Transforming Healthcare with IT: The Impact of Effective Implementation on Quality

Mahipal Brahambhatt

Organization: Change Healthcare

Abstract:

Objectives: Examine the implementation of an EMR system in a hospital, including its perceived impact, identifying factors that aid or hinder executions, evaluating its success, and comparing with theories of successful IT implementation. Utilize previous research and data from this study to formulate a theory of IT executions.

Design: Conduct a qualitative case study that duplicates a previously published US EMR implementation study, utilizing semi-structured interviews and documentation as methods and following the same questions.
Setting: A giant Swedish medical institution that recently combined two hospital locations into one.

Participants: Thirty experienced healthcare professionals featuring administrators, project members, physicians, and nurses.

Results: In Sweden, the implementation was completed within a year and at less than half the cost, using a well-liked EMR system that was supposed to increase efficiency and enhance patient care. This study's results and findings from a more challenging implementation case in the US indicate that effective implementation and operation at a low cost were affected by aspects of the system, the implementation method, and the conditions under which the executions took place.

Conclusion: The IT implementation theory presented in this study has empirical evidence to support it, making it a solid foundation for further research and successful implementation. The execution of an EMR is more likely to succeed if the system is user-friendly, with minimal training requirements, optimized for clinical work, and adaptable to changes. The involvement of clinicians in system selection and customization for their department needs, combined with a timeline that has been carefully planned based on the organization's change management capability, is crucial for success. The implementation process should be led by top leaders and supported by

a competent project team of IT specialists and users. Regular evaluations and modifications may be necessary, particularly for less advanced systems, to meet the evolving needs of users.

keywords: assessment, medical, IT, excellence.

Introduction

IT has significant potential to enhance excellence, and safety, decrease costs and generate new service innovations. The Electronic Medical Record (EMR) is the core component of a health IT system, with many western countries either planning or already implementing it. Prescription Order Entry, an element of EMR systems, has proven to reduce medication mistakes and adverse drug incidents.Numerous safety issues stem from inadequate communication between shifts, professions, and departments. Electronic Medical Records (EMRs) have the potential to enhance communication, but there is limited proof of their effect on communication processes, safety outcomes, and efficiency improvements or cost savings.Despite the numerous benefits of Electronic Medical Records (EMRs) and information technology in healthcare, it has not utilized their potential to the same extent as other industries. Implementation has been inconsistent, particularly in public healthcare systems, and represents large health information systems that serve multiple purposes and connect numerous organizations. One example of this is the UK's slow progress, where only 3% of NHS hospitals met the target of having an electronic patient record by 2005, but the target has now been postponed to 2007 or later.

Previous research

The review of the literature for this study discovered limited research on successful implementation and a lack of theory regarding the execution of this type of intervention in an organization. This shortage of research has also been noticed in earlier reviews that reported few studies on the implementation and effect of EMRs, which focused primarily on past incidents that were mainly retrospective, lacked controls, relied heavily on self-reported data from informants, and often occurred through surveys. Many of these studies were from well-funded US health systems that developed EMRs over several years to meet their needs, which may not apply to other systems. The research does not account for recent advancements and user-friendly EMR systems in the rapidly evolving field.The approach to setting up and implementing EMR systems

and the kind of system Under investigation show significant differences. Studies have differing definitions for the start, end, and scope of implementation, with some treating a nurse advising a doctor as an implementation activity while others view it as routine. Some research considers factors such as physician advocates as a component of the implementation procedure. Conversely, others view it as either beneficial or obstructive. There are also different definitions of success, with some studies not considering the perspectives of various stakeholders or the impact of redesigning work and clinical processes as part of the implementation.Nonetheless, Some results are frequently documented, particularly concerning the crucial elements for successful implementation. These can be categorized based on the attributes of the EMR system [1, 5–13], the implementation process [6, 8, 11, 14 –16], leadership [11, 14 –16], resources [1, 5, 6, 8, 14, 15, 17], and the culture of the recipient organization [15, 18 – 20]. Limited evidence suggests that implementation can be more difficult when there's a culture of negative or hostile relationships among professionals, departments, or governing groups, and that implementation can either enhance or obstruct collaboration. A study on the diffusion of innovation in various settings found that new techniques are quickly adopted when they have the relative advantage (perceived as better), compatibility with values and needs, low complexity (easy to understand and use), trial-ability (possibility of testing), and observability (visible examples elsewhere).

