Caregivers and Computers:
The Effect of Electronic Medical Records on Employment and Labor Relations in Nursing Homes

FINAL REPORT

**Submitted to the Quality Care Oversight Committee
and
1199SEIU Training and Employment Funds**

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1. EXECUTIVE SUMMARY

This executive summary highlights the central findings documented in our final report submitted to the Quality Care Oversight Committee and 1199SEIU Training and Employment Funds**.** These findings are based on a comprehensive evaluation of the New York State nursing home demonstration project, which took place over the past two and a half years and included multiple data sources. The primary purpose of this research was to examine the effects of electronic medical records (EMR) adoption on employment and labor relations in participating New York City area nursing homes. Our evaluation of the demonstration project provided us with a unique opportunity to examine some of the most critical workplace issues associated with the introduction of new technology in general and of EMR technology specifically. Our evaluation set out to examine the manner in which EMR adoption affects key workplace variables such as recruitment and retention, employee attitudes and perception, and work design. In addition, we examined the central individual and organizational level variables that affected employee acceptance of the new technology.

Our research design combined both quantitative and qualitative dimensions at two points in time—pre- and post-EMR implementation. For our quantitative evaluation, we used a quasi-experimental design that incorporates fifteen homes that received the technology and five control homes that did not. We designed a number of survey instruments that captured the central constructs examined in this evaluation across different categories of employees. Our response rate for the Time 1 (baseline) and Time 2 (followup) surveys stands at approximately 50 percent, with 1,241 completed surveys in the first wave and 1,276 completed surveys in the second wave. In addition to collecting individual-level quantitative data through surveys, we also conducted pre- and post-EMR implementation qualitative field visits to ten of the participating treatment nursing homes.

By almost every threshold measure, the New York nursing home demonstration project was a great success. The vendor, eHealth Solutions, successfully installed the technology in twenty homes. The electronic documentation rates in the vast majority of these homes are well over 90 percent. Strictly from the standpoint of the technology, the project met or surpassed virtually all threshold tests of success. Simply put, the demonstration project, judged on technical grounds, was a remarkable achievement.

Furthermore, from an organizational standpoint, which was the primary focus of our evaluation, our analysis largely supports the notion that the implementation of EMR technology has a great deal of promise. In assessing the effects of EMR adoption one year after implementation, the following key findings emerged:

- First, EMR did not affect the ability of the nursing homes to retain their employees; attrition (or turnover) rates were identical in the treatment homes and the control homes.
- Second, the adoption of EMR did play a positive role in the ability of the homes to attract new employees.

- Third, employees in nursing homes receiving the EMR technology reported a statistically and significantly lower level of workplace conflict one year following the adoption of the technology.
- Fourth, employees in treatment homes reported a statistically and significantly higher level of reported communication between employees and supervisors.
- Fifth, there is evidence in our research to suggest that a considerable number of frontline employees experienced time savings from their use of the EMR technology. Many of these employees reported allocating these time savings to resident care or other organizational tasks.
- Sixth, our survey data also suggests a reduction in observed medical errors and near misses, as reported by frontline staff.
- Seventh, alongside the overall positive effects associated with the introduction of EMR, we also found significant variation in organizational outcomes across the fifteen homes that received the technology. For example, although in general job satisfaction did not change significantly after the introduction of EMR, in some homes job satisfaction increased.

In addition to the effects of EMR on organizational and individual-level variables, we also examined some of the dominant factors that enhanced or hindered the acceptance of the EMR technology by frontline staff. Overall, four central themes emerged from our analysis of employee technology acceptance:

- First, the general level of EMR acceptance was relatively high. Thus, it appears that for the most part employee acceptance of the EMR technology one year after its introduction had met or exceeded general expectations.
- Second, although the overall level of technology acceptance was relatively high, there was variation across the fifteen nursing homes. In other words, not all nursing homes achieved the same level of employee EMR acceptance.
- Third, results from the statistical analysis of our survey data highlight the role of critical workplace variables such as job satisfaction, commitment, and trust, in predicting employee acceptance of EMR.
- Employee perceptions of their union leaders played an important role in explaining technology acceptance. Employees who had a more positive view of their union leaders were more likely to have a higher level of technology acceptance.

Our qualitative research in ten of the treatment nursing homes uncovered three overarching managerial strategies guiding the adoption of the technology, which we refer to as the *empowerment, efficiency,* and *command* strategies. Each of these strategies, which are described in detail in this report, had clear implications for the implementation process and the outcomes that are associated with it. Two findings from our study highlight the important role that organizational factors played in the adoption of EMR technology:

- First, nursing homes with different degrees of frontline staff empowerment also had varying levels of employee turnover over the course of the first year of EMR implementation.
- Second, our report highlights the link between organizational variables and the cost associated with the implementation of EMR technology. Nursing homes with higher levels of job satisfaction and discretion were found to have had significantly lower adoption costs, as measured by the number of service calls made to the technology vendor.

The report builds on the empirical findings and outlines a number of key lessons for technology adoption:

- The optimal use of EMR is largely a function of leadership and management strategy.
- The belief that the workforce in nursing homes is a barrier to successful EMR implementation is a myth.
- Union and employee participation in EMR adoption is important.
- Frontline staff perceptions of job security are also important.
- Staff acceptance of EMR technology can be influenced by the organization.

Finally, it is important to place our evaluation and findings in the broader public policy context. The American Reinvestment and Recovery Act, passed by Congress and signed into law by President Obama in February 2009, was designed to stimulate the American economy and help it recover from the deep economic recession that began in 2008. Title XIII of the Act consists of the Health Information Technology for Economic and Clinical Health Act, also called the HITECH Act. The objective of the HITECH Act is to encourage the adoption of electronic health records (EHRs), including EMRs, by providing incentive payments to physicians and healthcare institutions. (The principal difference between EHR and EMR is that EHR allows patients or residents to have access, within the limits of confidentiality, to their healthcare records.)

We strongly believe our research on the New York nursing home demonstration project contains findings that can help inform the policy makers who are shaping the criteria that will guide the allocation of billions of dollars under the HITECH Act.

2. INTRODUCTION: THE NATURE AND PURPOSE OF OUR EVALUATION

We are extremely pleased to submit this final report, which documents our evaluation of the New York State Nursing Home Demonstration Project. In this report, we summarize the central findings from our evaluation, which took place over the past two and a half years and included multiple data sources. The primary purpose of this research was to examine the effects of electronic medical records (EMR) adoption on employment and labor relations in participating nursing homes. Our findings are based on a longitudinal study of EMR adoption in fifteen of the project nursing homes that received the EMR technology and five "control" nursing homes, which did not receive the technology, employing a mixed methodological design with both quantitative and qualitative data collection methods.

As will be discussed in detail below, the underlying theme that emerges from this evaluation is one of variation in the adoption patterns and associated effects of EMR implementation. On the one hand, our research points to substantial potential workplace benefits associated with the adoption of EMR. Thus, for example, EMR implementation is associated with a reduction in workplace conflict and increased levels of communication. EMR adoption also appears to play a role in attracting new employees to participating nursing homes. There is also support in this report for a positive EMR effect on the quality of resident care provided by frontline staff. On the other hand, delivering on these potential benefits is not automatic and is contingent on certain management strategies and organizational characteristics. Our report focuses on the benefits and costs associated with EMR adoption and on the factors contributing to employee acceptance of

this new technology. Furthermore, we outline the central organizational factors that help explain when and where EMR adoption enhances employee and employer outcomes.

The report is structured as follows. First, in this section we provide background on the project and on our designated role. Second, we discuss our evaluation methodology. Third, we document the effects of EMR adoption on key workplace outcomes, including employee attitudes and perceptions, workplace conflict and communication, the organization of work, and ability to provide resident care. Fourth, we summarize our analysis of factors that contribute to employee acceptance of the new technology. Fifth, we analyze the variation in EMR adoption and implementation across the nursing homes in our sample. Finally, we summarize key findings and outline the public policy implications that emerge from our evaluation.

2.1 Background

The collective bargaining agreements between 1199/SEIU United Health Care Workers East and operators of nursing homes in downstate New York provide for the establishment of the Quality Care Oversight Committee (QCOC), which is directed to "develop and monitor the establishment and performance of the Quality Care Committees [QCC] at the individual nursing homes." The QCOC has several responsibilities, including "the implementation of clinician-centric electronic medical records; automation of assessments, care plans, and prescriptions; improved data collection and provision of accessible consumer information and patient satisfaction."[1]

In March 2006 an arbitration award dealing with the implementation of these agreements between the parties directs the QCOC "to develop and commence research and demonstration programs" in a sample of nursing homes that provide for "the

acquisition of electronic monitoring and data collection equipment; professional training of staff members in the use of such electronic equipment; …revision of computerized systems and network communications," and related tasks.[2] Subsequently, the State of New York allocated funds to support the tasks mandated by the arbitration award.

The Institute on Conflict Resolution at Cornell University was asked to undertake an evaluation of the effects of the introduction of these new technologies on employment and labor relations in the nursing homes participating in the demonstration project. The ICR evaluation team was extremely excited by the prospect of collaborating with other researchers who had the principal responsibility of evaluating the effect of these new technologies on the quality of resident care in the nursing homes. Furthermore, the QCOC demonstration project offered the opportunity to mount a unique, integrated, and multidisciplinary study that would be likely to have implications not only for nursing homes and health care more generally but also for our understanding of how the implementation and diffusion of new technologies affects workplace relationships and, ultimately, outcome measures.

2.2 Principal Research Questions

Our evaluation of this demonstration project provided us with a unique opportunity to examine some of the most critical workplace issues associated with the introduction of new technology in general and of EMR technology specifically. Our evaluation set out to examine the manner in which EMR adoption affects key workplace variables, such as recruitment and retention, employee attitudes and perception, and work design. The following subsections represent the primary research questions motivating

our evaluation. Nevertheless, as will be discussed in our results sections, our evaluation expanded beyond these questions and addressed additional issues as well.

2.2.1 Recruitment and Retention. The March 2006 interest arbitration award points out that, while the primary purpose of the QCCs is "the improvement of the care provided to nursing home residents," a secondary and "critically important" purpose is "to enhance the retention and recruitment of the employees providing such care."[3] The underlying assumption motivating, in part, the introduction of EMR technology is that it would have a positive effect on both employee retention and recruitment. Accordingly, one principal research question we address in our evaluation is the effect of EMR adoption on employee recruitment and retention.

2.2.2 Employee Attitudes and Perceptions. The introduction of new technologies usually has significant implications for the manner in which employees view their work and their organization, and therefore one of the central questions driving our evaluation was the extent to which nursing home adoption of EMR technology would affect employee attitudes and perceptions. Central among these is employee job satisfaction, which has been linked to additional workplace outcomes, such as employee turnover (see for example, Wright and Bonett, 2007; Tett and Meyer, 1994; Porter et al., 1974). Some of the subjective dimensions of job satisfaction include the employees' perceptions of their relations with supervisors and coworkers, their levels of stress, the extent to which they are treated fairly, and related aspects of their jobs.

2.2.3 Conflict and Communication. Previous research suggests that workplace innovations and restructuring can lead to increased tensions and conflict (for a recent review regarding the consequences of innovation on conflict see Anderson et al., 2004;

for a discussion of the effects of workplace restructuring on conflict see Avgar, 2009). In addition, the adoption of a specific technology intended to alter the manner in which crucial information is collected and shared across the organization is likely to have an effect on the manner in which staff communicate horizontally and hierarchically. Accordingly, another important component of our evaluation was the extent to which the introduction of EMR influences conflict and communications within the nursing homes in the demonstration project.

2.2.4 Organizational Effects. Previous research also suggests that the adoption of new technologies has effects at the unit, group, and organizational levels. The introduction of new technologies often affects the way in which work is carried out. Understanding the implications of the introduction of these new technologies on how work is organized and performed in the nursing homes is an important aspect of our evaluation.

2.2.5 Labor Relations. Still another important aspect of the evaluation is the effect of the new technologies, and of the demonstration project itself, on labor relations, i.e., the relationship between the nursing home operators and their managers, on the one hand, and the union and its representatives, on the other. The demonstration project is a product of the cooperative relationship that exists between the operators and the union. It appears to be an excellent example of so-called "integrative bargaining."[4]

Although cooperative, integrative relationships are usually considered highly desirable, they are often difficult to sustain, particularly when the bargaining parties are moving through a period of significant innovation and change. It is, therefore, critical that our evaluation take account of the effects of the new technologies on the relationship between the union and the employers. We need to assess these effects at both the

bargaining unit level and at the nursing home level. The effects on labor relations are important in and of themselves, but also because the quality of labor relations can be expected to have significant effects on the other critical dimensions of our evaluation.

3. EVALUATION METHODOLOGY AND DESIGN

3.1 General

Our evaluation of the demonstration project consists of three distinct components: a) the effects of the new technologies on employee relations and organizational variables, b) the effects of the new technologies, and of the demonstration project itself, on labor relations, and c) the effects organizational variables on employee acceptance, adoption and use of the EMR technology. In order to assess each of these components we employed a longitudinal mixed method research design using a number of original survey instruments and a detailed qualitative interview protocol.

Our research design combines both quantitative and qualitative dimensions at two points in time—pre- and post-EMR implementation. For our quantitative evaluation, we used a quasi-experimental design that incorporates fifteen homes that received the technology and five control homes that did not. Table 1 provides some basic descriptive statistics about the treatment and control homes. The table shows that the homes ranged in size from a low of 120 beds (Port Jefferson) to a high of 320 beds (Huntington Hills and Northern Manhattan). The control homes were carefully selected to provide a close match to the fifteen treatment homes. For example, they were all for-profit homes in the New York City region and in the same 1199SEIU bargaining units as the treatment homes. Whenever possible, we selected a control home that had common ownership

with a treatment home. We designed a number of survey instruments that captured the central constructs examined in this evaluation across different categories of employees. The development of the survey instruments was iterative and benefited from the input and engagement of the different project stakeholders, including the QCOC, eHealth Solutions (the technology vendor), the other research teams, and the project coordinator. The Commonwealth Fund provided support for part of the evaluation conducted by the research team, and we are grateful to Mary Jane Koren, Assistant Vice President of the Fund, for her guidance on the development of our research design and survey instruments. Table 1 lists the twenty nursing homes participating in this study and their size.

Table 1: Number of Beds, Number of Residents, and Occupancy Rates in the Treatment and Control Facilities, 2008

Facility Name	Demographics			
	# Beds	# Residents	Occupancy Rate	County/Borough
Treatment Facilities				
Four Seasons	270	266	99%	Brooklyn
Glengariff	262	227	87%	Nassau
Sands Point	180	168	93%	Nassau
Keser	200	190	95%	Brooklyn
Highfield Gardens	200	187	94%	Nassau
Huntington Hills	320	309	97%	Suffolk
Terrace	240	235	98%	Bronx
Bronx Center	200	194	97%	Bronx
Northern Manhattan	320	311	97%	Manhattan
Woodcrest	200	191	96%	Queens
Park Gardens	200	196	98%	Bronx
Port Jefferson	120	116	97%	Suffolk
Crown	189	177	94%	Brooklyn
Golden Gate	238	221	93%	Staten Island
New Surfside	183	178	97%	Queens
Control Facilities				
Cliffside	218	206	94%	Queens
Townhouse	280	270	96%	Nassau
Queens Center	179	174	97%	Queens
Woodmere	336	315	94%	Nassau
Eastchester	200	188	94%	Bronx

Source: New York State Annual Survey of Long-Term Care Facilities.

3.2 Quantitative Data Collection

3.2.1 Baseline Survey Data Collection. Our research design called for a baseline survey of nursing home staff to be conducted by telephone immediately before the installation of the EMR technology by the vendor in each of the fifteen nursing homes we included in our evaluation. Simultaneously, we also conducted a baseline telephone survey in five control homes.[5] The same baseline instrument was used in both treatment and control homes.

The vendor, eHealth Solutions, installed its EMR technology, called SigmaCare, in two and three homes at a time between June 2007 and the spring of 2008. We timed our baseline survey to occur at that point at which the technology was ready to "go live," but the staff in the nursing home had not yet begun training in its use. In general we had a two- or three-week window at home in which to conduct the baseline survey. We focused the survey on direct caregivers (RNs, LPNs, CNAs, and allied professionals) in the fifteen treatment homes and the five control homes. We excluded from the survey administrators and supervisors who were not in regular contact with residents in the homes. The survey was administered by Cornell University's Survey Research Institute; the director of SRI is Yasamin Miller, who played a key role in overseeing the administration of the survey.

Survey interviews lasted an average of 30 minutes and included over 100 items covering work design and structure, employee attitudes and perceptions, and employee background information. There was wide variation in interview length, with some lasting 20 minutes and others lasting as long as 60 minutes. At the time our baseline survey was conducted, the interview population across the twenty nursing homes included 3,177

employees in the occupational categories included in our survey. After omitting employees with inaccurate contact information and those who were unable to complete the survey from our sample, our response rate for the baseline survey stands at approximately 50 percent with 1,241 completed interviews. Table 2 provided the number of completed surveys from each of the 20 facilities and Table 3 below, provides means for the central descriptive statistics for the Time 1 and Time 2 samples.

Table 2: Completed Surveys Time 1 Data Collection by Facility

Facility	Total number of Surveys
A	37
B	65
C	106
D	77
E	52
F	35
G	144
H	37
I	71
J	55
K	44
L	33
M	104
N	51
O	51
P	51
Q	71
R	26
S	89
T	42
Overall	1241

Table 3: Descriptive Statistics (means) from Our Sample at Time 1 and Time 2

		Time 1	Time 2
Age		47.31	47.7
Tenure (years)		8.31	8.01
Member of union		75.7%	68.2%
Gender	Female	92%	89%
	Male	8%	11%
Education level	Below High school	45.4%	37.7%
	High school & Above	54.6%	62.3%
Employment status	Full	77.1%	71.8%
	Part	22.9%	28.2%

3.2.2 Follow-Up Survey Data Collection. We conducted a follow-up (or "second-wave") survey between August 2008 and July 2009. The follow-up survey was timed to occur approximately one year after the installation of the technology. Again, we aimed to conduct the follow-up survey within a two- or three-week window, so the data for the respondents in the second-wave survey was collected between 50 and 54 weeks after the installation of SigmaCare. To evaluate the degree to which the adoption of EMR technology affected key organizational and employment variables, primary instruments for the first and second wave were very similar. However, the second-wave instruments included additional items to assess the overall acceptance of the technology and the manner in which it was being utilized by frontline staff. In addition, our second-wave data collection included both employees who had left the organization after the implementation of the EMR technology and new employees who joined after the technology was in place. We tailored specific instruments for both of these categories to

evaluate the manner in which EMR technology affected both employees who left the home and employees who were hired in the course of the year. Our interview population across the twenty nursing homes included 3,735 employees in the occupational categories included in our survey.[6] As with the baseline data collection, our response rate for this wave stands at approximately 50 percent, with 1,276 completed surveys across the different respondent categories. Table 4 below provides the breakdown of completed surveys for each of the twenty nursing homes across the different types of instruments. Table 3 above provides the descriptive statistics for the Time 2 sample.

