic technology in healthcare, thereby increasing the chance of reimbursement. Although supporting advanced development and commercialisation phases requires high financial capital with uncertain return, the actual production and launch of products increases public awareness of the potential benefits of health robots and can stimulate financial organisations to also get involved in development. Not only financial support is needed. National agreements on key research themes and improved focus are necessary as well. Co-operation agreements on certain research areas among active health technology companies could probably accelerate product development. This can be achieved by stimulating innovation networks and facilitate in bringing partners together.

The most important technological barrier concerns difficulties in technological feasibility. Due to a lack of standards and platforms in health robotics, developers have to begin from scratch when developing an application. This leads to long development times accompanied with high development costs. The most impeding firm capability is a lack of contact with professional end users and patients. A possible public intervention could be the stimulation of innovation networks and to facilitate connecting partners in development.

The most important legal and political barrier is the lack of reimbursement regulations of health robotics. This insecurity contributes to the reserved character of financial organizations to invest in health robotics. Reimbursement problems evolve from a not yet set balance between clinical benefit of health devices on the one hand and cost-effectiveness studies of new health devices on the other. Accurate reflection of the costs of innovative health devices can contribute to develop more accurate estimates of device acquisition costs and to use those estimates to develop new rates. Another remarkable conclusion in this category of barriers is the relative limited influence of difficulties with clinical trials on the product's innovation process. This limited influence is caused by the limited number of unknown factors in health device development compared to clinical development of drugs in the pharmaceutical- or biotech- industry.

Finally, analysis of the user barriers showed that the complexity of integrating robotic products in the existing environment has a significant influence on the product innovation process. Active involvement of and communication with all future users of the robotic devices can prevent most of the implementation problems. It appears crucial to take into account technical, organizational and human factors in the innovation process.

After analysing the influence of the different barriers we can conclude that economic, technological and firm capability barriers have more influence on the product innovation process than the legal, political and user barriers do. Clear policy recommendations might improve the innovation climate in the robotic

health device sector, which in general shows great potential. Last but not least, avoid pitfalls in the road from idea to certified product while innovating medical devices [40].

3.6 Online Health Companion Networks

A comprehensive analysis describes the factors that influence online health companion contact use among people with DBM, CHF, asthma/COPD, rheumatic diseases, renal failure or chronic muscle disorders [41]. Respondents of their study are characterized as follows: they are likely to be a woman; aged around 44; married; Dutch; internet users; diagnosed with rheumatic disorders, asthma or COPD and they tend to have lower incomes compared to the general Dutch population. Respondents report privacy concerns and negative stories as barriers for adoption and disadvantages of using online health companion contact. Additionally, concerns regarding the quality of information are perceived as annoying. Benefits mainly concern the possibility to meet people in a similar situation, recognition for their health problems and obtaining information and sharing experiences. The combination with other healthcare services is a determinant for online health companion contact use as well. If decided to use online health companion contact, the selection of a specific website is among others based on technological preferences. Important characteristics of a website include closed access; discussed topics; easy use; type of users and a clear structure. In general, respondents prefer websites facilitated by a forum and organized by patient organizations. Online health companion contact can increase quality of life and self-management according to experiences of the respondents. They perceive to be better informed, better able to accept their disease, better capable to ask questions to medical doctors, better deal with their situation and to receive an increased amount of social support.

4 Results and Discussion

The values given to the attributes of the innovations by the expert panel are shown in Table 2.

Successful innovations should comply to attribute factors, i.e., high relative advantage, trialability, observability, compatibility, supporting view of opinion leaders, observability, homogeneity of groups, building on standards, supporting roles and social networks, technical fit, adjustability, financial fit, competition, strong support organization and co-operation. Although there are no metrics to measure and compare attribute factors, the compliance should be as complete as possible. Critical conditions for successful implementation of innovations are: maintain innovation instruments, active management involvement and commitment, work by method,

Table 2 Expert rating of attributes of innovations in the Netherlands on a 3-point scale (green: positive; yellow: undetermined; red: negative)

Attribute of innovation	Smart homes	eHealth	EHR	Self management	Robotic assiste	Online consumer
Relative advantage						
Trialability						
Observability						
Compatibility						
View of opinion leaders						
Public information						
Homogeneity of groups						
Standards, roles and social networks						
Technical fit						
Adjustability						
Financial fit						
Competition						
Support organisation						
Co-operation						

include the project manager in the management of the organization, be proactive and creative, measure progress in a simple way, encourage informal ambassadors, communicate with images, seek interaction and reflection, consider the project in the context of the organization, keep the materials and appliances in mind, and negotiate.