Methods

The objective was to assess implementation in a hospital and compare it to important factors for success identified by prior research and a published USA case study [22, 4, 23] using similar methods. The Swedish study used semi-structured interviews with 30 selected informants, both mid-implementation and 3 months after, who knew the system's selection, design, and implementation and various perspectives and outcomes. These informants included the project leader, four part-time leaders, three supervisors, four division heads, seven clinic heads, one instructor, five nurses, four doctors, and one doctor's assistant. The accuracy of the information was established by reviewing hospital documents and conducting visits to the location. Transcripts of the interviews were created, categorized, and grouped based on common themes. Additional questioning of the sources was undergone to resolve inconsistencies or vague responses. Legitimacy was assigned to the themes if they were referenced by at least four participants.

Findings
Preparation:

In 2003, the merger of two Stockholm hospitals 40 km apart resulted in the formation of the Karolinska University Hospital. The interviewees stated that there was a need to establish a combined electronic medical record (EMR) system to increase integration and enhance communication between the two locations, along with other associated services. Three independent appraisal studies were carried out and presented to a session of department heads. The interviewees described a decisive moment when the chief medical officer asked for a vote on which system should be adopted, and nearly all participants voted for one system. The meeting recommended that all departments at the Solna site would transition from using five different medical record systems to the one used by the other location and this received approval from upper management. The new system had to be installed in 40 clinics with 7000 users at the Solna site, requiring the installation of new hardware and significant software changes. The new platform included patient administration, clinical medical records, referral, and reply information, but was not entirely paperless as there were still many documents such as EKGs and radiology images.

Analysis of documents and interviews revealed four crucial choices that were faced and made before implementation, all related to implementing the main change within one year using limited internal implementation capacity and

Table 1: Questions for Interview:

What are the intended differences between the new and old system?
Can you provide information on the goals, projected expenses, outcomes, and schedule for introducing the new system?
What specific tasks were planned for the implementation of the system?
What actions have been taken to implement the system?
What have been the impacts of these changes on staff, management, and patients thus far?
Is there any empirical data demonstrating the effects? What further implementation steps and outcomes are anticipated?
What aided and impeded the implementation process, and what could have been done differently?
Can you describe the culture of your unit, practice, department, hospital, or region? What sets it apart in terms of the way things are done here, such as if it's like a family, entrepreneurial, bureaucratic, places a high value on efficiency, or something else?
Has the culture of your unit, organization, or region had an impact on the implementation of the system? If so, how (e.g. the speed of implementation, the selection of initial implementation locations, clinical leadership for the system)?
Has leadership style played a role in the implementation of the system in this clinic, hospital, or region?
Were there any significant events or turning points during the implementation of the system that marked a change in the way clinicians understand and use the system?
How has your previous experience with IT implementation impacted your current system implementation experience?
In your experience, what actual changes has the implementation of the system made to clinical practices or care processes, such as affecting the way consultations are conducted, a clinician's work organization, coordination of clinical work between individuals or across sites, automation of existing care processes, redesign of care processes, or chronic disease management?

Do you believe that the system has the potential to improve chronic disease management programs, such as for conditions such as diabetes, asthma, congestive heart failure, depression, or others, at the unit, organization, or regional level?

In your opinion, which aspects or functions of the system are most beneficial for improving chronic disease management, such as an electronic patient record, access to records from other clinicians and locations, ordering tests and procedures, reporting diagnosis and treatment outcomes, drug order entry, automated alerts and reminders, electronic communication with patients, or health history?

Do you have any additional thoughts or suggestions that could help us learn from the system implementation at the hospital, or anyone else we should speak with about this topic?

deferring other changes to later phases. The first choice was about the extent to which top-level management and the IT department should dictate the system and its details and how much independence the departments should have. The preparation process involved the departments, and top leadership set the schedule and closely managed the project, but The departments had the option to decide when to implement the change during the year and some details of the screens created by the hospital's IT department. The second key issue was whether to use an outside implementation service or rely on limited in-house resources. The solution was to manage the project internally, phase in the change over time, and use external consultants for specific changes. This was feasible due to the third choice and decision not to implement computer physician order entry (CPOE) to order medications simultaneously but to phase this in after the EMR and in the following year. The disadvantage was that some departments would lose the CPOE functionality in the current system. The fourth choice was not to implement functions needed for research by different departments during the EMR phase but to modify the EMR in the second year to allow this.