Table 4: Interview Groups by Facility – Completed Surveys Time 2 Data Collection

Facility Name	Interview Group					
	Continuing employee - First interview	Continuing employee - Second interview	Left workplace - First interview	Left workplace - Second interview	New employee - First interview	Total
Treatment Facilities						
A	9	23	1	1	0	**34**
B	11	29	3	8	14	**65**
C	26	61	3	4	39	**133**
D	27	34	4	12	18	**95**
E	13	18	7	7	6	**51**
F	4	7	7	9	14	**41**
G	10	27	6	0	26	**69**
H	14	58	6	16	45	**139**
I	12	39	4	1	27	**83**
J	11	23	4	2	0	**40**
K	10	23	10	11	10	**64**
L	12	10	4	5	3	**34**
M	11	38	4	11	16	**80**
N	10	27	6	0	26	**69**
O	3	21	1	3	10	**38**
Control Facilities						
P	7	26	1	5	20	**59**
Q	39	17	9	4	10	**79**
R	14	9	1	2	5	**31**
S	8	31	2	0	7	**48**
T	28	17	3	6	8	**62**
Overall	**273**	**527**	**84**	**110**	**282**	**1276**

3.3 Qualitative Data Collection

In addition to collecting individual level quantitative data through surveys, we also conducted qualitative field visits to 10 of the participating treatment nursing homes. As with the survey data collection, we conducted pre- and post-EMR implementation interviews. Our first visit to each of the ten nursing homes took place just prior to the introduction of the new technology. A year later we returned to the same ten homes and conducted a new round of interviews, usually with the same interviewees we had interviewed a year earlier. In contrast to the survey data collection, we did not conduct field research in control homes. This decision was driven primarily by our interest to focus our resources on as many of the organizations that were receiving the technology

In our field visits, we generally spent at least half a day at each home, and we usually interviewed the administrator of the home, the director of nursing services, the assistant director of nursing services, and several RNs, LPNs, and CNAs. In some cases we were able to interview the owner of the home (who was sometimes the administrator as well). We also tried to interview union delegates at each of the homes. The people we interviewed at each home depended on who happened to be available the day we visited as well as on the cooperation of the top administrators in letting us have access to their staff. These field visits inform this evaluation in a number of important ways. It is through this qualitative component of our evaluation that we were able to observe first hand how the technology was adopted and accepted at the organizational and individual levels.

3.4 Important Methodological Qualifications

We need to acknowledge some of the unique features of the New York nursing home project. First, it is almost certainly the case that the majority of participating homes would not have adopted EMR in 2007-2008 were it not for the substantial subsidy provided by the State. Many, if not most of them, would have invested in the technology out of their own funds within the foreseeable future, but it is impossible to say to what extent the State subsidy accelerated their plans. We also believe some of the participating homes would have delayed the decision to invest in EMR indefinitely (or until they were mandated to do so). In addition, the calculus underlying the decision to invest in EMR is probably quite different in for-profit homes than it is in public or not-for-profit homes.[7]

Second, the EMR project resulted from a partnership between the nursing home operators and 1199SEIU. In an industry in which most nursing home facilities in the U.S. remain nonunion, the presence of the union exerts a very strong effect on the character and nature of this project. By joining forces to lobby for support from the New York State Legislature, the parties were able to obtain a grant that neither could have obtained by lobbying on its own. In face-to-face interviews, almost all operators, administrators, and union representatives agreed that the partnership between the operators and 1199SEIU significantly facilitated the introduction of EMR in each of the participating homes.

Third, the fact that this project was undertaken in the New York City region gives it a uniqueness that distinguishes it from other regions of the nation. The operators, administrators, staff, and residents in the nursing homes in many ways mirrored the

highly diverse population of the New York City region. The staff in the participating

homes is also highly diverse, consisting principally of minorities and recent immigrants.

In sum, although we believe several of the unique features of the New York project

(particularly the union role) provide us with an opportunity to evaluate dimensions that

have been ignored in previous studies, we acknowledge that the uniqueness of the project

possibly limits the generalization of our findings.

4. THE EFFECTS OF EMR TECHNOLOGY ON WORKPLACE OUTCOMES: THE BENEFITS AND COSTS OF EMR IMPLEMENTATION

4.1 The Existing EMR Implementation Debate

Assessing the effects of EMR adoption on key workplace outcomes in 15 nursing

homes has the potential to contribute to the broader debate regarding its costs and

benefits. An important element in President Obama's economic stimulus package, the

American Recovery and Reinvestment Act, passed in February of 2009, is the inclusion

of $19 billion to support the installation of EMR in U.S. healthcare institutions (Pub.L.

111-5, 2009). President Obama has explained his support of investing federal dollars in

EMR on numerous occasions. For example, in discussing his proposed stimulus package

in a radio address in December 2008, he said:

> [T]he economic recovery plan I'm proposing will help modernize
> our health care system—and that won't just save jobs, it will save lives.
> We will make sure that every doctor's office and hospital in this country
> is using cutting edge technology and electronic medical records so that
> we can cut red tape, prevent medical mistakes, and help save billions
> of dollars each year.

In emphasizing the need for EMR, the President has followed the advice of

numerous healthcare experts who have pointed out that the healthcare sector lags behind

other industries in the use of computer technology. They believe the widespread use of EMR would help reduce medical errors, control the costs of healthcare, and lead to significant improvements in the quality of healthcare Americans receive. As is evident from the intense public policy discussion around EMR adoption, the expectations from this innovation are extremely high, yet the empirical evidence is still incomplete. Thus, we believe the results we report here should contribute to the state of the EMR debate.

Several factors motivate proponents of the use of EMR. One is certainly the ever-rising cost of healthcare in the U.S. The estimated cost of healthcare in the U.S. in 2008 was $2.4 trillion, about 16 percent of gross domestic product or about $7,900 per U.S. resident (Kaiser Family Foundation, 2008). Despite many efforts to control the cost of healthcare, for more than thirty years the annual rate of increase in healthcare costs has almost always been above the overall rate of inflation and has often soared into double digits. It is projected that in 2016, if no meaningful reforms in the healthcare system are undertaken, the U.S. will spend over $4.1 trillion on healthcare, or $12,782 per U.S. resident. If present trends continue, by that year healthcare will consume 20 percent of gross domestic product (Kaiser Family Foundation, 2007). Many experts blame inefficient and (often) inaccurate recordkeeping for a significant proportion of healthcare inflation.

A second factor motivating EMR proponents is evidence that medical errors result in the death of thousands of Americans each year. For example, the Institute of Medicine estimated that 98,000 Americans die each year as a result of medical errors (Kohn, et al., 2000). Recently the Institute estimated that 1.5 million Americans are harmed each year as a result of medication errors. This study estimated that medication errors cost hospitals

$3.5 billion each year (Aspden et al, 2007). One study showed that medical errors may be the third leading cause of death in the United States (Starfield, 2000).

EMR has been viewed as a major part of the solution to both the quality and cost of healthcare. Improving documentation procedures and standardizing care plans will, it is maintained, reduce error rates, save time and money, and enhance medical care. Some scholars have estimated that the combined efficiency and safety savings of EMR range between $142 and $371 billion a year (Hillestad, et al., 2005).

Other experts believe the use of EMR will enhance the quality of employment relations. By reducing, and possibly eliminating, paperwork, EMR should free up time that caregivers can then devote to their patients. The reallocation of staff effort away from paperwork and toward patient care should not only improve the quality of healthcare but also make healthcare jobs more interesting and fulfilling, thereby increasing job satisfaction and reducing turnover. High turnover of healthcare workers, particularly nurses, is a common problem in the industry, and reducing turnover can lead to both lower costs and higher quality care (for a recent review of the causes and consequences of nurse turnover in the healthcare industry, see Hayes et al., 2006).

Despite high expectations about the benefits of EMR, recent studies have found mixed evidence regarding the effect of EMR on patient care outcomes. For example, Linder and his co-authors examined seventeen quality care indicators in ambulatory medical units and found that the adoption of EMR had a significant positive effect on only two of them; one quality indicator was negatively affected (Linder et al., 2007; for a discussion of EMR's mixed potential see Sidorov, 2006).

Some healthcare experts are skeptical about EMR's effect on the quality of patient care because they believe the standardization required by computer technology deprives caregivers of the opportunity to tailor treatment to the needs of their patients. EMR may not allow the flexibility that high-quality healthcare requires.

Some stakeholders in the healthcare sector are also leery of the claims that EMR should have positive effects on job satisfaction and retention. Some of the union officials we have encountered in our fieldwork, for example, fear that EMR, rather than freeing up time for caregivers to spend with patients, will simply lead to healthcare institutions reducing the size of their staff. It is important to note, however, that at the inception of the New York State Nursing Home Demonstration Project the union and the operators reached an agreement that no bargaining unit jobs would be eliminated as a consequence of the installation of EMR technology. Previous research on EMR, however, has largely ignored the effects of this technology on employment-related outcomes as well as the link between employment relations and the quality of care. The absence of research that linked the adoption of EMR to changes in the workplace and, in turn, linked changes in the workplace to changes in the quality of care was one of the principal factors motivating our nursing home project.

Results from our evaluation research inform the existing EMR adoption discussion in two meaningful ways. First, as will be documented below, we do find mixed evidence associated with EMR implementation. The adoption of this new technology enhances certain organizational outcomes: for example, the technology seems to be associated with a reduction in conflict and an increase in communications. But it seems to hinder others: for example, our findings suggest that the technology is

associated with a decrease in employee discretion. Second, findings reported in Section 4 highlight the importance of preexisting organizational factors as predictors of EMR associated outcomes. In other words, EMR-associated outcomes, positive or negative, are likely to be contingent on key organizational characteristics and on managerial adoption strategies.

4.2 Overview of Our Findings

As noted, our evaluation supports the notion that the implementation of EMR technology has a great deal of promise for organizations. First, our research shows that the introduction of EMR did not affect the ability of the nursing homes to retain their employees; attrition (or turnover) rates were identical in the treatment homes and the control homes. Our research indicates that the adoption of EMR did play a role in the ability of the homes to attract new employees. Second, we find that employees in nursing homes receiving the EMR technology reported a statistically and significantly lower level of workplace conflict one year following the adoption of the technology. Third, employees in treatment homes reported a statistically and significantly higher level of reported communication between employees and supervisors. Fourth, there is evidence in our research to suggest that a considerable number of frontline employees experienced time savings from their use of the EMR technology. Many of these employees reported allocating these time savings to resident care or other organizational tasks. Fifth, we found significant variation in organizational outcomes across the fifteen homes that received the technology.

Although the small size of the sample of respondents we obtained in some of the homes limits our ability to draw hard-and-fast conclusions, the evidence we have

suggests that the findings we obtained at the aggregate level do not necessarily hold across all facilities. For example, although in general job satisfaction did not change significantly after the introduction of EMR, in some homes job satisfaction increased. It does appear, however, that various measures of conflict declined significantly and also at the aggregate level and in a majority of the nursing homes. Finally, analysis of our survey data provides support for the claim that the adoption of EMR can increase the quality of care provided to residents. As will be discussed below, employee-reported errors at Time 2 decreased significantly. In addition, a large portion of our Time 2 sample reported a perceived increase in the quality of care they are able to provide due to the adoption of the EMR technology. In what follows we review each of these findings in greater detail. Table 5 provides a summary of the key findings in this section and Table 6 below reports the means and standard deviations for the survey measures used in the Time 1 and Time 2 comparisons in this section.

Table 5: Summary of EMR Effects

(shaded arrow refers to statistical significance; arrow pointing downward means a decrease in the variable between Time 1 and Time 2; arrow pointing upward means an increase in the variable between Time 1 and Time 2)

Variables	Treatment Homes	Control Homes
Turnover	**No EMR Effect**	**No Change**
Recruitment	**Support for a Positive EMR Effect**	**NA**
Turnover Intention	**No Change**	**No Change**
Job Satisfaction	**No Change**	**No Change**
Discretion	⬇	**No Change**
Commitment	**No change**	**No Change**
Stress	**No Change across**	**No Change**

	Homes. Variation within Individual Homes	
Supervisor Trust	**No Change**	**No Change**
Organizational Trust	**No Change**	**No Change**
Time Spent on Documentation	**Decreased for Many Employees**	**NA**
Time Spent with Residents	**Increased for Many Employees**	**NA**
Conflict with Supervisor	⬇	⬇
Conflict within the Unit	⬇	⬇
Conflict with Other Units	⬇	⬇
Conflict with Residents	⬇	⬇
Communication with Supervisor	⬆	**No Change**
Communication with Others	**No Change**	**No Change**
Union Commitment[8]	⬆	**No Change**
Member Perception of Union Leadership	**No Change**	**No Change**
Quality of Care Provided to Residents	⬆	**NA**

Table 6: Descriptive Statistics for Variables Examined in This Section

	Mean		Std. Deviation	
	Time 1	Time 2	Time 1	Time 2
Job Satisfaction	3.99	3.98	.99	.94
Discretion	3.28	3.15	1.2	1.15
Conflict with Supervisor	2.00	1.76	.89	.81
Conflict within the Unit	1.81	1.66	.66	.59
Conflict with other Unit	1.94	1.73	.86	.78
Conflict with Residents	1.97	1.78	.88	.83
Communication with Supervisor	3.88	3.96	1.09	.99
Union Commitment	3.46	3.55	1.15	1.05

4.3 EMR Effects on Recruitment and Retention

One of the underlying rationales for the demonstration project was the assumption that the introduction of EMR technology would have a positive effect on both employee retention and recruitment. This assumption was based on the notion that EMR would increase the skill set of frontline staff, reduce the time they needed to spend documenting resident records, and therefore increase the attractiveness of these positions. On the other hand, it is also possible that EMR could have a negative effect on the recruitment and retention of nursing home staff. The competing argument rests on the view that any large-scale organizational change—one requiring change at the facility, unit, and individual levels—will disrupt established work practices, lead to higher levels of job dissatisfaction, and result in increased turnover and difficulties recruiting new staff. The demonstration project provides for a unique opportunity to examine carefully the relationship between EMR adoption and employee recruitment and retention.

We collected archival data on employee turnover and new hires before and after EMR implementation for both treatment and control homes and compared turnover and new hire rates between treatment and control facilities. These data are based on employee information provided by each of the nursing homes immediately prior to each of the data collection phases. Special attention was given to obtaining accurate information from the facilities.[9] The detailed turnover and new hire data for each of the twenty nursing homes are reported in Table 7. These data do not provide any information about the reasons some employees left their jobs and others were hired during the year that followed the introduction of the technology. However, the data do provide strong support for the claim that EMR technology did not affect, in either a positive or negative manner, the overall turnover rates for the treatment facilities in the year following the installation of the technology. As shown in Figures 1 and 2, 17 percent of the total number of employees in both the treatment and control facilities left their employment between Time 1 (when the baseline survey was conducted) and Time 2 (when the follow-up survey was conducted). Both treatment and control homes retained 61 percent of the employees they had at Time 1, and their new hires were 22 percent of the total number of employees on staff at Time 2. Thus, there were no differences in the overall rate of turnover between the treatment and control facilities, nor were there any differences between control and treatment facilities in their ability to hire new employees.

Table 7: Turnover and New Hire Rates by Facility

Facility Name	Employment Group			
	Continuing Employee	Left Workplace	New Employee	Total
Treatment Facilities				
A	95	0	0	**95**
B	129	44	47	**220**
C	182	23	91	**296**
D	140	45	45	**230**
E	109	24	23	**156**
F	66	83	60	**209**
G	210	54	97	**361**
H	65	16	20	**101**
I	147	16	61	**224**
J	97	28	1	**126**
K	63	40	30	**133**
L	91	14	13	**118**
M	148	28	39	**215**
N	84	17	59	**160**
O	75	27	26	**128**
Control Facilities				
P	93	32	77	**202**
Q	151	29	45	**225**
R	62	33	24	**119**
S	170	0	36	**206**
T	115	70	26	**211**
Overall	**2292**	**623**	**820**	**3735**

Figure 1: Turnover and Recruitment Rates for Treatment Facilities
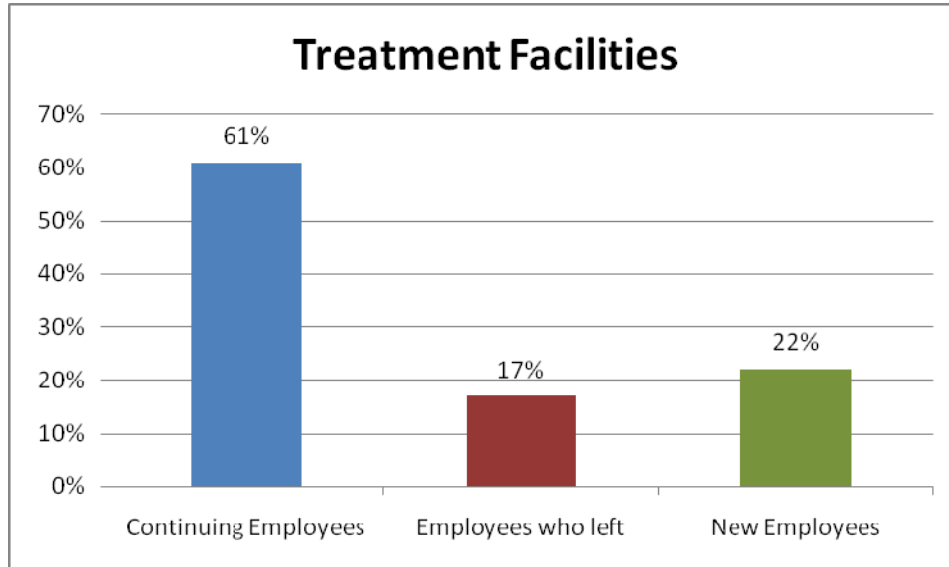
Figure 2: Turnover and Recruitment Rates for Control Facilities
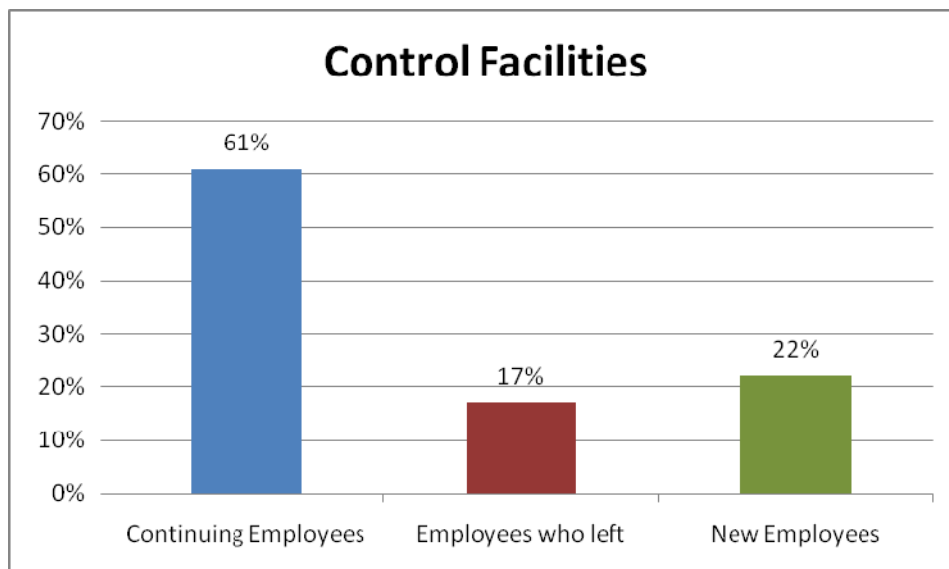
A second source of data on the effects of EMR on recruitment and retention is contained in our survey instruments tailored for employees who left the organization following the introduction of EMR and in the instruments tailored for employees who

were hired after the technology was put in place. This evidence shows that the introduction of EMR technology seems to have had no effect on retention. For new employees who knew that their prospective employer had EMR, the presence of the technology seems to have had a positive effect on their decision to take a job at the facility. Table 8 shows that 79.5 percent of the new employees were not aware that their facility had EMR when they applied for the position. Although only 20.5 percent of the new employees knew at the time they were hired that their facility was using EMR, Figure 3 shows that over 57 percent of these employees reported that EMR had either "some influence" or "a great deal of influence" on their decision to work for the nursing home. On a practical level, this finding suggests that nursing homes would benefit from increased "marketing" of their use of EMR technology in their recruitment efforts.