Many evaluation studies fail due to poor data collection, missing data and poor methodology [42]. This is not surprising, since innovation as a process comes with a rambling and excessive set of objectives, implementation methods, structures, timelines and finance, often claiming the same resources (personnel, clients, technology, finance). Sometimes objectives are even opposing each other. Objectives are rarely framed in a set of institutional instruments. Especially technical and social innovations are seldom thoroughly evaluated on efficiency effects. Implementation methods are usually practical rather than evidence-based. Transitions are rarely managed processes following the "new rules of the game" rather than pushing forward the "old rules of the game". Innovation implementation programmes usually start with smart objectives and end with enthusiasm but poor results [43]. The actors involved in diffusion of innovation are knowledge institutes and experts, branch organizations, occupational groups, patients and clients, administrators, government policy makers. They come in a variety of combinations and levels of commitment to the innovations. It takes great co-ordination effort to define and create win–win objectives and to derive new infrastructure when policies change [44].

Culture is a key characteristic of an organization or sector and has massive influence on success and failure of innovation. It is argued that creating an innovation culture is a dynamic process in which areas of tension and fundamental innovation dilemmas should meet rather than follow a recipe to implement role models and towards success criteria [45]. Four areas of tension and nine innovation dilemmas are described as follows [45]:

- Market versus technology;
- New versus old problem solving approaches;
- Structured evaluation and monitoring of innovation versus go-with-the-flow way of innovation;
- Freedom versus responsibility in the innovation process.

The innovation dilemmas are:

- Identification with present culture versus openness to diversity;
- Incremental versus radical innovation;
- Technology push versus market pull;
- Large versus small;
- Closed versus open innovation;
- Egalitarian versus hierarchical;
- Process directed versus room for creativity and entrepreneurship;
- Individual versus team performance;
- Short term versus long term.

Making the innovation dilemmas explicit does right to the complexity of innovation and provides a basis for choice. It makes obvious that there exists no single best strategy and that organizations and governments should apply trial and error strategies to make best possible choices.

National programmes create awareness for quality and innovation, and yield new ideas and methods to build new capacity to improve quality in both care and cure sector [46, 47]. The programmes aim to increase productivity in the care sector, using collaborative breakthrough methods and campaign methods. They are needed to trigger a new area of systematic improvement with a new body of knowledge, competences and expertise. Lessons are learned about improvement methods (e.g., plan-do-check-act cycles), internal structure, competencies of implementation directors, evaluation methods, and dissemination and assurance methods. Further beneficial impacts are developing acceptance for and some implementation of standardized measuring and improvement instruments. A programme to develop and introduce integrated reimbursement for diabetes care yielded a model for functional funding [46] and a Better Care Academy was established [48]. However, none of the nationally set targets were achieved as a result of over-ambitious goals, underperforming improvement teams, or inadequate timescale as a consequence of annual budgeting. Progress in projects was delayed by problems in identifying best practices and resistance to improving productivity on the part of caregivers. The resistance was fueled by concerns about diminishing quality of care. Also, programmes to improve dementia care had

initially no or limited effect on care from both the caregiver and client point of view due to slow start and lack of inclusion of regional co-operations. A rudimentary cost effectiveness analysis yielded an increase of effort by the caregivers for which there is no reimbursement. All innovation projects on mental diseases failed to commit primary healthcare providers, except for the case of anxiety disorders. This is attributed to the fact that there is little co-operation among caregivers and little integration of care processes [46]. Further causes reported to fail implementation are personnel switch, weak competence mix, poor understanding of output and outcome, lack of communication skills and implementation methods, unrealistic assumption that the 20/80 rule (tipping point) applies, and weak security of results.

5 Conclusion

Evaluation of innovations in their infancy is useful since the context of innovation is under reform. Successful innovations comply to a complex system of social, technical, and financial attributes. There exist no metric to objectively measure compliance and empirical data analysis cannot be performed because there are no data. Six innovations with high expectations were assessed: smart homes, eHealth, electronic health records, self management, robotic assisted devices and online health companion contacts. None complied convincingly to all attributes. Innovation in healthcare appears as a multi-level, multi-sector, multi-disciplinary transition and needs both successes and failures to make progress.