Project process to introduce the EMR:

Once the 2004 decision was determined on which system to adopt, those interviewed reported that senior management made it clear that departments only had limited control over the process, with regards to the limited modifications of the screens and the timing for implementation in 2005. Each department was expected to select internal staff to establish a department project group that would collaborate with the IT department to customize the system for the department and carry out the execution. All clinics in 2005 received consistent support from the project team and the implementation plan was strictly adhered to.

Impacts of the system on work and personnel:

A mid-way and post-impleme

ntation analysis of interviews conducted between June 2005 and March 2006 revealed recurring themes. The themes were illustrated with representative quotes from informants, and the vast majority of comments (95%) expressed positive opinions about the implementation process and the new system.

- Improved and comprehensive information on the system and a potential rise in patient safety (such as clearer information on medications)
  'It is now much simpler to locate patient information, resulting in time savings and improved patient care as there is no longer a need to wait to access data from other systems.'
- The discovery of new and improved methods of working was taking place.
  'The new system in the emergency room provides a real-time list of patients with basic information, making it easier for doctors to see and access the information, even if more than one doctor is involved with the patient. This represents progress over the previous situation, where patient data will be kept on several different systems, many of which were not accessible.'
- An expected improvement in patient safety is due to the availability of clearer medication information.
  'Easier access to patient information leads to improved patient care and time savings.'
- Reduction in time consumption (such as decreased number of phone calls due to the implementation of a uniform system throughout the hospital).
  'Emergency department staff have a favorable view of the new system, which enables them to monitor patients' movements in real time and track their location within the department, thus streamlining their workload.'
- Enhancing the integration of the combined locations.
- Potential for development (for instance, the potential use of electronic prescriptions and electronic dictation in clinics in the future).

A few drawbacks were reported :
- The rapid pace of implementation hindered the creation of new processes.

  'Individuals lacked the time and support to adapt their workflows to the new system, which would have improved if they had the opportunity to adjust their routines while implementing the new system. There was no room for improvement, and the process mostly involved transferring existing practices to the computer.'

- Implementation required personnel to divert time away from clinical duties (such as the challenge of securing physicians' and staff's time for training and customizing the system to meet the needs of their department).
- Certain local project teams faced challenges in securing time for collaboration with TC. Not all clinic and unit leaders comprehended the necessity of dedicating time to TC preparation.

The expenses incurred during the execution of the new system at the 700-bed 7000-employee teaching hospital site came out to be USD 700,000. This amount is less than half of the budget of $1.5 million set aside for consultants, integrating development, education, equipment, informational materials, and upgrading the hardware server. However, the cost does not account for the time spent by the clinic project personnel and other staff on planning, making adaptations, training, and other activities related to starting the use of the new system. A comprehensive report providing more information about the implementation and its effects is available.

Factors hindering and helping the change:
The factor most frequently brought up as a hindrance to implementation was the absence of extra time for personnel.

- It was challenging to manage the preparation for TC and the regular work parallelly.
- Personnel had to put in extra hours to fulfill their responsibilities.

One person interviewed believed that prior experience implementing an EMR in 2000 was an obstacle because

'The early change of this nature was complex and required significant effort to learn the new system, which also faced numerous issues. As a result, the overall experience with massive IT transformations was not entirely favorable.'

The recent merger led to new unit leaders managing both locations and personnel changes. Additionally, there were initial debates regarding the extent and manner in which departments should finance the system.

'There was a need for more information regarding the amount of time and budget allocated for the project within the department.'

The limited implementation timeline limited the ability to provide adequate preparation for all personnel.

'Due to the presence of individuals from various clinics, including nurses and secretaries, specific questions related to doctors or clinics were not asked as it was too difficult to direct them to the right person.

Table 2: Brief overview of electronic medical record implementation.

Classification of the type of change related to the implementation.	The merging of two teaching hospitals resulted in the adoption of the EMR used by one site (not Karolinska) instead of the previous EMR used at the Karolinska site. The implementation was successful.
process of choosing a system.	The hospital made the decision to choose the system with input from clinical staff.
Testing & design	The system had been previously tested at another site and also undergone a successful trial run in one department at the Karolinska site.
Process of Implementation	The selection, planning, and full implementation of the system took place as planned and at half the estimated cost.
Main helping factors	Before implementation, there was extensive consultation with clinical personnel.
Implementation	Agreement on the necessity of the system and the determination of the most appropriate system. Prioritization and implementation led by the management team. A capable team and a project manager with expertise in IT. A System that has been tried out and shown to work well. A simple, easy-to-understand technology that requires little training. Opportunities for growth and improvement of the system. Integration of order entry is straightforward.
Main problems	The recent merger is not yet fully completed, with new individuals occupying positions.
implementation	The time dedicated by department personnel towards implementation was taken from their regular work hours. There were challenges involving physicians in the preparation process. Initially, there were disputes regarding the amount of payment each department should contribute for the system.
Main impact	No additional time demands and improved efficiency. Improved coordination for long-term patients has been reported.