**Table 8: New Employee Knowledge that an EMR System Was in Place
Prior to Employment**

	Frequency	Percent	Cumulative Percent
No	182	79.5	79.5
Yes	47	20.5	100.0

Figure 3: EMR Influence on Decision to Work for Nursing Home
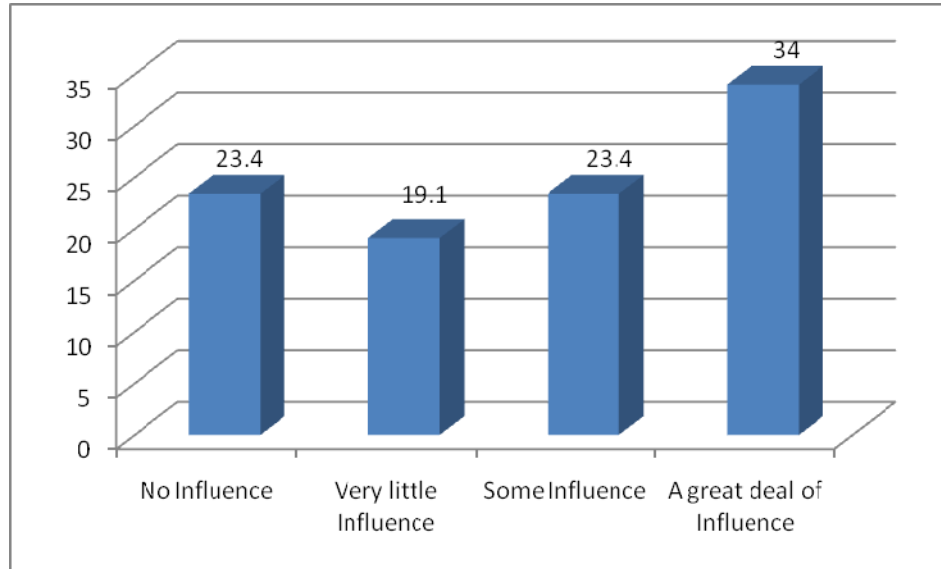
Survey data from employees who left their nursing home after the introduction of EMR indicates that this innovation played a minor role in explaining respondents' exit behavior. As shown in Figures 4 and 5, of the 153 respondents who left their nursing home after the introduction of EMR, only a small minority agreed that this decision was affected by the introduction of SigmaCare in their facility in general (12.5 percent) and by apprehensions of using this technology (5.3 percent). This evidence suggests that the adoption of EMR does not create retention difficulties for nursing homes and that employee turnover is not directly explained by the decision to innovate in this way.

Finally, we examined employee retention by measuring employee turnover intentions before and after the EMR adoption. Although turnover intentions do not necessarily predict actual turnover of employees, they do provide a portrait of employee attitudes regarding their decision to stay with their nursing home. Analysis of the data for both the treatment and control homes shows no significant difference in employee

turnover intentions when comparing attitudes before and after the adoption of EMR. On the one hand, this finding suggests that the adoption of EMR does not significantly decrease employee intentions to leave a facility. On the other hand, it also indicates that the introduction of EMR did not increase employee intentions to leave their nursing homes. Taken together, these findings suggest that EMR can play a positive recruitment role for nursing homes but does not significantly affect actual employee exit or turnover intentions.

Figure 4: Decision to Leave Nursing Home Due to Adoption of SigmaCare

Adoption of SigmaCare Reason for Exit			
	Frequency	Valid Percent	Cumulative Percent
Strongly Disagree	44	28.9	28.9
Disagree	79	52.0	80.9
Neutral	10	6.6	87.5
Agree	14	9.2	96.7
Strongly Agree	5	3.3	100.0
Total	152	100.0	
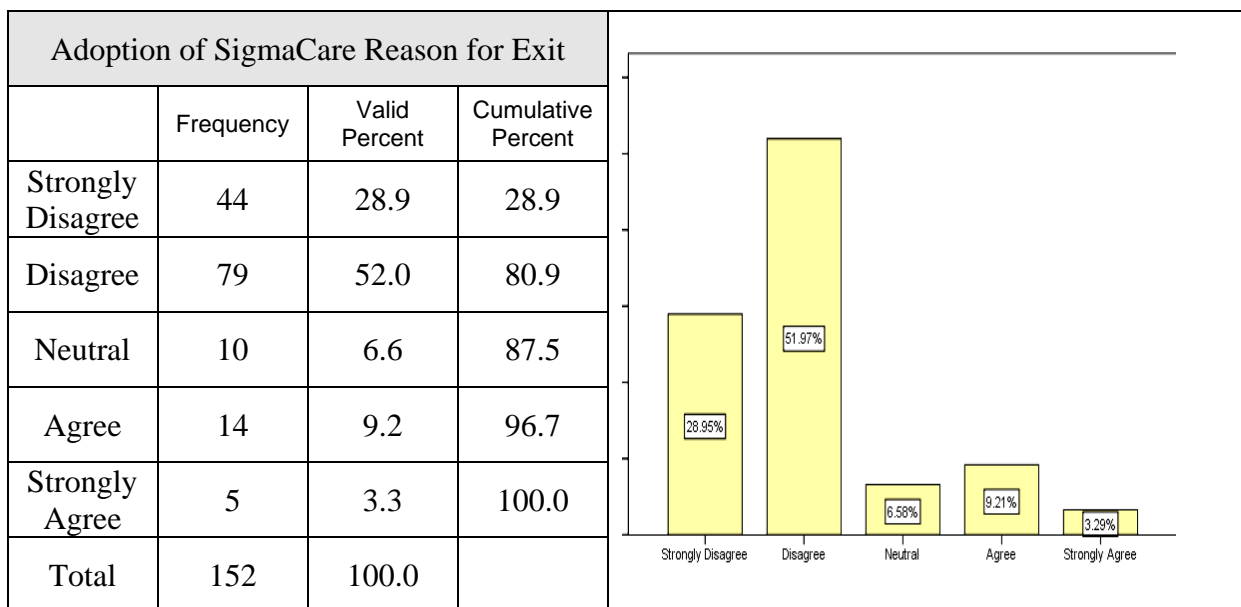
Figure 5: Decision to Leave Nursing Home Due to Fear of Using SigmaCare

Afraid Using SigmaCare Improperly - Why Left			
	Frequency	Valid Percent	Cumulative Percent
Strongly Disagree	55	35.9	35.9
Disagree	75	49.0	85.0
Neutral	15	9.8	94.8
Agree	5	3.3	98.0
Strongly Agree	3	2.0	100.0
Total	153	100.0	
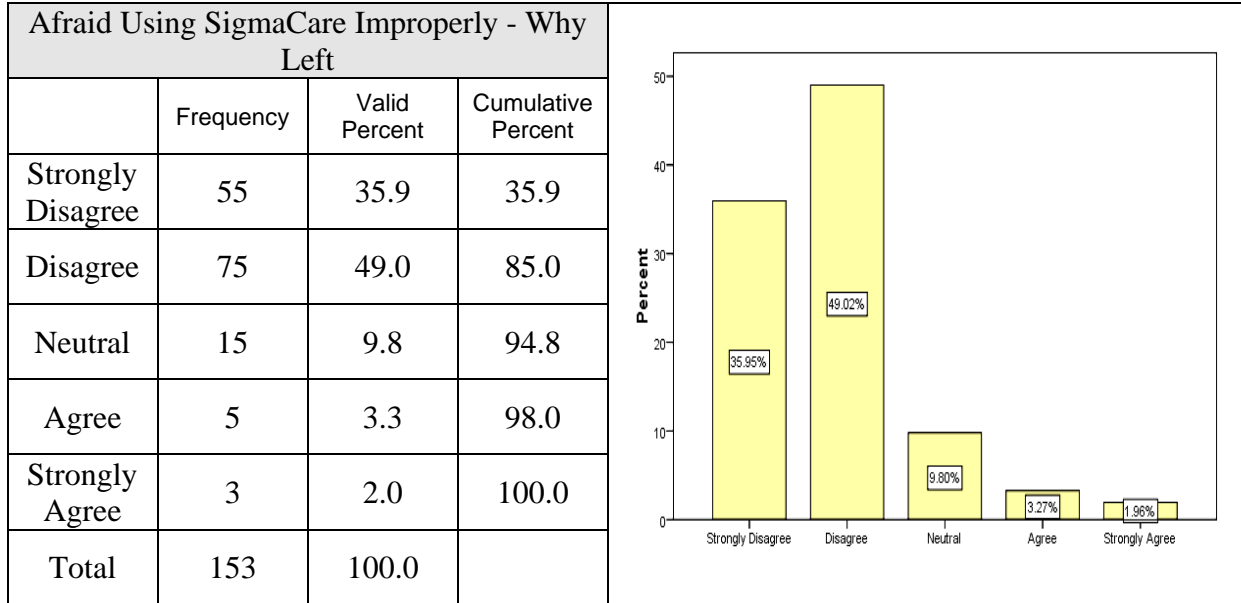
4.4 EMR Effects on Employee Attitudes and Perceptions

A second key research question that motivated our evaluation is the extent to which EMR adoption affects employee attitudes and perceptions regarding their working conditions. In our surveys, we collected data on employee attitudes regarding job satisfaction, trust, organizational commitment, and stress. Conceptually, it is possible to make the argument for either a positive or negative EMR effect on these attitudes. In fact, one of the most heated issues regarding EMR implementation is the manner in which it might influence frontline staff. On the one hand, one of the underlying expectation about the adoption of EMR is that it will improve employee attitudes because of improvements in the way work is performed and the reallocation of time away from documenting resident care and toward the actual care of residents and their families (our baseline interviews with administrators and staff across different nursing homes strongly support the prevalence of this expectation). On the other hand, some argue that EMR might

increase employee workload and stress (for a recent study documenting a small increase in perceived workload associated with the adoption of an EMR system in a clinic setting see Carayon et al., 2009). The demonstration project provided us with a unique opportunity to put these opposing propositions to the test.

Comparing employee responses at Time 1 and at Time 2 indicates that of the multiple constructs examined, none of the perception and attitude variables changed significantly (either positively or negatively). This provides support for the claim that the adoption of EMR, in and of itself, will not have a negative effect on employee perceptions of their working conditions. On the other hand, the absence of significant positive changes suggests that EMR adoption did not enhance employee perceptions of and attitudes towards their work.

4.5 EMR Effects on the Organization of Work

Another way in which EMR is likely to affect healthcare organizations is by restructuring the way in which work is organized and the manner in which employees execute their tasks. With regard to the organization of work, we explored whether the adoption of EMR changed the level of teamwork and problem solving within treatment homes as well as the autonomy and discretion provided to frontline staff. With regard to teamwork and problem solving, analysis of the survey data indicates that EMR had no statistically significant effect on these constructs. Thus, employees reported the same level of unit and nursing home teamwork and problem solving one year after the introduction of EMR as they did prior to its adoption.

Our survey data does suggest, however, that employee discretion was affected by the adoption of EMR. As shown in Figure 6, the overall level of discretion reported by

employees one year after the adoption of EMR was lower than the level at the time of the baseline survey. Thus, at the aggregate level, the adoption of EMR appears to lower employee perceptions of job discretion. This difference in employee discretion is significant at the .05 level of significance. It is important to note that for the control homes there was no significant change in the level of discretion between Time 1 and Time 2.

The finding that the introduction of EMR technology is associated with declines in the level of discretion is clearly an important one, and it is a finding we did not expect. Although we cannot completely explain why employee discretion declined after the introduction of EMR, our field interviews do cast some light on this matter. A number of frontline staff told us that the transition from paper to electronic documentation imposed a stricter discipline on how they perform their work. In a paper regime, documentation could be delayed, possibly to the end of a shift even if this was not in accordance with required time limits. The use of EMR seems to increase the enforcement of the narrow time limits. Similarly, EMR technology can create an additional pressure to adhere to time constraints regarding the administration of medications, which in the nursing homes we studied is almost always a task performed by LPNs. Almost by definition, electronic documentation reduces the flexibility that frontline staff has in performing their duties, and it increases their accountability. Some of the administrators told us in our field interviews that EMR allowed them to monitor staff performance at any time of the day or night.

Figure 6: Comparison of Employee Discretion Means at Time 1 and Time 2
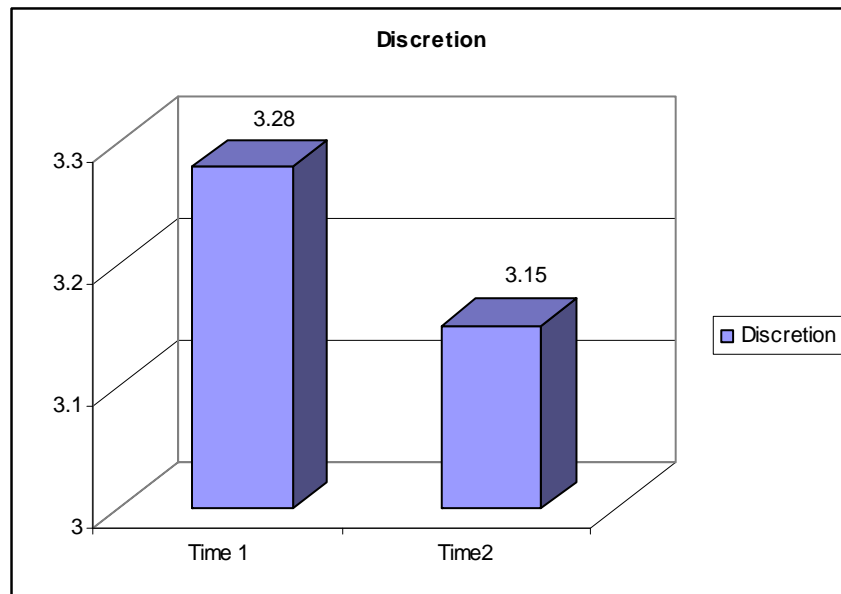
One of the proposed changes associated with the adoption of EMR is the amount of time spent by frontline staff with residents. According to proponents, the use of EMR should reduce the time spent documenting resident care, allowing for more time to be spent with residents and their families and for conducting tasks more directly related to resident care. To assess whether both of these changes (reduced documentation time and allocation of time to resident care) in fact took place in the fifteen treatment homes we included a set of survey items that explored how technology affected employee allocation of their time.

As shown in Figure 7, employee responses to the question of technology-related time savings varied. On the one hand, 39 percent of the 596 respondents answering this question reported spending either "much less" or "less" time documenting resident care. This suggests that for a relatively large number of employees, technology facilitated a reduction in documentation work. On the other hand, approximately the same percentage

of responding employees (40 percent) reported spending either "much more" or "more" time documenting resident care.

Figure 7: Time Spent Documenting Resident Care One Year after the Introduction of EMR Technology

In general, the amount of time you now spend documenting patient care compared with the time you spent before SigmaCare is:

1. Much less   2. Less   3. About the Same   4. More   5. Much more
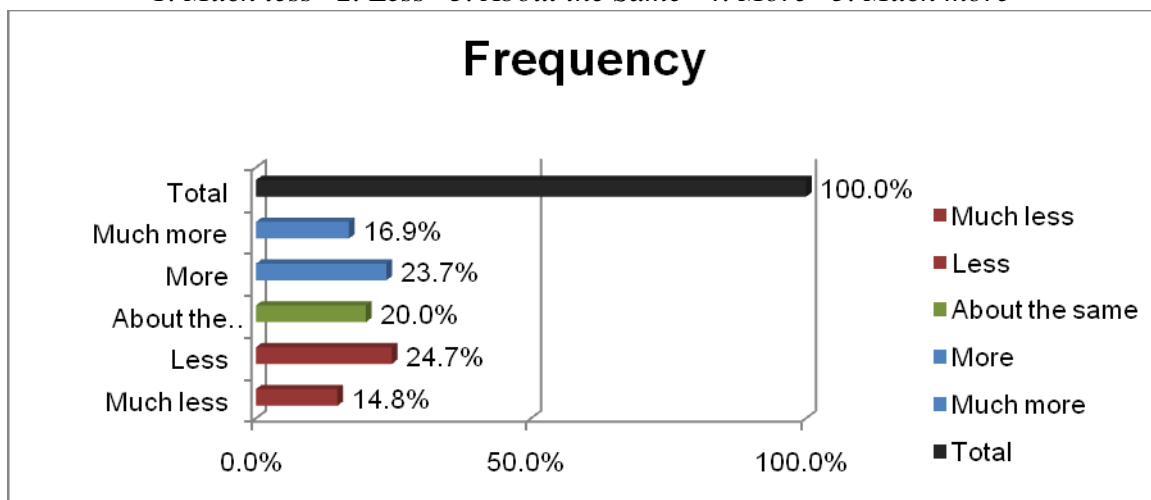
For those employees who reported spending less time on documentation, we asked them to estimate the amount of time they saved per day using EMR. As shown in Table 9, of the 376 employees who said they had saved time on documentation, the plurality reported saving between one and two hours daily (46.5 percent). Another 12.2 percent reported saving between two and three hours daily, and approximately 7 percent reported saving three or more hours daily. However, 128 respondents (34 percent) who initially said they had saved time on documentation then reported that in fact they had saved "almost no time" at all. These findings suggest that although EMR technology has

the potential to reduce the time devoted to documentation, it does not achieve this objective uniformly.

Table 9: Amount of Resident Care Documentation Time Saved Using EMR Technology Compared

How Much Time Do You Save Using SigmaCare Daily?			
	Frequency	Valid Percent	Cumulative Percent
Almost no time	128	34.0	34.0
Between 1 and 2 hrs	175	46.5	80.6
Between 2 and 3 hrs	46	12.2	92.8
Between 3 and 4 hrs	17	4.5	97.3
More than 4 hrs (specify how many)	10	2.7	100.0
Total	376	100.0	

We also examined what employees did with the time they saved using EMR. We asked those employees reporting any amount of time saved using the technology how they allocated this additional resource. As shown in Table 10, a significant proportion of responding employees reported using the additional time with residents (83 percent), and by assisting coworkers (68 percent). Table 10 also shows that 26 percent of the responding employees reported spending the time the technology saved them with the residents' families. Thus, where employees were able to use the technology in a manner

that reduced the time spent documenting resident care, they devoted more time to other meaningful resident care tasks.

Table 10: Use of Time Saved by Frontline Staff

How do you use the time saved using SigmaCare? (all that apply)

a) Used Saved Time with Residents				b) Used Save Time with Residents' Families				c) Used Saved Time to Help Co-workers		
	Frequency	Valid Percent			Frequency	Valid Percent			Frequency	Valid Percent
No	64	16.6		No	285	74.2		No	120	31.2
Yes	322	83.4		Yes	99	25.8		Yes	265	68.8
Total	386	100.0		Total	384	100.0		Total	385	100.0

4.6 EMR Effects on Workplace Conflict and Communication

An additional area of inquiry for our evaluation was the way in which the adoption of EMR affected workplace conflict and communication. Use of EMR has a clear implication for how employees share and exchange information, thereby affecting interpersonal dynamics and relations. As with the variables explored above, arguments can be made for EMR having either a positive or negative effect on conflict and communication. On the one hand, access to more accurate and timely information might enhance the level of communication within treatment nursing homes and reduce different forms of conflict. On the other hand, it is possible that electronic access to such information would decrease the employees' need to engage in face-to-face communication, thereby possibly negatively affecting interpersonal relations and increasing various forms of interpersonal conflict.

Our survey data provides strong support for a positive EMR effect on workplace conflict and communication. It is important to note that we were not able to collect actual

measures of workplace conflict; we are able to report here only the survey respondents' perceptions about levels and changes in various measures of workplace conflict. For example, a comparison of survey data at Time 1 and Time 2 indicates that, for all of the forms of conflict examined, post-implementation levels were significantly lower. As shown in Figures 8-11, respondents reported that conflict decreased across four distinct conflict categories: 1) conflict with supervisors; 2) conflict within units; 3) conflict between units; and 4) conflict with residents. This reported decline in conflict levels was significant at the .001 level of significance, and it suggests that changes in the way information was gathered and disseminated in the post-EMR period was associated with a perceived reduction in workplace conflict.

It is important to note, however, that reported levels of conflict were also significantly lower in the control homes. This indicates that it is possible that the reduction in the reported level of conflict is not associated with the technology but rather with some external pressure. For example, during the period of our study the economy in the New York City area and elsewhere deteriorated significantly. Some social scientists maintain that workplace conflict declines during periods of economic recession; research on strikes and other forms of work stoppages consistently shows that they follow the business cycle, increasing in periods of low unemployment and decreasing in periods of high unemployment (see, for example, Lipsky and Farber, 1976). Nevertheless, we believe that it is likely that the reduction in reported conflict in the treatment homes was related to the use of EMR. This claim is primarily supported by findings that indicate that employees in the treatment homes also reported a significant increase in interpersonal communication, while there was no significant change in communication in the control

homes. For example, Figure 12 shows that employees in the homes with EMR technology reported significantly higher levels of communication with their supervisors about work-related issues after the introduction of the technology. Past research demonstrates that the relationship between conflict and communication is a complex one (for a summary of game theory research on this relationship, see Davis, 1983, pp. 90-96). However, based in part on interviews we conducted in the field, we believe that the increase in communication and the flow of information in the homes with EMR was largely responsible for the decrease in various forms of reported conflict.