References

1. Björnberg A, Garrofé BC, Lindblad S. Euro health consumer index. Brussels: Health Consumer Powerhouse; 2009. ISBN 978–91-977879–1-8.
2. Douven R, Ligthart M, Mannaerts H, Woittiez I. Een scenario voor de zorguitgaven 2008–2011. Den Haag: CPB; 2006. CPB document 121, ISBN 90–5833-278–0. (In Dutch).
3. de Hollander AEM, Hoeymans N, Melse JM, van Oers JAM, Polder JJ. Zorg voor gezondheid. Volksgezondheid Toekomst Verkenning. Bilthoven: RIVM; 2006. RIVM report number: 270061003, ISBN-10: 90-6960-148-6. (In Dutch).
4. De verzorgingsstaat heroverwogen. Over verzorgen, verzekeren, verheffen en verbinden. Den Haag: Wetenschappelijke Raad voor het Regeringsbeleid, WRR report number 76. ISBN 978-90-5356-926-9. (In Dutch).
5. http://www.zorginnovatieplatform.nl. Visited on April 16, 2010. (In Dutch).
6. Oirschot van R, Sooneus E, Bake J, Kroon R. Kennis(in)kaart. Succes- en belemmeringsfactoren voor het versnellen van opschaling van innovaties. Den Haag: Alares; 2010. report number 100422 ZIP ES. (In Dutch).
7. Rogers EM. Diffusion of innovations. New York: Free Press; 2003. ISBN 978-0-7432-2209-9.
8. Cain M, Mittman R. Diffusion of innovation in healthcare. Oakland: California Healthcare Foundation; 2002. ISBN 1-929008-97-X.

9. Ottes L. Verspreiding van innovaties: stimulansen en barrières. In: Weten wat we doen. Verspreiding van innovaties in de zorg. Zoetermeer: Raad voor de Volksgezondheid en Zorg; 2005. ISBN 90–5732-1521. (In Dutch).
10. Blanson Henkemans OA, Alpay LL, Dumaij ACM. Aging in place: self-care in smart home environments. In: Al-Qutayri MA, Editors. Smart Home Systems. Olajnica: In-Tech; 2010. p. 105–120.
11. van den Broek G, Cavallo F, Odetti L, Wehrmann C. Ambient assisted living roadmap. Berlin: VDI/VDE-IT AALiance Office; 2009.
12. Toepassing van domotica in de zorg moet zorgvuldiger. Den Haag: Dutch Healthcare Inspectorate. IGZ reference number 09–57, 2009. (In Dutch).
13. Maas A, Mooij R, Bangma M, Rietkerk O, Berkers F, Verhagen P, Blanson Henkemans O, Pathuis W. Bruggen slaan tussen gezondheid, zorg en vrager. Delft/Leiden: TNO; 2009. report number 34999. (In Dutch).
14. Rövekamp AJM, Valentijn P, Mooij R. eHealthNU. First results from literature and interviews. Leiden: TNO; 2010. (In Dutch: eHealthNU. Eerste resultaten op basis van literatuur en interviews).
15. Landewé C, Philippens M, van Oort G. Inventarisatie in de diabeteszorg. Een overzicht van ervaren barriers, mogelijke oplossingsrichtingen en gewenste functionaliteiten. The Hague: KPN; 2010. (In Dutch).
16. Dumaij ACM, Freriks G. Towards developing a coherent healthcare information infrastructure. In: eHealth in Belgium and in the Netherlands, Proceedings of MIC2002, IOS-press Studies in Health Information and Informatics, vol 93, ISBN 0926-9630, (2002) p. 1–7.
17. Jaana M, Pare G, Sicotte C. Home telemonitoring for respiratory conditions: a systematic review. Am J Manag Care. 2009;15(5):313–20.
18. Clark RA, Inglis SC, McAllister FA, Cleland JG, Stewart S. Telemonitoring or structured telephone support programmes for patients with chronic heart failure: systematic review and meta-analysis. BMJ. 2007;334(7600):942.
19. Martinez A, Evers E, Rojo-Alvarez JL, Figal DP, Garcia-Alberola A. A systematic review of the literature on home monitoring for patients with heart failure. J Telemed Telecare. 2006;12(5):234–41.
20. Neubeck L, Redfern J, Fernandez R, Briffa T, Bauman A, Freedman SB. Telehealth interventions for the secondary prevention of coronary heart disease: a systematic review. Eur J Cardiovasc Prev Rehabil. 2009;16(3):281–9.
21. Dumaij ACM, Haaker T. The electronic locum record for general practitioners. Outcome of an evaluation study in the Netherlands. Int J Med Inf. 2010;79(2010):623–36.
22. Dumaij ACM, Blank JLT Healthcare prosumerism. In: Bos L, Carroll D, Kun L, Marsh A, Roa LM (eds.). Communications in Medical and Care Compunetics, Vol.1. A Liber Amicorum in Memory of Swamy Laxninarayan. Springer, ISBN 978-3-642-15050.
23. Lau DH. Patient empowerment: a patient-centred approach to improve care. Hong Kong Med J. 2002;8(5):372–4.
24. Alpay L, Blanson O, Otten W, Rovekamp T, Dumaij ACM. eHealth applications for patient empowerment in the Netherlands: directions for best practices in the Netherlands. J Telemed Telecare. 2010;16(7):787–91.
25. Aujoulat I, Marcolongo R, Bonadiman L, Deccache A. Reconsidering patient empowerment in chronic illness: a critique of models of self-efficacy and bodily control. Soc Sci Med. 2008;66(5):1228–39
26. Lorig K, Holman M. Self-management education: history, definitions, outcomes and mechanisms. Ann Behav Med. 2003;26:1–7.
27. Redman BK. Patient self-management of chronic disease. Sudbury, MA: Jones and Barlett; 2004.
28. Raats CJ, van Veenendaal H, Versluijs MM, Burgers JS. A generic tool for development of decision aids based on clinical practice guidelines. Patient Educ Couns. 2008;73:413–7.