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Implementation Cost	$600,000 for 600 beds, 6000 hospital site employees.

Interview participants at Karolinska stated that the following elements assisted in the implementation:

- Personnel recognized the advantages of having a unified system for both sites, such as facilitating the transfer of information about staff and patients.

   'Once the merger was confirmed and underway, everyone was motivated to establish a shared record for all departments and locations, as the benefits and necessity of this became clear to everyone.'

- The other location was already utilizing the EMR and had made it user-friendly. The IT department only needed to enhance the system's capacity, as no significant changes were necessary.

- The system had a positive reputation, and many people were dissatisfied with the previous systems. According to users, the new EMR was user-oriented and easy to operate.

   'The system has an intuitive design that can be adapted to the current medical practices and can also accommodate any future changes in work processes.'

   'The new system saves time by making it easier to locate information and access it quickly.'

- The personnel were familiar with EMR systems, making the transition to a new system easier than moving from a paper-based system.

- There was widespread dissatisfaction with the current system, as well as the existence of five different medical record systems within the hospital.

- The new system required minimal extra work and training, minimizing disruption to staff.

- The project was given top priority by senior management, heads of clinics, and hospital management, with adequate resources being provided.

- The project was considered well-planned and well-organized, partly due to the project leader's competence and previous experience with the system at another site, as well as support from the hospital's well-functioning IT department.

Comparison to findings from other studies:

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The examination of previous studies has revealed that certain key elements are essential for the successful execution of electronic medical record systems. This can be considered the most comprehensive and evidence-based theory on EMR implementation based on current scientific knowledge. By using case study analysis methods, the results of the study are compared with these previously identified factors.

Table 3: Important factors for implementation revealed by previous research.

Key components of a successful execution plan		EMR implementation by Karolinska
The EMR System		
EMR system simplicity of use, effectiveness, and accessibility		Yes
Acceptance by doctors and attentiveness of implementers to concerns		Yes
There are no systemic failures	Yes	
There are no competing managerial or clinical qualifications.	Yes	
Implementation process		
Participation of users in development and selection	Yes	
Providing the correct kind, quantity, and amount of education	Yes	
Prior knowledge of computers or EMR	Yes	
Leadership		
strong managerial backing	Yes	

Heroic physician	Yes
Resources	
Sufficient human and financial resources	Yes
Organization culture and climate	
Academic health center more open to change	Yes

Table 4: Presence of features predicting successful innovation implementation (Rogers, 1995)

Rogers' theory from 1995.	implementation by Karolinska
Perceived improvement as relative advantage	Yes (Before and during the implementation process)
Similarity (consistent with needs and values)	Largely (, the implementation of prescription order entry and utilization for research purposes established)
Complexity (Ease of use and comprehension)	Yes (intuitive)
Trialability (Opportunity for testing and experimentation)	Yes (piloted in first department)
Observability Visible examples from other sources)	Yes (at the other site of hospital)

Comparison to Roger's theory of diffusion of innovation:

The basis of Roger's theory on the adoption of innovations is a review of different interventions and scenarios. The research provides some limited validation of the theory. To enhance our comprehension of EMR implementation, incorporating Roger's theory with another model may be useful. Although both theories stem from empirical studies, additional research is required to examine and scrutinize each of the factors.

Discussion:

A recent study identified significant flaws in most investigations on the use of information technology in healthcare. However, it also found some evidence of improved patient care. It was found that the majority of healthcare providers needed more guidance to successfully implement Information Technology. The research in this paper primarily depended on self-reports by a limited number of participants, obtained through observation and documentation, which is a common limitation of many studies. The EMR system and its implementation process have similarities and differences compared to other EMR systems and implementations in different conditions. The study site did not transition from paper to electronic but instead replaced five outdated systems with a single one and the personnel were already familiar with EMRs. Many EMR implementations require additional development before or during the execution, and some involve a more significant change from paper-based to electronic systems.