Figure 8: Comparison of Employee-Reported Conflict with Supervisor Means at Time 1 and Time 2
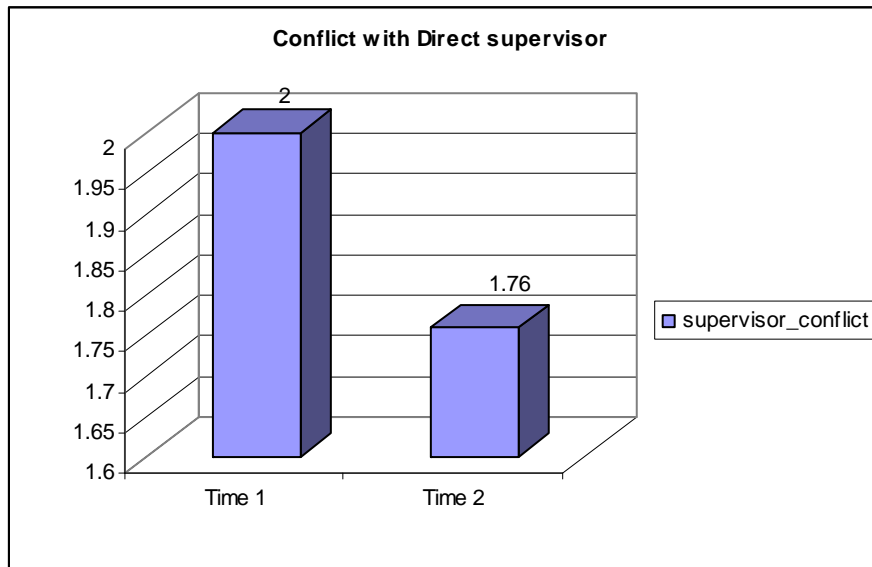
Figure 9: Comparison of Employee-Reported Conflict within Unit Means at Time 1 and Time 2
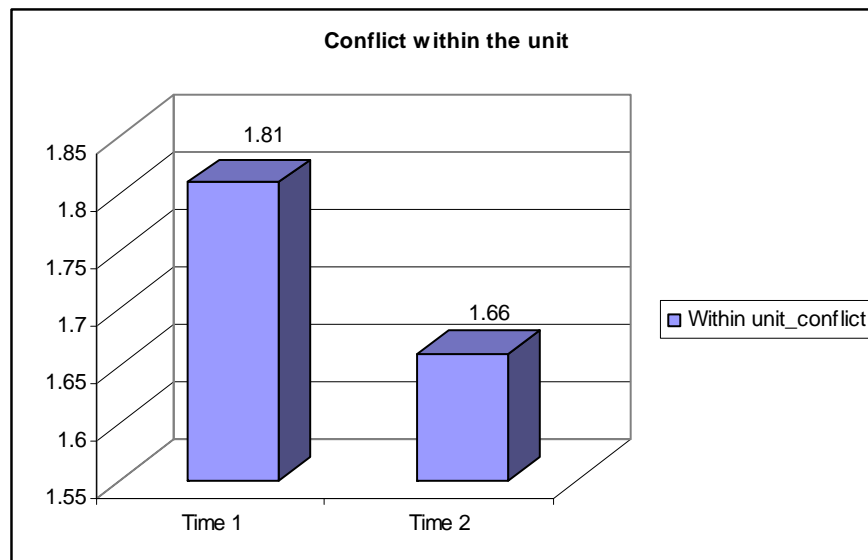
Figure 10: Comparison of Employee-Reported Conflict between Units Means at Time 1 and Time 2
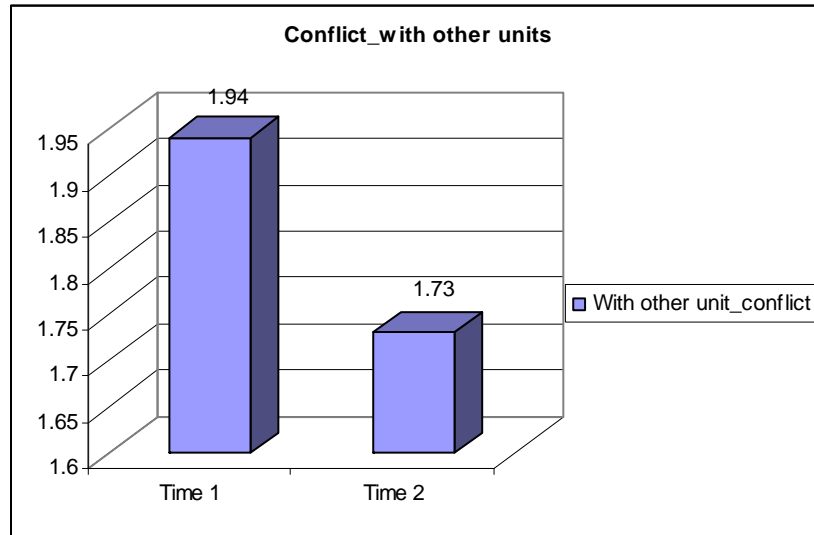
Figure 11: Comparison of Employee-Reported Conflict with Residents Means at Time 1 and Time 2
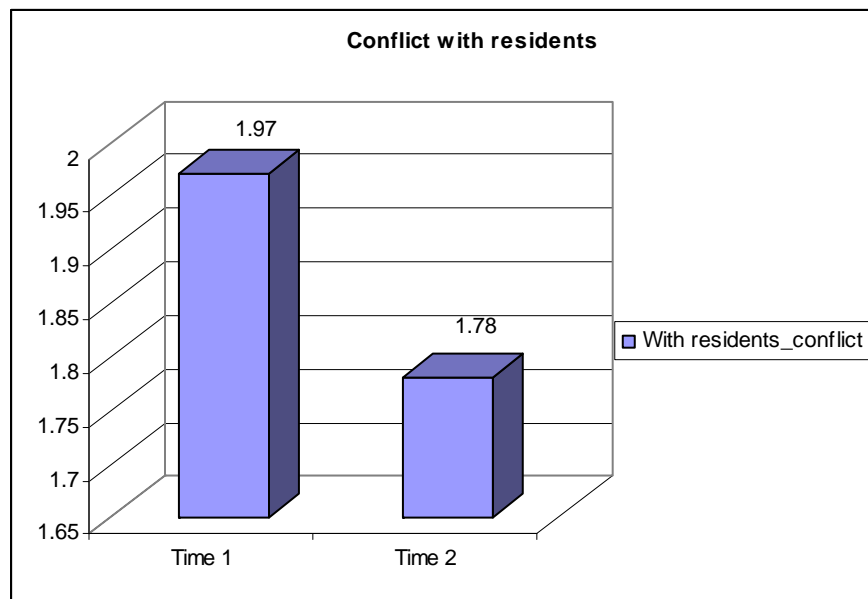
Figure 12: Comparison of Employee-Reported Communication with Supervisor about Work, Means at Time 1 and Time 2
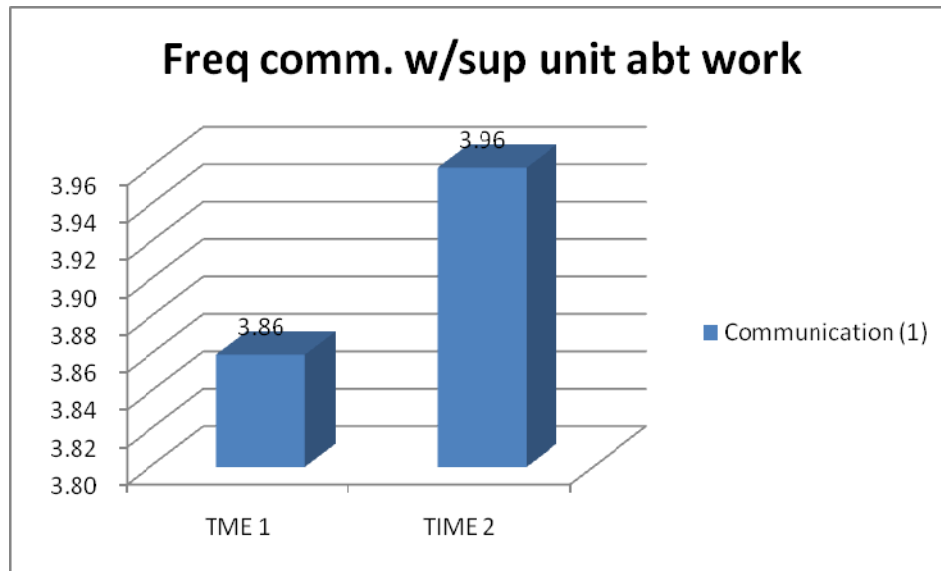
In sum, we believe our findings support the argument that EMR can lead to higher levels of workplace communication and lower levels of workplace conflict. At the very least, our evidence does not support the belief that the adoption of EMR leads to higher levels of workplace conflict and decreased levels of communication.

4.7 EMR Effects on Labor Relations Variables

In addition to examining the effect of EMR technology on employee perceptions of their nursing home, we also assessed the degree to which it influenced member perceptions of their union. In particular, we examined two union-related constructs: the members' commitment to their union and members' perceptions of their union leadership. With regard to member perceptions of their union leadership, no significant difference was found in the comparison of Time 1 and Time 2 survey results. Analysis of the survey data does suggest, however, that the adoption of EMR can have a positive effect on the members' commitment to their union. We measured the members'

commitment by asking respondents the extent to which they agreed with the statement, "The union's successes are my successes." As shown in Figure 13, employees reported significantly greater commitment to their union after the adoption of the technology. The figure shows the difference in level of commitment between Time 1 and Time 2 was significant at better than the .05 level. Union members in the control homes, on the other hand, did not report a significantly different level of union commitment, providing additional support for the proposition that the use of EMR was associated with an increase in the members' commitment to their union.

However, we need to report two important qualifications on this finding. First, we found an increased level of union commitment for only one of the commitment items included in our survey instrument. Other union commitment measures were not significantly different in Time 2 than they had been in Time 1. Second, the active role that 1199SEIU played in the adoption of the EMR technology almost certainly influenced the change in member attitudes about their union. In other settings where the union does not play the role of an active partner in the decision to adopt and implement EMR, it is not at all certain that the use EMR would be associated with increased member commitment.

Figure 13: Comparison of Member-Reported Union Commitment Means at Time 1 and Time 2
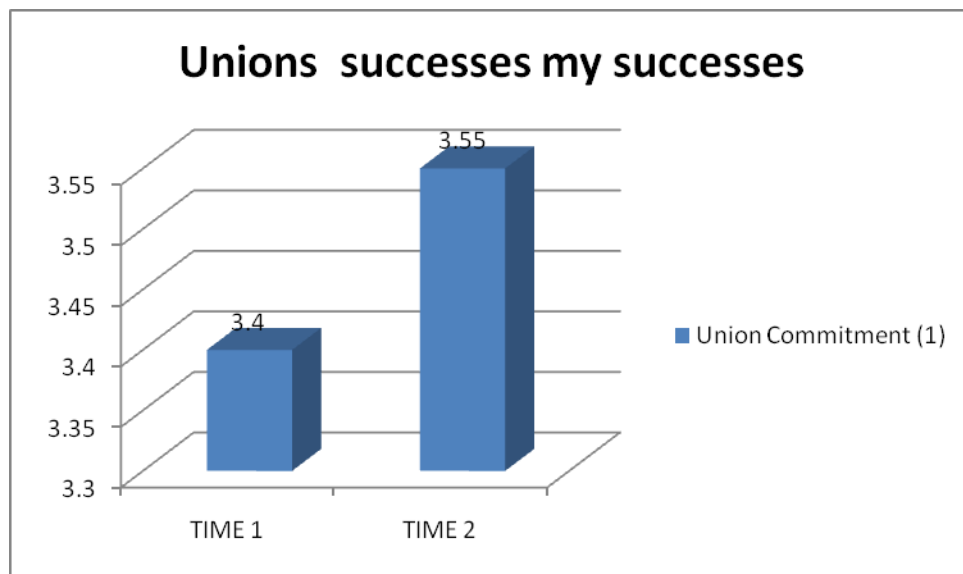
4.8 Variation across Individual Nursing Homes

Our summary of significant findings up to this point has been based on a comparison of aggregated data from all treatment and control survey respondents at Time 1 and Time 2. This analysis is important since it provides an overview of the ways in which EMR might affect adopting organizations and their employees. Nevertheless, one of the themes that emerge from our evaluation of the demonstration project, which will be discussed in further detail below, is the wide variation observed in the adoption of EMR and outcomes across the fifteen nursing homes studied. Not all nursing homes experienced the same EMR benefits or incurred the same costs. To examine this variation across nursing homes, we analyzed survey data at the individual facility level, comparing all key measures at Time 1 and Time 2.

Table 11 summarizes the significant pre- and post-EMR changes at the individual nursing home level. As is evident in this table, EMR technology did not have a uniform

effect on all nursing homes. Thus, for example, in several nursing homes we found no significant post-EMR changes for the variables we found to be significant at the aggregate level, while the reported means for some of the workplace measures were significantly different after the adoption of EMR at both the aggregate and the individual facility level. We need to point out that the fact that only a handful of measures were significantly different at the facility level in no way diminishes our findings that a much larger number were significant at the aggregate level. To conduct a test of significant differences at the facility level, we needed to use the portion of our overall sample that represented our panel data, i.e., the employees who were on staff and interviewed at both Time 1 and Time 2. As Table 2 shows, at Time 2 our sample of respondents at the facility level who were also interviewed at Time 1 ranged from a low of three (at Nursing home O) to a high of 27 (at Nursing home D). At five of the treatment homes the size of the samples of respondents was simply too small to do a test of statistical significance. In the case of other homes, the sample of respondents was technically large enough to do a significance test, but practically speaking not large enough to expect discover a statistical difference between Time 1 and Time 2.

At the aggregate level we found that the introduction of EMR had no significant effect on reported levels of job stress. At the facility level we found the same result at most of the homes, but not all of them. Figure 14 shows that at the Nursing home M, the employees who remained on staff and were interviewed at both Time 1 and Time 2 reported a significant *decline* in job stress; at Nursing home M the stress index declined by 13 percent. But Figure 15 shows that at the Nursing home J employees reported a significant *increase* in job stress: the index increased by 32 percent. As we discus in a

later section of this report, we believe these facility-level variations are principally a consequence of the variation in leadership and management style across the 15 treatment homes in our sample. At Nursing home M, for example, the top administrator and his staff had a style that emphasized staff participation in decision-making and shared responsibility.

Table 11 also reveals an especially noteworthy finding: in eight of the ten homes for which a statistical test of significance could be performed at least one measure of perceived conflict (of the four measures we used) declined significantly after the introduction of EMR; in five of the homes either three or four measures of conflict declined significantly. The respondents' conflict with their supervisor, with the residents they served, and within their own care unit or with other units at their home declined significantly in four of the homes (Nursing home C, D, I and N). At Nursing home O and L respondents reported no significant change in conflict between Time 1 and Time 2. As we noted in Section 3.6, the significant decline in conflict at the aggregate level as well as in many of the individual homes after the introduction of EMR might have been the result of factors external to the home, especially the deterioration of the economy and the job market in the New York City region between Time 1 and Time 2. But our field interviews support the view that the introduction and use of EMR was at least in part responsible for the decline in conflict.

Table 11: Summary of Time 1 and Time 2 Comparison for Individual Nursing Homes (only significant results are reported)

1. Nursing Home A

	Time 1	Time 2	Change
N/A	-	-	-

2. Nursing Home B

	Time 1	Time 2	Change
N/A	-	-	-

3. Nursing Home C

	Time 1	Time 2	Change
Conflict with Direct Supervisor	2.00	1.73	-0.27*
Conflict within the Unit	1.90	1.71	-0.19*
Conflict with Residents	2.16	1.90	-0.26*

4. Nursing Home D

	Time 1	Time 2	Change
Commitment	4.30	4.03	-0.27*
Discretion	3.74	3.50	-0.24*
Conflict with Direct Supervisor	2.10	1.68	-0.42**
Conflict within the Unit	1.99	1.65	-0.34**
Conflict with Other Units	2.11	1.61	-0.50**
Conflict with Residents	2.09	1.77	-0.32*

5. Nursing Home E

	Time 1	Time 2	Change
Conflict with Direct Supervisor	2.11	1.66	-0.45*
Conflict with Residents	2.22	1.80	-0.42*

6. Nursing Home F

	Time 1	Time 2	Change
N/A	-	-	-

7. Nursing Home G

	Time 1	Time 2	Change
Conflict with other Units	1.92	1.70	-0.22*
Conflict with Residents	1.96	1.73	-0.23*

8. Nursing Home H

	Time 1	Time 2	Change
N/A	-	-	-

9. Nursing Home I

	Time 1	Time 2	Change
Conflict with Direct Supervisor	1.88	1.62	-0.26*
Conflict within the Unit	1.82	1.58	-0.25*
Conflict with Other Units	1.72	1.44	-0.28*
Conflict with Residents	2.00	1.71	-0.30*

10. Nursing Home J

	Time 1	Time 2	Change
Stress	2.70	3.13	+0.43*
Conflict with Other Units	1.95	1.51	-0.44*

11. Nursing Home K

	Time 1	Time 2	Change
N/A	-	-	-

12. Nursing Home L

	Time 1	Time 2	Change
Discretion	3.58	3.19	-0.39*

13. Nursing Home M

	Time 1	Time 2	Change
Stress	3.13	2.73	-0.40*
Conflict with Direct Supervisor	2.15	1.83	-0.32*
Conflict within the Unit	1.91	1.65	-0.27*
Conflict with Other Units	2.01	1.65	-0.36*

14. Nursing Home N

	Time 1	Time 2	Change
Conflict with Direct Supervisor	2.25	1.74	-0.51**
Conflict within the Unit	1.85	1.52	-0.33*
Conflict with Other Units	2.07	1.74	-0.33*
Conflict with Residents	1.95	1.56	-0.39*

15. Nursing Home O

	Time 1	Time 2	Change
Discretion	3.50	3.03	-0.47**

*Refers to a significant mean difference between Time 1 and Time 2 ($p<.05$)
**Refers to a significant mean difference between Time 1 and Time 2 ($p<.01$)

Figure 14: Comparison of Time 1 and Time 2 Employee Stress at Nursing home M
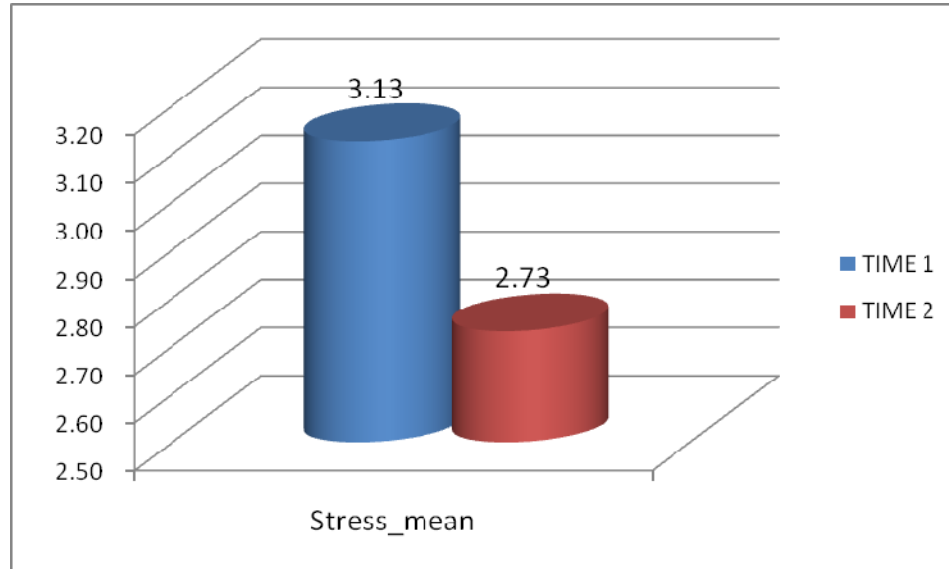

Figure 15: Comparison of Time 1 and Time 2 Employee Stress at Nursing home J
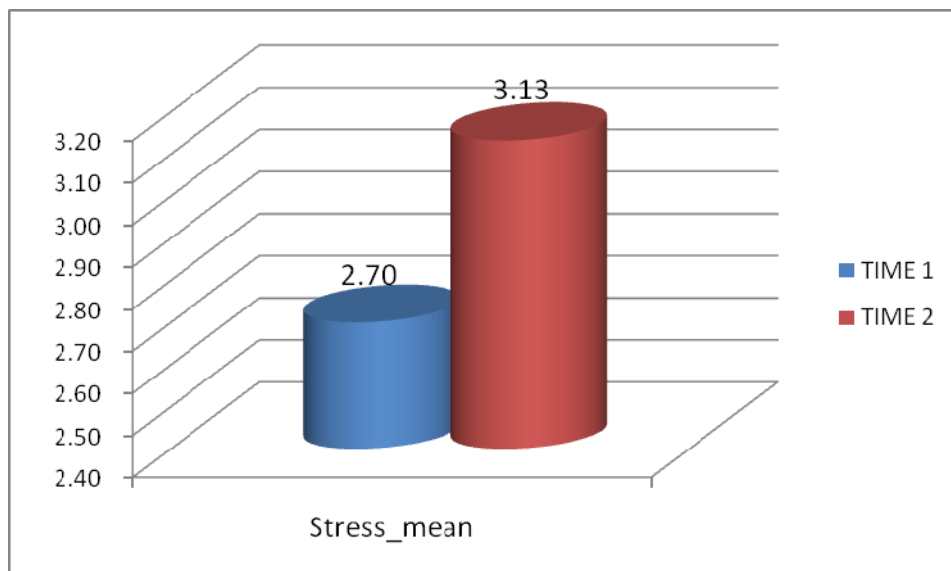
Taken together, the evidence reported in this section strongly suggests that, although EMR technology may have some effects on frontline staff that hold generally

across organizations, the technology is also likely to affect individual organizations differently. In a subsequent section of this report we address the critical organizational factors that we believe contribute to variation in EMR adoption patterns and outcomes across facilities.