29. Corbin J, Strauss A. Unending work and care: managing chronic illness at home. San Fransisco: Jossey-Bass Publishers; 1988.
30. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55(1):68–78.
31. Leventhal H, Weinman J, Leventhal EA, Phillips LA. Health psychology: the search for pathways between behavior and health. Ann Rev Psychol. 2008;59:477–505.
32. O'Connor AM, Bennett CL, Stacey D, Barry M, Col NF, Eden KB, Entwistle VA, Fiset V, Holmes-Rovner M, Khangura S, Llewellyn-Thomas H, Rovner D. Decision aids for people facing health treatment or screening decisions. Cochrane database of systematic reviews 2009, issue 3. Art. No.: CD001431. doi: 10.1002/14651858.CD001431.pub2.
33. Loukanova S, Bridges JFP. Empowerment in medicine: an analysis of publications trends 1980–2005. Cent Eur Cent J Med. 2008;3(1):105–10.
34. Carmel M, Peterson C, Robinson R, Sturmberg JP. Care for chronic illness in Australian general practice—focus groups of chronic disease self-help groups over 10 years; implications for chronic care systems reforms. Asia Pac Fam Med. 2009;8:1. doi: 10.1186/1447-056X-8-1.
35. Schaefer J, Miller D, Goldstein M, Simmons L. Partnering in self-management support: a toolkit for clinicians. Institute for Healthcare Improvement, Cambridge, MA; 2009 Available at:http://www.improvingchroniccare.org/downloads/partnering_in_selfmanagement_support__a_toolkit_for_clinicians.doc.
36. Mesters I. Motivational interviewing: hype or hope. Editor. Health Expect. 2009;5:3–6.
37. Gates B. A robot in every home - The leader of the PC revolution predicts that the next hot field will be robotics. Sci Am. 2007;296:44–51.
38. Butter M, et al. Robotics for healthcare. Leiden: TNO Quality of Life; 2008.
39. Dumaij ACM, Boon WPC, v Blijswijk T, Butter M (2011). Identifying barriers in the innovation process of medical robotics. Submitted.
40. Wieringa FP, Poley MJ, Dumaij ACM and Steen AFW van der (2007). Avoiding pitfalls in the road from idea to certified product (and the harsh clinical environment thereafter) when innovating medical devices. Proceedings of the IEEE Benelux EMBS symposium/Belgian day on biomedical engineering.
41. Dumaij ACM, Tijssen E (2011). Online health companion contact among chronically ill in the Netherlands. Health Technol., pp.1–19, doi 10.1007/s12553-011-0003-2.
42. Vos L, Dückers M, Wagner C. Sneller beter, wat kunnen we ervan leren? Tijdschrift over Kwaliteit en Veiligheid in Zorg. 2008;6:10–4. (In Dutch).
43. Beter Sneller. Tien geleerde lessen uit de praktijk. Den Haag: ZonMW; 2008. ISBN 978–90-6910–247-4. (In Dutch).
44. Zwart E. Achter de geraniums. Forse groei dementerenden thuis: wie neemt de regie?. CC Zorgadviseurs: Arnhem; 2008. ISBN 9789079513017. (In Dutch).
45. Prud'homme van Reine PR, Dankbaar B. A crossvergence perspective on creating cultures of innovation: the dynamic interaction between corporate cultures and regional cultures as drivers for convergence and divergence in innovation management. 5th workshop on international strategy and cross-cultural management, Istanbul, Koç University, 28–29 Sept (2007).
46. Øvretveit J, Klazinga N. Meta-evaluation of ten national quality improvement programmes in The Netherlands 2004–2009. The Hague: The Netherlands Organisation for Health Research and Development (ZonMw); 2010.
47. van der Linden B. Grootschalige kwaliteitsverbetering: lessen uit 10 ZonMW programma's. Kwaliteit in zorg. 2010;2:4–8. (In Dutch).
48. Zorg voor Beter Academie. http://www.zorgvoorbeter.nl/aan-de-slag/academie/. Site visited on 3 June 2010. (In Dutch).