One should be cautious when making generalizations in this field as the success of complex interventions in complex social organizations is contingent upon the conditions under which they are executed. The results of this study, however, are more robust compared to other studies as the research was carried out prospectively and concurrently, using detailed project documentation, and incorporating a systematic comparison with a theory of information technology implementation developed from prior research and a previous study before the collection of empirical data.

In light of certain limitations, it is possible to form some preliminary conclusions regarding why the implementation occurred as it did and why the findings contrasted with the less successful Kaiser implementation studied through the same methods. These conclusions are backed by the key points outlined earlier in the previously summarized theory. Factors that could have contributed to the relatively successful Karolinska implementation include:

- Pre-implementation consultation
- Agreement on the need for the system and the preferred choice

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- Strong management team leadership and prioritization
- A skilled IT project leader and team
- A system that was user-friendly, intuitive, and required minimal training
- Potential for future system growth
- Simple integration of medication order entry after implementation.

The findings from this and other studies indicate that an electronic medical record (EMR) that aims to fulfill numerous needs may not fulfill local clinical requirements, is harder to implement, and can negatively impact productivity and access to critical patient care information. For a new system to be well-received, its benefits must significantly outweigh these drawbacks and be adequately conveyed, especially if it is perceived to be less user-friendly and requires additional time for operation, which previous research often reports. Developing the system will require time and resources.

Practical implications:

According to this study's comparison with other research, there are general guidelines for implementing an EMR system in a hospital:

† Select a system that can meet a variety of needs and has a proven track record in similar settings.
† The primary factor to consider should be whether the system is user-friendly for clinical staff and saves time. Staff resistance may be justified if they believe the system is difficult to use, which could make implementation more challenging or even impossible.
† The EMR system should be intuitive and require little or no training.
† It should also be flexible enough to accommodate changes and modifications for different departments and uses.
† The decision-making process should be inclusive, but once decided, the implementation should be directed and decisive.
† Balance the involvement of local control, clinical participation, and meeting higher-level requirements during the implementation.
† Involve different levels of staff in appropriate ways, with clear guidelines on which decisions can be made locally and which require higher-level approval for common standards.
† Consider the impact of prior and concurrent factors, which have been shown to impact the success of EMR implementation.
† EMR implementation is a "conditional intervention" and success depends on many environmental factors, including the amount of change the EMR system demands and

other changes taking place at the same time. Organizations with a strong ability to adapt to change may have an advantage in managing multiple changes simultaneously.

Further research is needed to understand the implementation of different EMR systems in various settings, using standardized reporting methods to allow for comparison. Building on previous research to test hypotheses and define the conditions critical to success for particular systems can lead to the development of knowledge and theories.

Conclusions:

The previous efforts to implement Electronic Medical Records (EMRs) in healthcare services have faced challenges due to high costs. The study presented in this paper focuses on a case study of an EMR implementation in a teaching hospital in the USA. The research team, who had no association with the hospital, anticipated similar challenges as previous EMR implementations. However, the results were unexpected and defied previous research findings. The implementation at Karolinska was successful and completed within the timeframe and budget. The data gathered from the respondents' perspectives on what aided and hindered the execution showed a general agreement on the main contributing factors. These included local control of the EMR system selection, employee engagement, leadership support, and backing from the IT department.

The findings from the Karolinska implementation suggest that a well-accepted EMR system can be effectively implemented within a year in a teaching hospital with some prior computerization experience. However, the study did not examine whether the system could support clinical work and process redesign. The comparison of interview data with a theoretical model of EMR implementation highlighted the significance of organizational, leadership, and cultural factors, as well as a user-friendly EMR system that improves productivity, saves time and supports clinical work.

This theoretical model offers a foundation for future research and a practical guide for EMR implementation to enhance safety and the quality of patient care.

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organizations and had no connections with the organizations studied, technology suppliers, or consultants.

References :

1. Shekelle, P. G., Morton, S. C., & Keeler, E. B. (2006). Costs and benefits of health information technology. *Evidence report/technology assessment*, (132), 1-71.

2. Hendy, J., Reeves, B. C., Fulop, N., Hutchings, A., & Masseria, C. (2005). Challenges to implementing the national programme for information technology (NPfIT): a qualitative study. *Bmj*, *331*(7512), 331-336.

3.Ovretveit, J. (2006). Summary review of research into IT implementation in healthcare. *Stockholm: Karolinska Institutet Medical Management Centre*.