4.9 EMR Effects on Resident Care

Although the focus of our evaluation was on the implications of EMR adoption for workforce-related issues, we also collected data on the effects of new technology on the reported quality of resident care provided by employees.[10] It is important to emphasize that these data are based on employee responses to survey questions on resident care and are therefore a reflection of frontline employees' and supervisors' perspectives.[11] Two sets of findings reported below support the claim that EMR adoption can improve the quality of resident care provided by employees.

First, as seen in Figure 16, analysis of our survey data from the treatment facilities documents a statistically significant reduction in the percentage of employees who reported observing medical errors. At Time 1, approximately 25 percent of the respondents reported observing a medical error or near miss in the three months prior to the survey date. At Time 2, the percentage of employees reporting an observed error or near miss in the three months prior to the survey declined by approximately five percentage points to close to 20 percent of the sample. This decrease in observed errors or near misses was statistically significant ($p=.014$). In contrast, analysis of the survey data from employees in control facilities did not document a statistically significant decrease in the percentage of employees reporting observed errors or near misses.

Figure 16: Percentage of Employees Observing Errors and Near Misses at Time 1 and Time 2
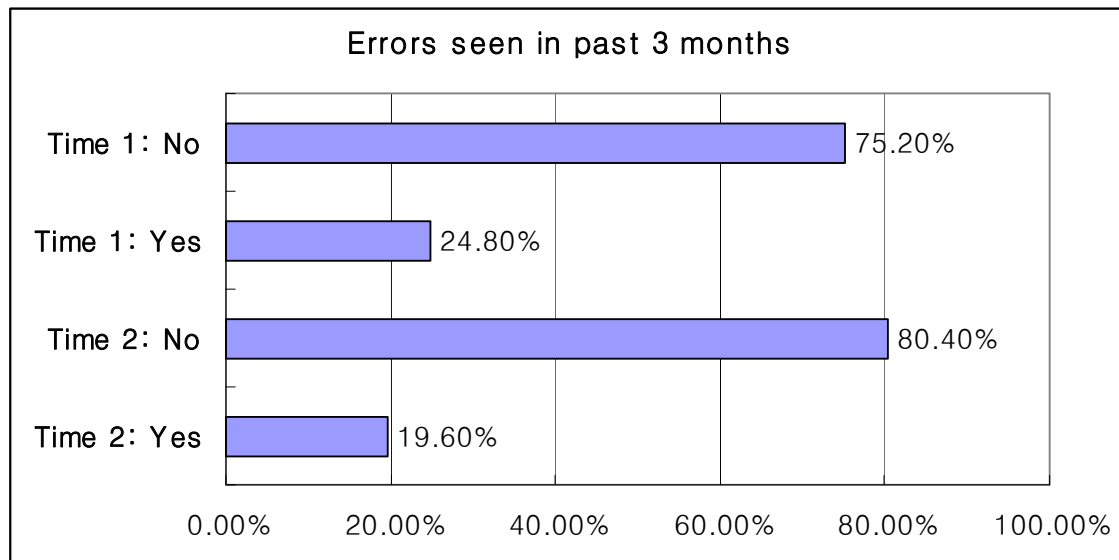
We also examined the change in number of observed errors and near misses reported at Time 1 and Time 2. As part of our survey, we asked those employees who reported observing errors and near misses at Time 1 and Time 2 how many incidents had they observed. As shown in Table 12, the number of reported errors and near misses decreased at Time 2. At Time 1, the average number of reported errors or near misses over the preceding three-month period was 6.32. At Time 2, the average number of reported errors or near misses reported was 4.45. In addition to a decrease in the average number of reported incidents, Table 12 also documents a dramatic reduction in the variation of employee responses. At Time 1, the standard deviation for reported errors or near misses was 13.04. At Time 2, the standard deviation was 5.98. In other words, there appears to be greater consistency in terms of the reported number of observed errors or near misses at Time 2 than at Time 1. Figures 17 and 18 illustrate the distribution of number or reported errors or near misses for Time 1 and Time 2, respectively.

Taken together, these findings regarding the reduction in observed errors or near misses have important implications for the study of EMR adoption. The reduction in both the percentage of employees reporting errors and the average number of incidents reported, strongly suggest that the implementation of EMR increases the overall safety culture in adopting nursing homes.

Table 12: Comparison of Mean Number of Reported Errors or Near Misses and Standard Deviations at Time 1 and Time 2

Number of Reported Errors or Near Misses	Time 1	Time 2
Mean	6.32	4.45
Std. Deviation	13.043	5.981

Figure 17: Frequency Distribution of Reported Errors or Near Misses at Time 1
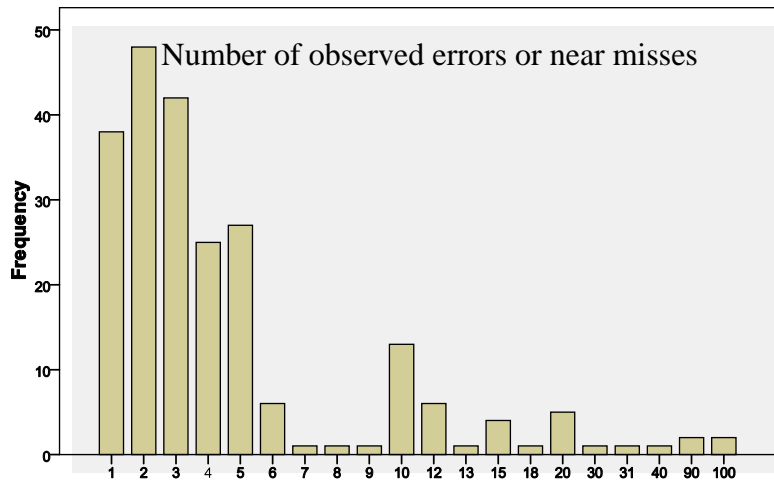
Figure 18: Frequency Distribution of Reported Errors or Near Misses at Time 2
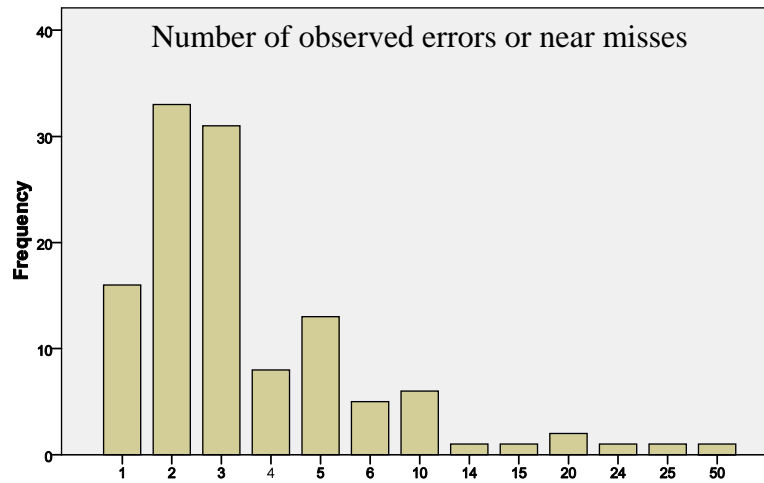
In addition to survey items regarding observed errors or near misses, we also asked respondents about how EMR technology affected the resident care they provide. As seen in Figure 19, close to 50 percent of the 596 employees who responded to this survey question at Time 2 perceived an improvement in the quality of care they were able to provide residents since the adoption of the EMR technology (31 percent reported being able to provide better care and close to 19 percent reported being able to provide much better care). Forty-one percent of the respondents perceived no change in the quality of care they were able to provide. Nine percent of the respondents perceived a decrease in the quality of care they were able to provide (7.7 percent reporting that the care they were able to provide was worse and 1.3 percent reporting that the care they were able to provide was much worse). This evidence also supports the claim that the adoption of EMR can enhance the ability of frontline staff to care for their residents.

Figure 19: Employee Perceptions of Quality of Care Provided Using EMR

In general, the quality of care you are able to provide to your residents since you started using SigmaCare is:

1. Much better   2. Better   3. About the Same   4. Worse   5. Much worse
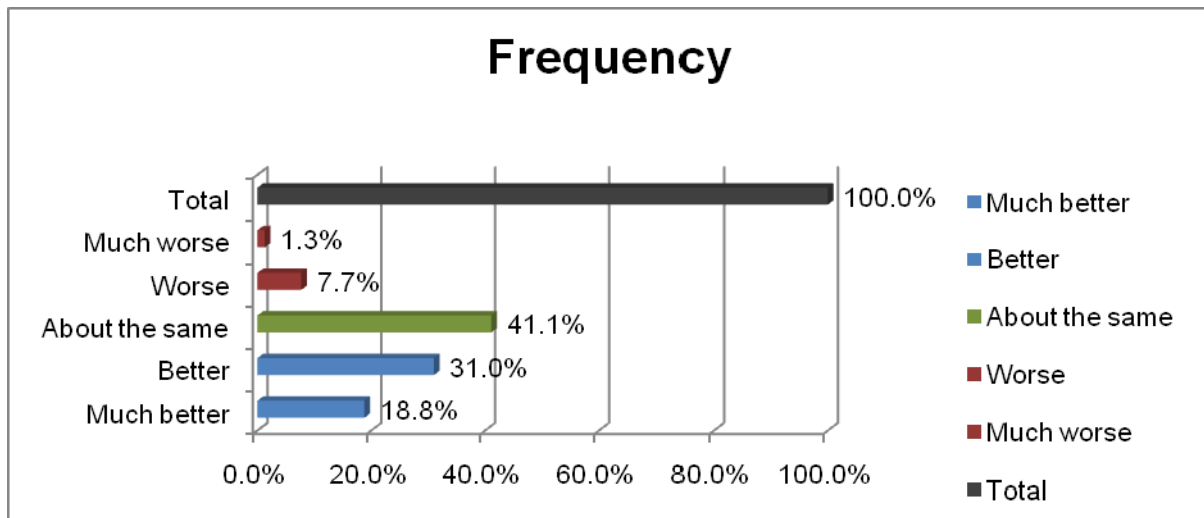
5. FACTORS INFLUENCING EMPLOYEE ACCEPTANCE OF EMR TECHNOLOGY

5.1 Overview of Our Findings

Section 3 of this report documented the key variables affected by the introduction of EMR technology. Our findings support the proposition that the adoption of EMR has a number of important organizational and employee-level consequences. In this section we draw attention to another central dimension of our evaluation, namely, the attitudes and perception of nursing home staff toward the technology. More specifically, our evaluation included an analysis of the degree to which employees in the treatment homes accepted EMR. Furthermore, we examined the factors that help explain variation in EMR

technology acceptance. Thus, the results reported in this section allow for a better understanding of what organizations might try doing to increase the acceptance of EMR.

Our analysis of EMR technology acceptance draws heavily on the well-established general technology acceptance literature (Davis, 1989; Davis et al., 1989). This literature, which emerged primarily from the information sciences scholarship, has developed a widely used model delineating the core dimensions associated with the acceptance of technology (Mahmood et al., 2000; Venkatesh and Davis, 1996; Igbaria, 1994). The *technology acceptance model* (or TAM), which emerged from this literature, is an extremely useful framework for our evaluation because it allows us to explore the antecedents to different technology acceptance dimensions. The TAM, which has evolved over the past two and a half decades, has outlined three technology acceptance dimensions, which we employed in our evaluation: 1) user perceptions of the *usefulness* of the technology; 2) user perceptions regarding the *ease of use* of the technology; and 3) user perceptions regarding the organizational support, which was developed in later TAM research (see Igbaria et al., 1995).

Overall, three central themes emerge from our analysis of employee technology acceptance. First, our findings suggest that across the fifteen nursing homes, the general level of EMR acceptance is relatively high. Thus, it appears that, for the most part, employee acceptance of the EMR technology one year after its introduction has met or exceeded general expectations. Second, although the overall level of technology acceptance is relatively high, our findings indicate that here, too, there is variation across the fifteen nursing homes. In other words, not all nursing homes achieved the same level of employee EMR acceptance. This finding provides additional support for our

overarching claim that the adoption of EMR is heavily influenced by organizational characteristics. Demonstrating that EMR acceptance varies across organizations, our final set of results in this section examines the factors that help explain this variation. Results reported below highlight the role of central workplace variables, such as job satisfaction, commitment, and trust in predicting employee acceptance of EMR.

5.2 Employee Acceptance of EMR Technology

As previously noted, the overall acceptance of EMR technology was relatively high. Survey respondents were asked to rate on a scale of 1-5 a set of items regarding their perceptions of the *usefulness* of the technology, its *ease of use,* and the *organizational support* for its use. As seen in Table 13, the mean scores for each of these dimensions was 3.59 (out of 5) for reported EMR usefulness, 3.83 (out of 5) for reported ease of use, and 4.09 (out of 5) for reported organizational support. It is interesting to note that of the three dimensions, the mean score for employee perceptions of the usefulness of the EMR technology was lowest. This may suggest that additional attention should be given to the "marketing" of the technology's utility.

Figure 20 graphically depicts the distribution of employee responses for the three technology acceptance dimensions. As illustrated in the frequency distribution, there is a wide variation in employee perception regarding each of the technology acceptance dimensions; nevertheless, a large proportion of the respondents indicated a high level of acceptance across each of the three dimensions.

Table 13: Mean Scores for Technology Acceptance Dimensions across All Treatment Nursing Homes

	N	Mean	Std. Deviation	Minimum	Maximum
TAM Usefulness	736	3.59	.837	1	5
TAM Ease of Use	792	3.83	.659	1.38	5
TAM Organizational Support	725	4.09	.502	1.57	5

Figure 20: Frequency Distribution for Technology Acceptance Dimensions
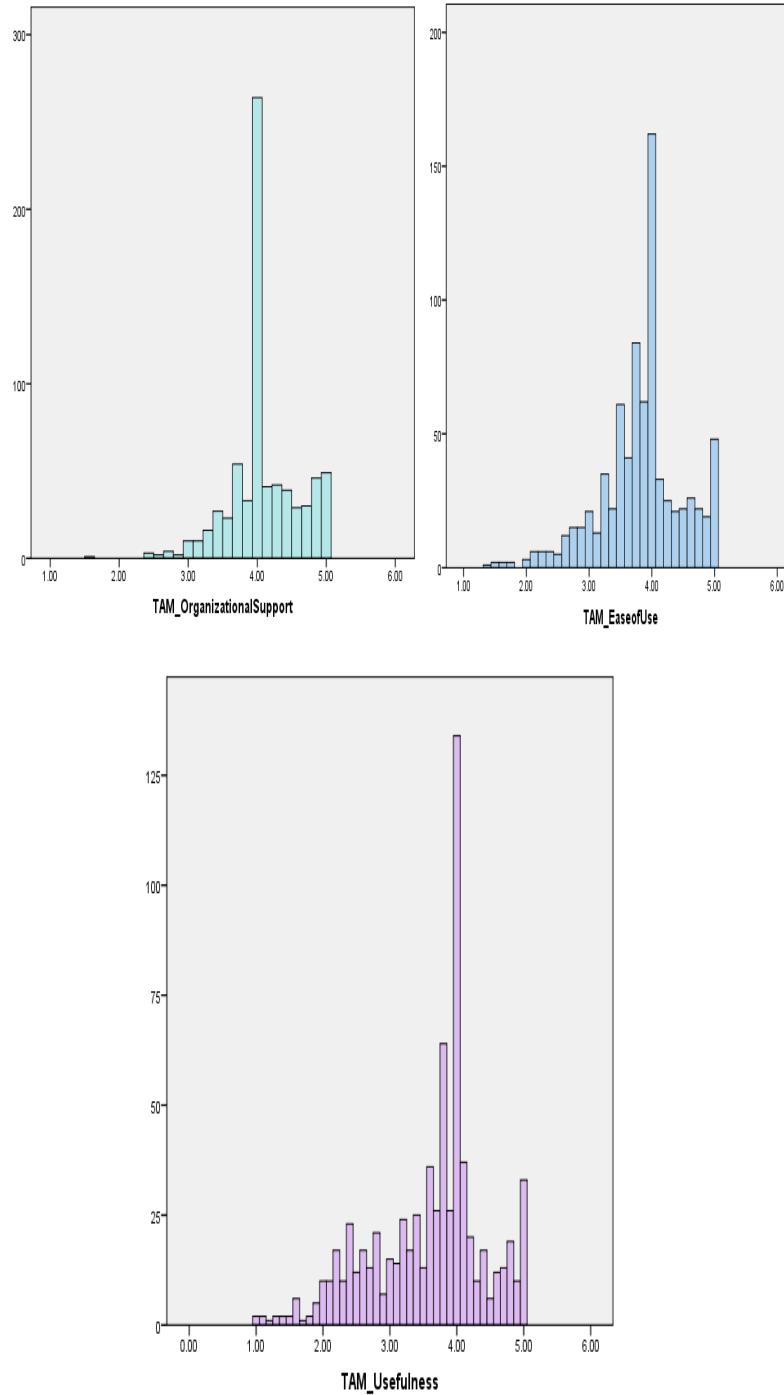
As was the case with our evaluation of post-EMR adoption changes, it is necessary to compliment the aggregated level of analysis across all treatment homes with an individual nursing home level of analysis. In other words, what does the variation in EMR technology acceptance look like for the fifteen nursing homes participating in the demonstration project?

As seen in Figures 21-23, there is a great deal of technology acceptance variation across the nursing homes. Mean scores for employee perceptions of EMR usefulness vary across the nursing homes from a low of 3.31 (out of 5) to a high of 3.85 (out of 5). Mean scores for employee perceptions of EMR ease of use vary between 3.37 and 4.09. Finally, mean scores for employee perceptions of their nursing home support for EMR vary between 3.83 and 4.26.

Thus, despite the fact that each of the fifteen nursing homes received precisely the same technology with the same vendor providing the hardware, software, and training, there are clear differences in the level of EMR acceptance across these organizations. Here, too, this evidence strongly suggests that implementation of EMR is not simply a matter of purchasing the appropriate technological infrastructure but has a great deal to do with organizational characteristics and managerial strategies.

Figure 21: Comparison of Mean Scores for Employee Perceptions of EMR Usefulness across the Fifteen Nursing Homes

TAM:Usefulness

Home	Score
A	3.84
B	3.52
C	3.83
D	3.31
E	3.34
F	3.35
G	3.37
H	3.72
I	3.85
J	3.63
K	3.52
L	3.59
M	3.54
N	3.85
O	3.42
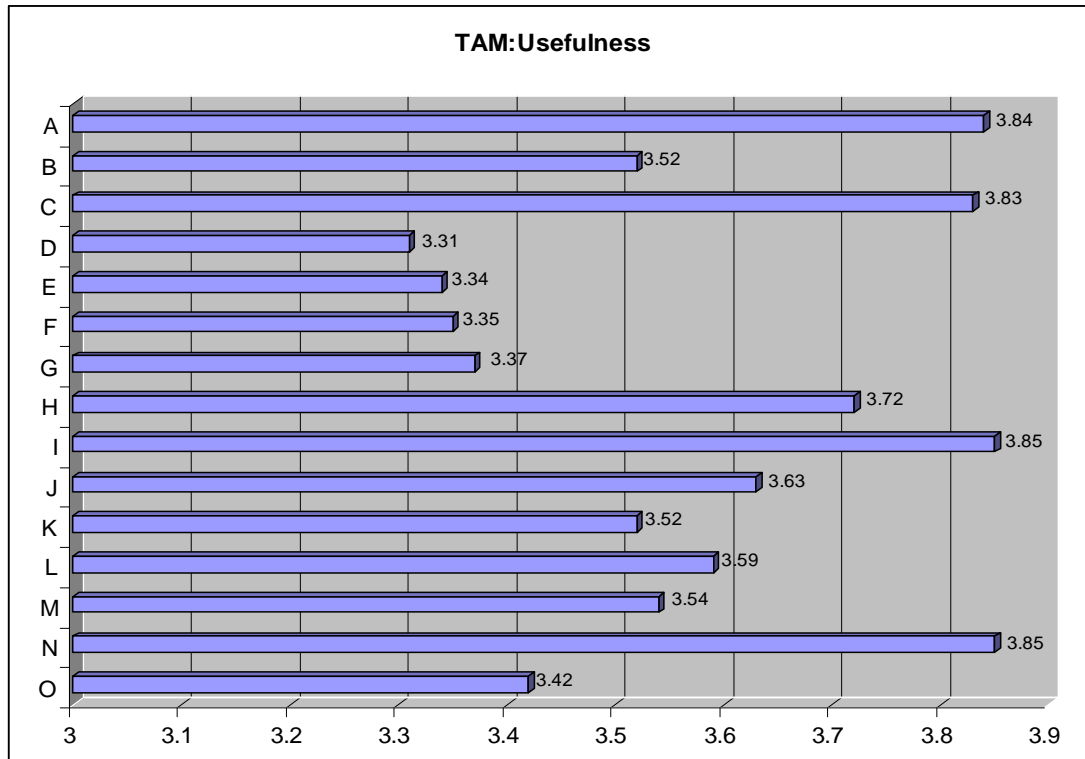
Figure 22: Comparison of Mean Scores for Employee Perceptions of EMR Ease of Use across the Fifteen Nursing Homes

TAM:Ease of Use

Home	Score
A	4.09
B	3.87
C	3.94
D	3.69
E	3.65
F	3.57
G	3.74
H	3.96
I	4.03
J	3.75
K	3.74
L	3.75
M	3.77
N	3.93
O	3.69

63
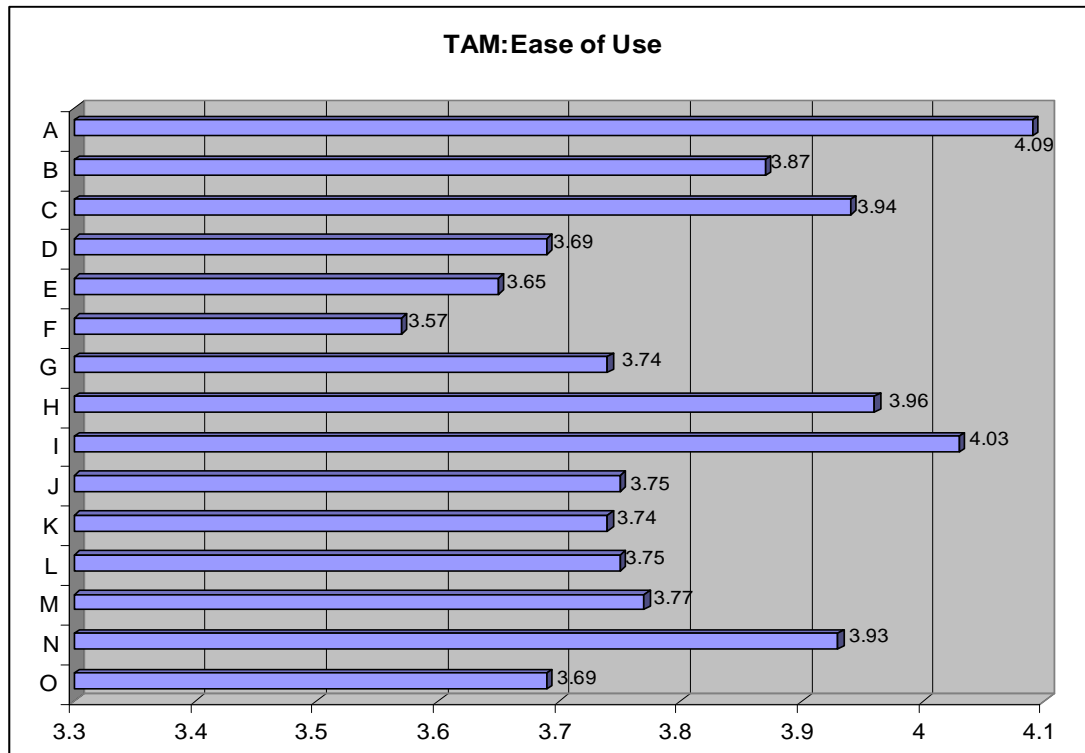
Figure 23: Comparison of Mean Scores for Employee Perceptions of Organizational Support for EMR across the Fifteen Nursing Homes
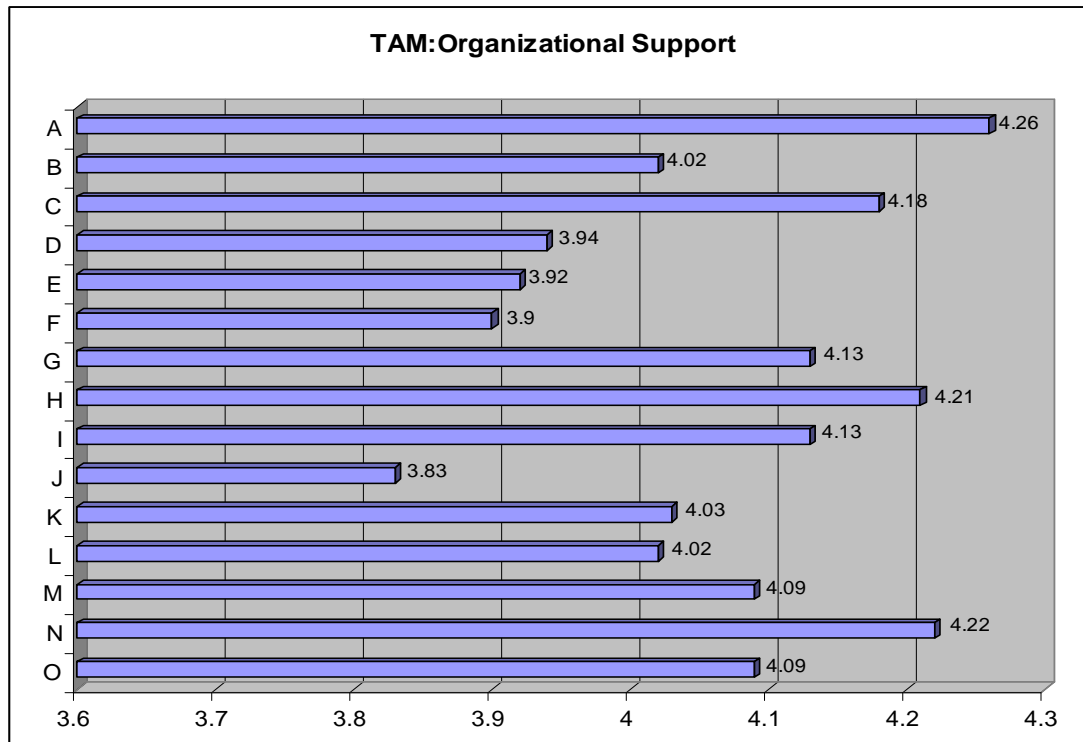
5.3 Modeling Employee Acceptance of EMR Technology

If organizational factors strongly influence the adoption of EMR, what are some of the key workplace predictors explaining adoption variation? In Section 5 we will report on organizational level variables, which play an important role in the adoption of EMR. We find that individual level attitudes and perceptions, as well as employment status, account for significant variation in employee acceptance of the technology. To conduct the analysis we employed both our Time 1 and our Time 2 survey data. More specifically, we conducted regression analyses predicting EMR technology acceptance at Time 2 based on employee attitudes and perceptions at Time 1. For this analysis we used a matched sample, including employees that responded to both surveys (this sample included 427 employees). We were therefore able to assess which individual level factors

help explain the degree to which employees accepted the EMR technology. Table 14 provides correlations, descriptive statistics, and explanations for the variables included in the regression analyses discussed in this subsection.

Tables 15-17 report findings for eleven regression models explaining four TAM outcome variables using three general categories of explanatory variables. First, in terms of the outcome variables included in the analysis, we examined each of the three TAM dimensions discussed above as well as an overall technology acceptance variable. In creating an overall technology acceptance variable, we combined the three specific dimensions into one outcome measure. As Table 14 shows, the Cornbach Alphas for the TAM construct is very high.

Second, in terms of the explanatory variables examined in the regression models reported below, we included three general categories of variables in separate analyses: 1) employee perceptions and attitudes regarding their work at the nursing home and their level of attachment to the organization; 2) employee perceptions of relational dynamics in their organization including trust, communication and conflict; and 3) employee commitment to and perceptions of their union and its leadership. In addition to these explanatory categories, we also include a set of individual control variables, such as gender, age, educational level and facility. Individual variables for each of these categories were included in regressions the four technology acceptance variables.[12] In what follows, we summarize the significant findings from this analysis.

Table 15 documents the results from our analysis predicting technology acceptance based on employee perceptions and attitudes about their work. The individual variables tested in this analysis were: 1) job satisfaction; 2) turnover intentions; 3) stress;

4) commitment to the nursing home; and 5) employee discretion. Results from this analysis indicate that three of the five variables are statistically significant in explaining three of the four TAM dimensions measured.

First, employee job satisfaction at Time 1 had a statistically significant positive effect on overall acceptance of technology, perceptions of technology usefulness and perceptions of technology ease of use at Time 2. Interestingly, job satisfaction did not have a statistically significant effect on employee perceptions of organizational support at Time 2. Second, Table 15 also illustrates the statistically significant effect of employee commitment to the organization at Time 1 on the three TAM dimensions at Time 2. Here, too, organizational commitment did not have a significant effect on perceptions of organizational support for the technology. Finally, employee perceptions of the level of discretion provided by the nursing home had a statistically significant effect on employee overall acceptance of the EMR technology and on employee perceptions of the usefulness of the technology. Employee discretion did not significantly affect employee perceptions of EMR technology ease of use or of organizational support.

Taken together, the statistical significance of this set of explanatory variables strongly supports the claim that employee perceptions of their working conditions play an important role in the adoption of new technology. Previous research has shown that each of these variables is important for a variety of organizational and individual-level outcomes. Our research demonstrates that organizational attention to employees on each of these factors carries a technology acceptance dividend.

The second set of regression tests reported in Table 16 examined the effects of relational variables at Time 1 on technology acceptance at Time 2. The relational explanatory variables examined included: 1) reported employee-supervisor trust; 2) reported organizational trust; 3) reported employee-supervisor communication; 4) reported general communication; and 5) a set of reported conflict variables among different groups within the nursing home.

As seen below, two of the explanatory variables tested had a significant effect on technology acceptance. First, greater levels of reported organizational trust had a significant and positive effect on employee perceptions of the usefulness of the EMR technology. Second, the respondents' reported level of communication with supervisors in their nursing home had a significant and positive effect on overall technology acceptance, perceptions of its usefulness, and perceptions of its ease of use. Reported levels of communications with supervisors did not have a significant effect on employee perceptions of organizational support for the EMR technology. It is interesting to note that none of the conflict related variables included in the regression analysis had a significant effect on technology acceptance.

The third set of regression analyses examined the effects of employee perceptions regarding their union on technology acceptance. In particular, two variables were included in these regression models: 1) member commitment to their union; and 2) member perceptions of their union leadership. As seen in Table 17, members' perceptions of their union leaders had a positive and significant effect on technology acceptance. More specifically, more positive perceptions of union leadership significantly enhanced employee overall acceptance of EMR technology, its perceived usefulness, and ease of

use. It is important to note that union leadership explained a relatively large proportion of the variance across these three outcome variables (8.4 percent, 11.4 percent, and 5.4 percent, respectively). This is an extremely important and interesting finding. First, it suggests that in addition to organizational and managerial factors, union-related variables also influence the adoption of EMR. Second and more specifically, member views of their union leadership influence perceptions of workplace innovation. In other words, union leaders can play a positive role in the adoption of new technology. As noted above, this finding may not be generalized, given the unique role 1199SEIU played in this demonstration project. Nevertheless, it strongly suggests that where unions participate and collaborate with employers during the adoption process, their members are likely to support the implementation of EMR. Employee-reported union commitment did not, however, have a significant effect on any of the TAM outcome variables.

It is interesting to note that in addition to the explanatory variables examined a number of control variables had significant effects on technology acceptance. First, we included a control variable measuring the amount of time spent on a computer outside of work at Time 1. Greater reported use of a computer prior to the EMR adoption was positively and significantly related to perceptions of technology ease of use as seen in Table 15. In other words, employees with more computer experience at Time 1 reported greater EMR ease of use at Time 2. This variable was not, however, significantly related to any of the other technology acceptance outcomes. Second, as seen in Table 15, employee union membership was positively and significantly related to employee perceptions of organizational support for the EMR technology. This is an important

finding, since it suggests that union membership does not negatively affect employee perceptions of their organization's support for new technology.

Third, as documented in Tables 16 and 17, employment status (full-time or part-time) had a significant effect on employee acceptance of technology. Part-time employment was negatively related to overall acceptance of technology in the regression analysis shown in these tables. Part-time employment status also had a statistically negative effect on employee perceptions of EMR technology ease of use in the regression analysis reported in Table 16. On the one hand, this finding is not surprising. Part-time employees spend less time with the technology and are therefore likely to have lower levels of acceptance. On the other hand, since the tasks performed by part-time employees are just as central to resident care as those performed by full-time employees, this finding has very clear and important implications for nursing homes. Given that employment status matters in the adoption of EMR technology, nursing homes and the technology vendors should develop strategies to enhance part-time employees' comfort with and acceptance of the technology.

The findings reported in this subsection suggest that the degree to which technology is accepted by frontline staff and supervisors is, in part, within the control of the organization, its administration, and managers. Greater attention to factors associated with working conditions, relational dynamics, and perceptions of the union can improve a nursing home's adoption process. It is important to note again that a number of variables that we expected to influence technology acceptance were not significant in our analysis. For example, employee perceptions of workplace conflict at Time 1 did not affect technology acceptance at Time 2. In addition, the employees' commitment to their union

was also not statistically significant in predicting overall acceptance of EMR. Finally, employee turnover intention and reported stress were also not significant.

Table 14: TAM Variable Definitions and Correlations

Variable	Scale	M	SD	1	2	3	4	5	6	7	8
1. Overall TAM	(Dis A) 1 - 5 (Agree) 25 items, α=.93	3.85	.59								
2. Age		49.4	10.1	.08							
3. Gender	F: 0, M: 1	.07	.26	.09	-.06						
4. Education Level	Category 1-7	2.64	1.08	-.10	-.24**	.01					
5. Years worked at nursing home	Number of yrs	9.36	8.27	.06	.53**	.03	-.06				
6. Employment Status	F: 1, P: 2	1.13	.34	-.17*	-.20**	.02	.11	-.23**			
7. Member of Union	Not U: 0, U: 1	1.00	.00	.a	.a	.a	.a	.a	.a		
8. Nursing Unit	Category 1-19	1.71	2.11	.00	-.03	-.09	.03	.07	-.07	.a	
9. Job Satisfaction	(Dis A) 1 - 5 (Agree)	4.10	.93	.13	.08	.06	-.20**	.00	-.08	.a	-.05
10. Turnover Intention	(Dis A) 1 - 5 (Agree)	2.36	1.20	-.07	-.06	-.07	-.02	.01	.08	.a	.09
11. Stress	(Dis A) 1 - 5 (Agree) 2 items, α=.70	3.09	1.11	-.01	.10	-.09	.03	.18*	-.01	.a	.01
12. Commitment	(Dis A) 1 - 5 (Agree)	4.17	.88	.15*	-.01	.09	.02	.02	.06	.a	-.09
13. Discretion	(Dis A) 1 - 5 (Agree)	3.31	1.20	.10	-.09	.13	.01	.02	-.11	.a	.04
14. Supervisor Trust	(Dis A) 1 - 5 (Agree)	4.03	.99	.11	.08	.14	-.04	.07	-.13	.a	-.03
15. Organizational Trust	(Dis A) 1 - 5 (Agree)	3.62	1.25	.07	.06	.12	-.11	-.09	-.10	.a	-.11
16. Conflict with supervisor	(Not at all) 1 - 4 (Large extent) 3 items, α=.83	1.95	.94	-.01	.12	-.06	-.07	.08	.01	.a	.10
17. Conflict within the unit	(Not at all) 1 - 4 (Large extent) 9 items, α=.86	1.75	.63	.01	-.02	-.07	-.05	.05	-.02	.a	.14
18. Conflict with other units	(Not at all) 1 - 4 (Large extent) 3 items, α=.83	1.89	.85	-.04	.10	-.08	-.05	.08	.05	.a	.15*
19. Conflict residents	(Not at all) 1 - 4 (Large extent) 3 items, α=.86	1.96	.89	.08	.03	-.07	-.08	.03	.00	.a	.15*
20. Communication with supervisor	(Dis A) 1 - 5 (Agree)	3.80	1.24	.14	-.01	.13	.03	.10	-.05	.a	.05
21. Communication others	(Dis A) 1 - 5 (Agree)	3.98	1.04	.03	-.08	-.04	-.06	-.03	-.16*	.a	.01
22. Union Commitment	(Dis A) 1 - 5 (Agree)	3.43	.99	.19*	.14	.04	-.26**	.07	-.25**	.a	.11
23. Union Leadership	(Dis A) 1 - 5 (Agree) 11 items, α=.93	3.64	.82	.26**	.16*	.02	-.28**	.07	-.22**	.a	.11
24. Working on PC Hrs	How many hrs / day	.66	.47	.00	-.33**	.06	.29**	-.19**	-.01	.a	-.12

[a] N=178 (for all correlations)
*p< .05 **p< .01. All significance tests are two-tailed.
[a] Correlation coefficients with union membership were not calculated because union membership was a constant.