4.Simon, J. S., Rundall, T. G., & Shortell, S. M. (2005). Drivers of electronic medical record adoption among medical groups. *The Joint Commission Journal on Quality and Patient Safety*, *31*(11), 631-639.

5. Miller, R. H., & Sim, I. (2004). Physicians' use of electronic medical records: barriers and solutions. *Health affairs*, *23*(2), 116-126.

6. Sittig, D. F., Kuperman, G. J., & Fiskio, J. (1999). Evaluating physician satisfaction regarding user interactions with an electronic medical record system. In *Proceedings of the AMIA Symposium* (p. 400). American Medical Informatics Association.

7.Gamm, L. D., Barsukiewicz, C. K., Dansky, K. H., & Vasey, J. J. (1998). Investigating changes in end-user satisfaction with installation of an electronic medical record in ambulatory care settings. *Journal of healthcare information management: JHIM*, *12*(4), 53-65.

8. Keshavjee, K., Bosomworth, J., Copen, J., Lai, J., Küçükyazici, B., Lilani, R., & Holbrook, A. M. (2006, January). Best practices in EMR implementation: a systematic review. In *AMIA*.

9. Blair, D., & Schutte, P. C. (2003). The electronic medical record in multi-site family practice. Part II: The implementation phase. *The Journal of Medical Practice Management: MPM*, *19*(3), 131-136.

10.Chiang, M. F., & Starren, J. B. (2002). Software engineering risk factors in the implementation of a small electronic medical record system: the problem of scalability. In *Proceedings of the AMIA Symposium* (p. 145). American Medical Informatics Association.

11. Gadd, C. S., & Penrod, L. E. (2000). Dichotomy between physicians' and patients' attitudes regarding EMR use during outpatient encounters. In *Proceedings of the AMIA Symposium* (p. 275). American Medical Informatics Association.

12.Wager, K. A., Lee, F. W., & White, A. W. (2001). Life after a disastrous electronic medical record implementation: one clinic's experience. In *Pitfalls and triumphs of information technology management* (pp. 153-168). IGI Global.

13. Wager, K. A., Lee, F. W., White, A. W., Ward, D. M., & Ornstein, S. M. (2000). Impact of an electronic medical record system on community-based primary care practices. *The Journal of the American Board of Family Practice*, *13*(5), 338-348.

14. Townes Jr, P. G., Benson, D. S., Johnston, P., & Vaughn, C. (2000). Making EMRs really work: the southeast health center experience. *The Journal of ambulatory care management*, *23*(2), 43-52.

15. Dansky, K. H., Gamm, L. D., Vasey, J. J., & Barsukiewicz, C. K. (1999). Electronic medical records: are physicians ready?. *Journal of Healthcare Management*, *44*(6), 440-454.

16. Audet, A. M., Doty, M. M., Peugh, J., Shamasdin, J., Zapert, K., & Schoenbaum, S. (2004). Information technologies: when will they make it into physicians' black bags?. *Medscape General Medicine*, *6*(4).

17. Retchin, S. M., & Wenzel, R. P. (1999). Electronic medical record systems at academic health centers: advantages and implementation issues. *Academic medicine: journal of the Association of American Medical Colleges*, *74*(5), 493-498.

18. Berg, M. (2004). *Health information management: integrating information technology in health care work*. Psychology Press.

19. Gustafson, D. H., Sainfort, F., Eichler, M., Adams, L., Bisognano, M., & Steudel, H. (2003). Developing and testing a model to predict outcomes of organizational change. *Health services research*, *38*(2), 751-776.

20. Rogers, E. M. (1995). The Diffusion of Innovations (4th Edn., New York, Free Press). *See also Spence, WR (1994), Innovation: The Communication of Change in Ideas, Practices and Products (London, Chapman and Hall)*.

21. Scott, J. T., Rundall, T. G., Vogt, T. M., & Hsu, J. (2005). Kaiser Permanente's experience of implementing an electronic medical record: a qualitative study. *bmj*, *331*(7528), 1313-1316.

22. Øvretveit, J., Scott, T., Rundall, T. G., Shortell, S. M., & Brommels, M. (2007). Implementation of electronic medical records in hospitals: two case studies. *Health Policy*, *84*(2-3), 181-190.

23. Yin Robert, K. (1994). Case study research.

24.Øvretveit, J. (2004). A framework for quality improvement translation: understanding the conditionality of interventions. *The Joint Commission Journal on Quality and Safety*, *30*, 15-24.