Table 14: TAM Variable Definitions and Correlations (continued)

Variable	Scale	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
10.Turnover Intention	(Dis A) 1 - 5 (Agree)	-.32**														
11.Stress	(Dis A) 1 - 5 (Agree) 2 items, α=.70	-.29**	.40**													
12.Commitment	(Dis A) 1 - 5 (Agree)	.29**	-.16*	.00												
13.Discretion	(Dis A) 1 - 5 (Agree)	.13	-.17*	-.17*	.08											
14.Supervisor Trust	(Dis A) 1 - 5 (Agree)	.42**	-.37**	-.18*	.15*	.16*										
15.Organizational Trust	(Dis A) 1 - 5 (Agree)	.51**	-.43**	-.31**	.25**	.15*	.53**									
16.Conflict with supervisor	(Not at all) 1 - 4 (Large extent) 3 items, α=.83	-.10	.20**	.17*	.08	-.02	-.22**	-.11								
17.Conflict within the unit	(Not at all) 1 - 4 (Large extent) 9 items, α=.86	-.33**	.29**	.29**	-.13	-.09	-.35**	-.37**	.51**							
18.Conflict with other units	(Not at all) 1 - 4 (Large extent) 3 items, α=.83	-.15	.15*	.18*	-.03	-.05	-.29**	-.26**	.66**	.55**						
19.Conflict residents	(Not at all) 1 - 4 (Large extent) 3 items, α=.86	-.08	.10	.09	-.04	-.09	-.15*	-.17*	.55**	.50**	.57**					
20.Communication with supervisor	(Dis A) 1 - 5 (Agree)	.18*	-.24**	-.18*	.21**	.36**	.27**	.20**	-.04	-.08	-.08	-.10				
21.Communication others	(Dis A) 1 - 5 (Agree)	.17*	-.11	.01	.12	.13	.13	.05	.01	-.07	.01	.10	.11			
22.Union Commitment	(Dis A) 1 - 5 (Agree)	.18*	-.12	-.10	-.06	.02	.08	.25**	-.03	-.02	-.02	-.01	.04	-.12		
23.Union Leadership	(Dis A) 1 - 5 (Agree) 11 items, α=.93	.19*	-.08	-.15*	.02	.12	.14	.24**	-.02	-.08	-.04	-.04	.13	-.08	.82**	
24.Working on PC Hrs	How many hrs / day	-.07	.02	.02	.03	-.04	-.05	-.05	.00	.01	-.04	-.03	-.01	.07	-.08	-.06

[a] N=178 (for all correlations)
*p< .05 **p< .01. All significance tests are two-tailed.
[a] Correlation coefficients with union membership were not calculated because union membership was a constant.

Table 15: The Effects of Employee Attitudes and Perceptions on EMR Technology Acceptance

	Overall TAM	TAM Usefulness	TAM Ease of Use	TAM Organizational Support
Nursing Home Control	.003	.016	-.015	-.085
Age	-.022	-.017	-.028	-.011
Gender	.037	.078	.021	-.030
Education Level	-.015	.040	-.025	-.074
Years Worked at Nursing Home	.023	.017	.034	.034
Employment Status	-.102	-.089	-.098	-.064
Member of Union	-.019	-.084	-.007	**.146***
Nursing Unit	-.010	.002	-.001	-.009
Working on PC Hrs	.073	.055	**.163***	.039
Job Satisfaction	**.082***	**.183*****	**.090***	.074
Turnover Intention	-.005	-.028	-.025	-.009
Stress	.042	.028	-.008	.047
Commitment	**.084***	**.127***	**.098***	.081
Discretion	**.068****	**.103****	.091	.097
F Statistic	**8.726******	**13.128******	**6.763******	**5.703***
Model R²	.069	.095	.051	.015
Adjusted R²	.061	.088	.044	.013

*p < .05. ** p < .01. *** p < .005. **** p < .001.

Table 16: The Effects of Reported Relational Dynamics on EMR Technology Acceptance

	Overall TAM	TAM Usefulness	TAM Ease of use	TAM Organizational Support
Nursing Home Control	.030	.028	.012	-.026
Age	-.047	-.035	-.031	-.038
Gender	.078	.093	.033	.012
Education Level	-.053	-.018	-.019	-.120
Years Worked at Nursing Home	-.019	-.013	.002	-.008
Employment Status	**-.254****	**-.346***	**-.247***	-.099
Member of Union	-.048	-.079	-.044	.087
Nursing Unit	.044	.048	.034	.014
Supervisor Trust	.071	.063	.023	-.039
Organizational Trust	.081	**.146*****	.040	-.064*
Communication with Supervisor	.116	**.107***	**.077***	-.005
Communication with Others	.018	-.043	-.015	.084
Conflict with Supervisor	-.004	.031	-.021	-.003
Conflict within the Unit	.008	.026	.019	.070
Conflict with Other Units	-.008	.024	.009	.001
Conflict with Residents	.065	.054	.083	.104
F Statistic	**7.285****	**9.710******	**5.373****	**5.625***
Model R²	.028	.093	.039	.021
Adjusted R²	.024	.083	.031	.017

* $p < .05$. ** $p < .01$. *** $p < .005$. **** $p < .001$.

Table 17: The Effects of Union Commitment and Leadership on EMR Technology Acceptance

	Overall TAM	TAM Usefulness	TAM Ease of use
Nursing Home Control	-.022	-.022	-.012
Age	-.015	-.004	-.009
Gender	.040	.054	-.005
Education Level	.020	.006	.000
Years Worked at Nursing Home	.031	.032	.016
Employment Status	**-.217***	-.100	**-.229***
Member of Union			
Nursing Unit	-.063	-.024	-.089
Union Commitment	-.034	.003	.019
Union Leadership	**.166********	**.370********	**.139****
F Statistic	**10.874********	**31.763********	**7.097*******
Model R²	.084	.114	.054
Adjusted R²	.076	.111	.046

6. EXPLORING THE VARIATION IN EMR ADOPTION AND IMPLEMENTATION

6.1 Overview of Our Findings

Sections 3 and 4 of this report have illustrated a number of ways in which the adoption and implementation of EMR technology across the treatment nursing homes was subject to variation. Section 4 highlighted some of the individual-level factors that help explain variation in the implementation of EMR, focusing on technology acceptance as the outcome. In this section, we report our findings regarding organizational-level factors that contribute to variation in the approach nursing homes employed in their adoption of EMR. In addition, this section illustrates the implications that organizational-level variation has for the implementation of EMR.

As will be documented below, our qualitative research in ten of the treatment nursing homes uncovered three overarching managerial strategies guiding the adoption of the technology, which we will refer to as the *empowerment, efficiency,* and *command* strategies.[13] Each of these strategies, which are described in detail in this section, had clear implications for the implementation process and the outcomes that are associated with it.

This section also provides support for the claim that organizational-level factors play a central role in the EMR adoption process. First, our findings indicate that nursing homes with different degrees of frontline staff empowerment also had varying levels of employee turnover over the course of the first year of EMR implementation. Second, findings from research conducted in collaboration with Lorin Hitt and Prasanna Tambe highlight the link between organizational variables and the cost associated with the implementation of EMR technology. Nursing homes with higher levels of job satisfaction and discretion were found to have had significantly lower adoption costs, as measured by the number of service calls made to the technology vendor.

6.2 Variation in Organizational Adoption Strategies

One of the advantages of this study is the fact that many of the factors that could potentially contribute to outcome variation are, in fact, naturally controlled. First, the type of technology implemented in each of the ten nursing homes examined in this paper was, for the most part, identical and was provided through the same technology vendor.[14] Second, with regard to labor relations, 1199SEIU represents virtually all of the frontline staff (CNAs and LPNs) and each of the ten homes was covered by similar collective bargaining agreements.[15] Third, because nine of the ten homes were in the New York

City area, we were able to rule out a number of possible external factors that otherwise might explain variation in EMR outcomes.[16] Thus, if we observe variation in the outcomes associated with the adoption of EMR in our sample of homes, its origins would likely be due to internal organizational factors, such as organizational and workforce characteristics.

Our interviews at each of the homes revealed a surprising degree of divergence across the institutions in how the homes intended to apply the technology and, more importantly, what benefits they expected to attain from its implementation. The nursing home administrators we interviewed had very different notions about how they could use the technology to advance specific organizational goals and objectives. In sum, we found three overarching strategies homes pursued in the adoption of EMR: a command strategy, an efficiency strategy, and an empowerment strategy.

Top management in the nursing homes not only had different ideas about how EMR could be used in their organizations, but they had different views on the mechanisms through which EMR would deliver its anticipated benefits. Proponents of EMR have advocated its adoption using a host of rationales ranging from clinical benefits to pure economic savings. However, delivering on the different anticipated outcomes entails a variety of different mechanisms or causal linkages.

One of the possible explanations for the mixed evidence on the effects of EMR on the quality of care is that these different mechanisms or linkages have largely been ignored in previous research. For example, one way in which EMR could enhance the quality of resident care is by improving the accuracy of documentation, thereby decreasing medical errors and promoting timely care. Alternatively, another mechanism

for improving the quality of care is through the more efficient use of frontline staff time and efforts. Earlier we reported that the use of EMR in the fifteen homes we studied allowed a significant proportion of the direct caregivers to free up the time they had spent on documentation, allowing them to devote more attention to residents and their families. Whether EMR affects other outcomes (such as financial returns) is likely to depend on precisely which mechanism delivers the benefits, if there are any. Our typology of EMR adoption strategies recognizes that different nursing homes expect EMR to achieve overarching goals and objectives through different mechanisms.

More specifically, our findings suggest that the strategy a nursing home pursues in adopting EMR is strongly related to four organizational characteristics and attributes: a) managerial style; b) the nature of employment relations in the home; c) the nature of labor relations in the home; and d) the extent to which the home has implemented so-called "resident-centered care" or "culture change." Regarding resident-centered care (or patient-centered care in the hospital setting), over the past two decades, nursing homes have been experimenting with methods to transform the manner in which care is delivered, shifting from a physician and institution focus to one that places the resident's needs at the center of attention (for a recent review of culture change and resident-centered care in nursing homes see Doty, Koren and Sturla, 2008; also see Lopez 2006; Scott et al., 2003; for a more general discussion of patient-centered care see Davis et al., 2004). The adoption of resident-centered care is associated with changes in clinical and employment practices that are geared to increasing resident autonomy and voice as well as the discretion and decision-making authority exercised by frontline staff (Doty et al., 2008). In some respects, resident-centered care, which emphasizes teamwork in the

delivery of healthcare, parallels the use of high-performance work systems in other organizations (Applebaum et al., 2000; Osterman 2000).

An organization's EMR adoption strategy can be viewed, according to our framework, as a mediating construct that links organizational characteristics and attributes to outcomes associated with the adoption of EMR.

Table 18: A Typology of Strategies for the Adoption of EMR

	Type A	Type B	Type C
Strategic EMR Goals and Objectives	*Command*	*Efficiency*	*Empowerment*
Top Management's Application of EMR	*Surveillance and Discipline*	*Monitoring and Learning*	*Learning and Skill Development*

6.2.1 A Command Strategy for Adopting EMR. In our typology, one approach used by homes in our sample for adopting EMR is one that we call the "command" strategy. As shown in Table 18, nursing homes that we included in this category viewed EMR technology through a very specific and relatively narrow lens: they viewed the adoption of EMR as a means of increasing their ability to keep staff under surveillance and impose discipline within the organization. Three of the nursing homes in our sample clearly represented the command approach.   These organizations had a more traditional, top-

down management style and regarded EMR as an additional tool that would enhance their control and authority over frontline staff and middle managers.

In one home we placed in the command category, the director of nursing services (DNS) described the application of EMR as follows:

> I want to know if and when residents are getting their meds. If
> there's a problem, I want to know which nurses are involved.
> There's going to be better quality of life because people can
> be kept in check. If it's not good for them, let them be afraid.
> The residents' lives are in our hands. Now I will be having
> more eyes to see what is going on (Interview with DNS, November
> 2007).

A DNS in another command home expressed the following view:

> Staff is going to be forced to grow up or grow out. If they
> are not able to learn from their mistakes, employees
> will need to be held responsible and accountable for
> such mistakes (Interview with DNS, July 2007).

Administrators in nursing homes in the command category focused almost exclusively on the ways in which EMR would allow them to receive more accurate and timely information on the activities and behaviors of their staff. Although administrators in all the homes in our study emphasized the importance of frontline staff accountability, the administrators in command homes often spoke of the possibility of using the technology for punitive purposes.

The administrator of a command home discussed the disciplinary benefits of the technology:

> If there's a problem, I want to know which nurses are involved.
> I may give them an in-service, then a warning. If they don't
> like that, they can find a job somewhere else (Interview with
> nursing home administrator, July 2007).

In two of the three command homes, EMR was seen as a tool that could compliment other control mechanisms, such as surveillance cameras installed in the facility. The administrators in these two homes believed that the combination of surveillance cameras and EMR would allow them to see what their staff was doing and compare it to the electronic record of what the staff reported they had done. Interestingly, in each of these homes the administrators paid very little attention to the ways in which EMR might enhance the quality of resident care or improve workplace outcomes, such as recruitment and retention, job satisfaction, and teamwork.

Interviews with frontline staff in the command homes were almost always consistent with our interviews with top administrators. Many of the staff were extremely skeptical about EMR and viewed it as a means by which top management would push accountability down the chain of command. In contrast to nursing homes using the efficiency or empowerment approach, we observed very little enthusiasm or excitement in the command homes about the potential benefits of EMR. The staff focused instead on how EMR would make their work more onerous and less flexible.

We observed three additional organizational characteristics in homes pursuing a command strategy. First, the top-down, authoritarian style used by management meant that administrators made decisions with very little attention paid to input from frontline staff and very little regard for the staff's concerns and needs. Staff in command homes had very little real "voice," either on the individual or the collective level. All of the nursing homes in our study were required to establish a joint labor-management committee to oversee the adoption of EMR, but in the command homes the role played by these committees was insignificant.

Second, the command homes were also characterized by very adversarial employment and labor relations. Frontline staff and middle managers in the command homes painted a portrait of extremely strained employer-employee relations infused with a high level of interpersonal conflict and very low levels of trust. Some of the employees in these homes complained about their working conditions and their treatment by supervisors and administrators. For their part, administrators expressed distrust of their staff and sometimes conveyed disappointment in the commitment of their staff to the organization and its residents. The command homes did not have formalized human resource management practices beyond those required by the collective bargaining agreement.

Our interviews also exposed extremely adversarial labor relations in the command homes. In one of the command homes the union and the administration were locked in an ongoing dispute regarding the use of temporary workers in the home. According to one of the union representatives we interviewed, the use of temporary staff (often called "agency" staff) violated the collective bargaining agreement. In a second command home bargaining unit employees engaged in a job action during the introduction of EMR to protest a number of their unsettled issues, particularly overtime pay. This is the only home in the study in which employees engaged in a job action during the adoption of EMR.

Third, command homes also had a traditional approach to resident care. They showed no signs of adopting resident-centered practices. It is not surprising that nursing homes that viewed EMR as a means of tightening managerial control and authority had

little interest in resident-centered care, which features the delegation of authority to residents and staff.

6.2.2 An Efficiency Strategy for Adopting EMR. The nursing homes we included in the efficiency category did not view EMR primarily as a means to increase managerial authority and control. Rather, administrators in these homes focused on the cost savings and financial gains that might be delivered by EMR. Obviously, by definition, all the homes we studied were determined to have positive financial outcomes. But they differed on the means they believed were most effective in achieving bottom-line results. Command homes believe managerial authority is the best route to profit, but the homes we placed in the efficiency category had a somewhat different view. They believe that seeking efficiencies in the use of staff and in the delivery of healthcare services is the essential ingredient in achieving expected returns on investment. In efficiency homes, administrators viewed EMR as a means of reducing operating costs and increasing Medicare and Medicaid reimbursements. Administrators in the efficiency homes were motivated to adopt EMR by their expectation that the technology would allow them to operate in a more efficient and streamlined fashion.

Top administrators in the efficiency homes seemed to be motivated to adopt EMR by at least two principal linkages or mechanisms. First, these administrators believed EMR would result in significant logistical savings for their organizations. In addition to the reduction in the time clinical staff would need to devote to paperwork, efficiency-oriented administrators thought EMR would alleviate the need for overtime and agency employees. The agreement between the nursing home operators and 1199SEIU prohibited the participating homes from reducing bargaining unit employees as a

consequence of the introduction of EMR. But in most of the homes we visited lower-level administrators (who were not in the bargaining unit) were needed to take care of paperwork. In efficiency homes we found that top administrators hoped that EMR would lead to savings in clerical staffing and potentially in staff working hours.[17]

Second, administrators in efficiency homes placed a very strong emphasis on the effect EMR adoption would have on their Medicaid and Medicare reimbursements as well as on payments from private insurers. More accurate documentation, many administrators believed, would minimize unreimbursed clinical care, which seems to plague nursing homes as a result of stringent documentation requirements. Furthermore, the use of EMR technology has the potential of alerting physicians and frontline staff to medical care that is not covered under resident insurance plans and might be provided by reimbursable alternatives. For example, SigmaCare immediately indicates when a medication is not covered under the resident's insurance plan and provides a recommended substitute that is. Administrators in these nursing homes also focused on other logistical savings such as cutting down on the use of paper and other office supplies.

One of the administrators in an efficiency home expressed the following view:

> The thing that I like about it is that it removes redundancy—
> it removes labor, wasted paper, wasted time--when you can
> pull the information directly out of the system. The system,
> has so much information, just trying to harness it all and
> make use of it all is at times overwhelming, but at the
> same time very exciting because it gives you the opportunity
> to run the organization much more efficiently, and just run
> the organization in a different way, in a better way (Interview
> with nursing home administrator, August 2008).

It is important to note that interviewees in efficiency homes, in contrast to most of the interviewees in command homes, also focused on EMR's potential for improving resident care. Administrators in efficiency homes anticipated that the reduction in medical and medication errors and the increase in the time staff could spend with residents would lead to noticeable improvements in the quality of care. Nevertheless, in our judgment, administrators in efficiency homes placed more emphasis on cost containment than they did on improvements in improving resident care.

In contrast to the focus on surveillance and discipline in command homes, in efficiency homes the focus was on monitoring and learning. Monitoring, in contrast to surveillance, has the purpose of allowing administrators to improve their understanding of organizational inefficiencies, both clinical and logistical, and to learn how to manage an organization more effectively. The use of surveillance rests on the premise that errors are always the fault of the staff; the use of monitoring is based on the idea that staff errors may be the consequence of inadequate supervision, a lack of suitable training, or other problems that cannot be blamed on the caregiver.

An administrator in an efficiency home signified the difference between a single-minded focus on staff responsibility and an approach that recognizes the organizational context of staff performance when she said she hoped that "working with this technology will allow us to reexamine organizational structures and processes so that we can improve as an organization" (Interview with nursing home administrator, July 2007).

Administrators in efficiency homes also differed from administrators in other homes on their management style, approach to employment and labor relations, and their use of resident-centered care. First, efficiency homes did not use an authoritarian

managerial style common to command homes but instead tended to use a style that we characterize as progressive. Although administrators in these nursing homes did not relinquish their managerial authority or prerogatives, they did establish formal and informal channels for employee voice and input in organizational decisions. For example, we observed that the joint labor-management committees established in efficiency homes typically provided frontline staff with a genuine vehicle through which they could express their concerns and make recommendations. In addition, administrators in these organizations delegated to their supervisors a higher level of discretion and autonomy than we observed in command homes.

Regarding employment relations, we concluded that efficiency homes had what can best be described as a traditional approach. On the one hand, employment relations were not usually as adversarial and contentious as they were in command homes. On the other hand, the efficiency homes exhibited a clear hierarchical differentiation characterized by an arms-length relationship between top management, middle management, and frontline staff.

Labor relations in the efficiency homes were, on the whole, cooperative in nature. Our interviews with both 1199SEIU union representatives and the organization's top managers revealed a healthy, stable, and cooperative relationship between the union and management. Administrators in these nursing homes welcomed the union's input regarding EMR implementation and tried to insure that their concerns were properly addressed. For its part, the union made a sincere effort to support the nursing home's attempts to "market" the new technology to frontline staff and increase union member

"buy in." In contrast to the union role in command homes, the union in efficiency homes played an active role in insuring the successful adoption of EMR.

Finally, we characterize the approach efficiency homes took to resident-centered care as somewhere in the middle ground. These homes had not completely adopted a resident-centered philosophy or practice, but they had adopted certain practices associated with resident-centered care. They seemed inclined to grant their residents a greater level of autonomy, for example. In other words, efficiency homes seemed to have a hybrid approach to resident-centered care. Their partial adoption of the resident-centered philosophy, we believe, is consistent with the dual goals of efficiency and improvement in resident care pursued by homes in this category.

6.2.3 An Empowerment Strategy for Adopting EMR. The third EMR adoption strategy in our typology, presented in Table 11, is the empowerment approach. In contrast to the command homes that focused primarily on managerial command and the efficiency nursing homes that focused primarily on operational cost containment and improved efficiencies, the three nursing homes that we included in the empowerment category emphasized the link between EMR adoption and employee empowerment, skill development, and broader organizational learning. Administrators in these nursing homes saw a direct link between the introduction of EMR technology and their ability to increase staff involvement in the care of residents and improve employment-related outcomes in an industry where staff satisfaction, recruitment, and retention present ongoing organizational challenges. Empowerment homes sought to leverage the dramatic organizational change associated with the introduction of new technology to support other organizational initiatives such as the move toward resident-centered care.

The linkage between EMR and organizational outcomes in empowerment homes was based on the belief that the opportunities this technology provided for increased staff skill and knowledge as well as improved employee satisfaction and organizational commitment served as key mechanisms for achieving desired organizational benefits. Administrators spoke of EMR as a tool through which they could connect frontline staff (primarily CNAs) to broader clinical and organizational objectives. These administrators believed EMR had the capacity to increase the skills of frontline staff and give them a better sense of how their work was linked to resident care. EMR technology could connect documentation activities to the care plans for residents. Enhancing skills in this manner, empowerment homes believe, would be likely to lead to increased employee satisfaction and commitment, lower turnover, and better care for residents.

We observed that the three homes we included in the empowerment category had organizational characteristics with respect to management style, employment relations, labor relations, and resident-centered care that differed from the homes we included in the command and efficiency categories. First, managerial style in the empowerment homes was markedly different from the style we encountered at either command or efficiency homes. We characterize the managerial style in empowerment homes as participatory in nature. Administrators at these nursing homes spoke ardently about the need to engage frontline staff and increase opportunities for staff involvement. The participatory approach clearly differentiated these homes from others in an industry that usually places great weight on hierarchical distinctions. Administrators in empowerment homes told us of their attempts to push for greater levels of discretion and autonomy for all frontline staff. Staff empowerment, they argued, led to enhancements in both resident

and employee outcomes. It is not surprising that empowerment homes viewed EMR as a means to support and possibly strengthen their participatory management style.

The administrator in one of the empowerment homes described how he thought EMR would complement other types of organizational restructuring intended to increase autonomy and discretion. He stated:

> The technology is an integral part of other changes we are
> conducting here, such as 'culture change'. We are trying
> to give people the opportunity to manage themselves, which
> means giving them the tools to work as best they can in their
> environment. The technology will serve as an educational
> tool helping us reach these goals (Interview with nursing
> home administrator, July 2007).

Empowerment homes also differed from command and efficiency homes with respect to the way in which they organize work processes. Although interviewees did not use the term explicitly, their approach to employment relations incorporated many of the ideas associated with high-performance work systems (Applebaum et al., 2000). Thus, for example, employees in empowerment homes were given opportunities to participate in decision making, and there was a greater reliance on interdisciplinary teams than we observed in either command or efficiency homes.

In one respect, empowerment homes were similar to efficiency homes: in each of the efficiency homes we visited there appeared to be a cooperative labor-management relationship along with a high level of trust and reciprocal engagement between the parties. In common with efficiency homes, the adoption of EMR in empowerment homes seemed to be facilitated by labor-management cooperation. Union representatives in these homes encouraged their members to participate actively in the adoption process,

and administrators made a point of addressing union fears and concerns about the effects of the technology on working conditions and staffing levels.

An administrator in an empowerment home expressed his view that the union was essential for the success of EMR adoption by stating that "the union is actively promoting it; if they were dragging their feet, it'd be dead on arrival. If you don't have people willing to accept this change, it won't happen" (Interview with nursing home administrator, July 2007). The 1199SEIU vice president responsible for this home supported the view that the cooperative labor-management relationship in the home was essential for the success of the EMR implementation. He stated that "this nursing home is ready (for EMR) because of the relationship we have had here. This home is a beacon for labor-management relations" (Interview with 1199SEIU Nursing Home Division vice president, July 2007). An administrator in another empowerment home viewed the union as a partner in the successful implementation of EMR:

> I think the union has been a tremendous help, really, because
> they were also on board with this 100 percent from the beginning,
> and I think it would have been difficult if they hadn't been on
> board to convince the union members to accept this new technology
> with a positive kind of approach… I certainly think having their
> support, without question, has made things go smoother and become
> successful (Interview with nursing home administrator, August 2008).

Finally, consistent with their approach to engagement and participation, each of the empowerment homes had adopted most of the practices associated with resident-centered care. Residents were given opportunities to influence the nature of their care, and within limits could determine matters such as the food in their diets and meal times. The physical layout of the nursing home was designed to reduce traditional institutional elements and promote a resident-friendly environment (for a further discussion of

resident-centered practices, see Doty et al., 2008). Empowerment homes viewed the introduction of EMR not only as a means of empowering their frontline staff and supervisors but also as a tool for insuring that they were in fact delivering resident-centered care.

Table 19 summarizes the relationship between a home's EMR adoption strategy and the four organizational characteristics we discussed in this section.

Table 19: Organizational Characteristics Associated with EMR Adoption Strategy

	Command Strategy	Efficiency Strategy	Empowerment Strategy
Managerial Style	*Authoritarian*	*Progressive*	*Participatory*
Employment Relations	*Adversarial*	*Traditional*	*High Performance*
Labor Relations	*Adversarial*	*Cooperative*	*Cooperative*
Resident-Centered Care	*No*	*Partial*	*Yes*

6.3 Implications of Organizational Variation for Turnover During Implementation

Our qualitative research found clear differences in the way nursing homes approached EMR adoption. In order to extend these findings, we also examined the relationship between organizational variation in the extent to which employees felt

empowered, on the one hand, and turnover rates during the implementation process, on the other.

In order to conduct this analysis, we combined survey data from the fifteen treatment homes with the archival data we collected on actual employee turnover between Time 1 and Time 2. Using aggregated Time 1 survey data for a set of items that measure different empowerment dimensions, we categorized the nursing homes into high and low empowerment groups. As seen in Figures 24 and 25 below, nursing homes with different levels of employee empowerment at Time 1 also had very different turnover rates. More specifically, nursing homes grouped into the high empowerment category had a turnover rate of 12 percent compared with a 19 percent rate for employees in the low empowerment category. As noted above, the average turnover rate across all of the nursing homes in our study (both treatment and command homes) was 17 percent.

Two caveats are required about this analysis. First, our measure of empowerment is at the level of the individual respondent, whereas in our discussion on implementation strategies we categorize some of the homes as having an empowerment strategy. It is probably obvious to the reader that not all individual respondents who we categorize as feeling empowered are necessarily employed in homes that pursued an empowerment strategy. Although a high proportion of empowered employees are in empowerment homes, some of the empowered employees work at efficiency and command homes. Second, although we have shown an association between employee perceptions of empowerment and turnover, we cannot establish a causal relationship between these two factors. Reason strongly suggests, however, that homes that had lower turnover rates in the year that followed the introduction of EMR were probably able to gain greater

proficiency in the use of the technology than homes that had higher turnover rates. To the extent that empowering employees reduces turnover, to that extent should empowerment lead to more optimal use of EMR technology. Whether empowerment leads to higher quality of care or lower costs are propositions we cannot address in this report. Nevertheless, our findings on the relationship between turnover and empowerment contribute to the identification of factors that will hinder or enhance EMR implementation.

Figure 24: Turnover Rate for Nursing Homes with High Levels of Perceived Employee Empowerment
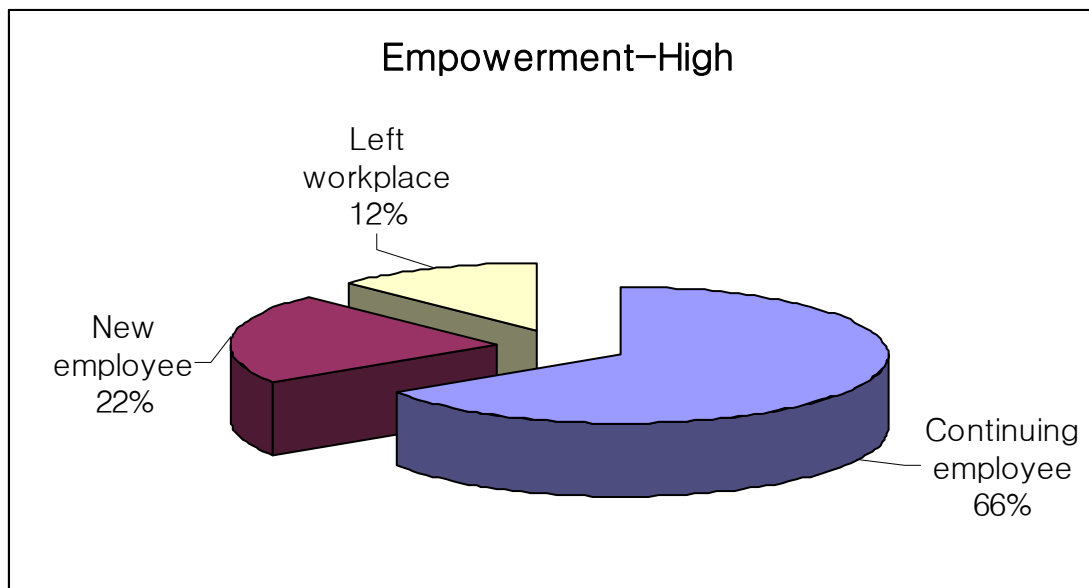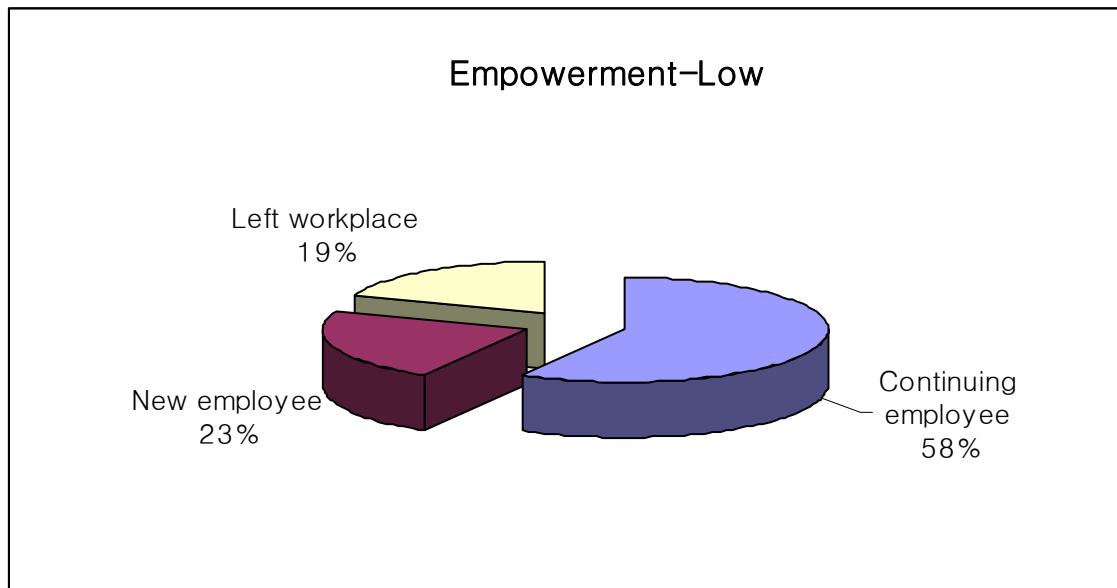
Figure 25 Turnover Rate for Nursing Homes with Low Levels of Perceived Employee Empowerment

Empowerment-Low

Left workplace
19%

New employee
23%

Continuing employee
58%

*6.4 Implications of Variation for the Cost of Implementation*

In addition to demonstrating a link between levels of perceived empowerment and nursing home turnover rates, findings from our evaluation also substantiate a relationship between organizational variables and the cost of EMR implementation. It is important to note that these findings are the product of our collaboration with Lorin Hitt and Prasanna Tambe, who are conducting an evaluation of the financial outcomes associated with the introduction of EMR as part of the demonstration project (for greater details on these findings see Avgar et al., 2010).

In order to examine the effects of organizational variables on the EMR adoption costs, we combined our survey data from Time 1 with data collected by Professors Hitt and Prasanna, which tracks the "service tickets" (or service calls made to the vendor) for each of the facilities over a twelve-month period. This service ticket data serves as a proxy for costs since higher numbers of these tickets reflect a larger level of resources

expended, primarily by the vendor, during implementation. The organizational variables examined were job satisfaction and employee discretion.

As shown in Figure 26, greater levels of reported job satisfaction at the facility level at Time 1 was negatively and significantly associated with the number of service tickets per bed. This strongly suggests that EMR adoption costs are lower in facilities with higher levels of job satisfaction.

Figure 26: Service Tickets and Worker Satisfaction
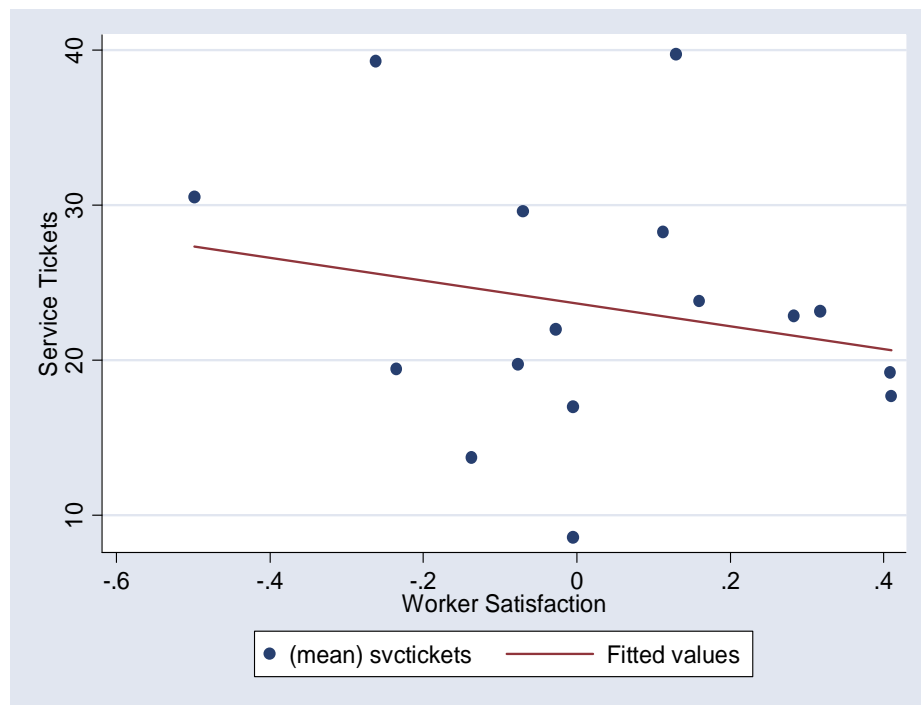
Similarly, as shown in Figure 27, we also find that a negative and statistically significant relationship between levels of reported employee discretion service tickets per bed. This finding also suggests that where nursing homes allow for greater levels of employee discretion, their EMR implementation costs are lower. Both of these findings provide important insights regarding the central role of workforce-related factors in the

process of implementing EMR technology in general and for the associated costs in particular.

Figure 27: Service Tickets and Employee Discretion
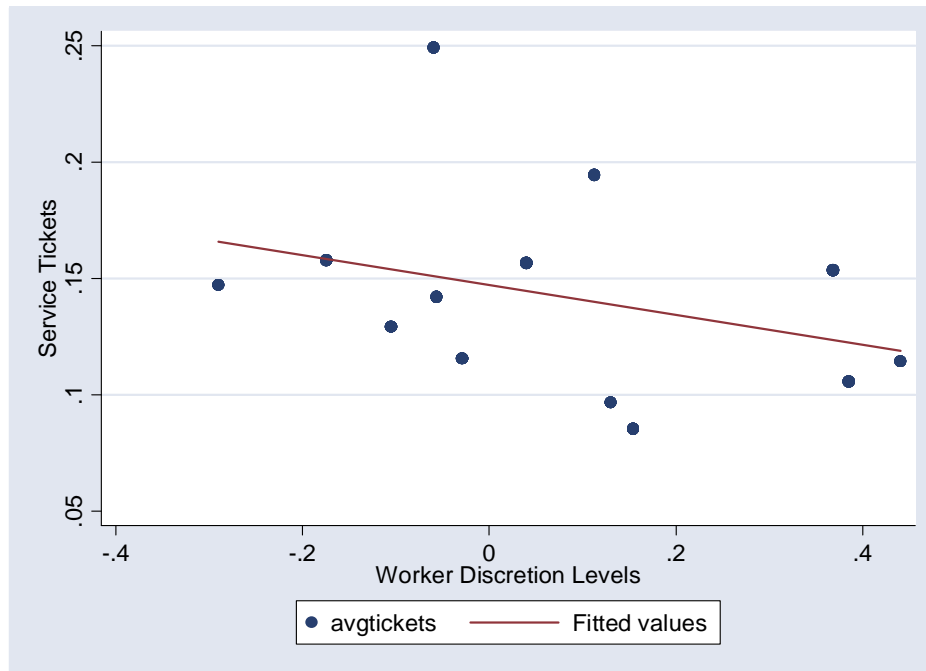
7. LESSONS OF THE STUDY AND IMPLICATIONS FOR POLICY MAKERS

In this final section of our report, we will not simply recapitulate our principal findings but attempt to derive the major lessons we have learned during nearly three years of immersion in this demonstration project. We have had the benefit of being involved in the project almost from the outset—shortly after the New York State Legislature funded the project—and therefore we have had an opportunity to attend various meetings at which the project was formed and developed. For example, in September 2006 we were invited to attend the meeting at which the three firms that were competing to provide the EMR technology to the homes in the demonstration project made their final presentations. At that meeting, organized by the QCOC, dozens of nursing home operators and administrators heard these presentations and had a chance to ask questions

of the potential vendors. We also attended a meeting the QCOC conducted near the start

of the project with union officers and delegates to discuss their hopes and anxieties, and

we participated in a conference that was held about eighteen months after the vendor

began to install the technology that allowed administrators and staff from each of the

homes to exchange information on how they were making use of the technology. We had

numerous conversations with the chair and members of the QCOC, the coordinator of the

project, the vendor's management team, and various other stakeholders. In sum, many of

the lessons we learned over the course of conducting our research are based not only on

the interviews we conducted in the field and the hard data contained in our surveys but

also on our interactions with all of the key players over the past three years.

Accordingly, we would like to offer a set of observations that we believe should

have value for practitioners and policy makers who are contemplating the use of EMR in

healthcare and are, to be sure, based on our survey data and field interviews but are also

based on all the interactions we have had with all of the players.

7.1 Lessons of the Study

By almost every threshold measure, the New York Nursing Home Demonstration

Project was a great success. The vendor, eHealth Solutions, successfully installed the

technology in twenty homes, and to date the technology continues to be used by each of

the homes. The electronic documentation rates in the majority of these homes are well

over 90 percent. To our knowledge only one home decided, after several months of use,

to give up the technology and return to paper documentation. Both the nursing home

operators and the key union leaders believe the project has been a success, and they

generally take pride in what they have accomplished by working together. Of course,

there were technical glitches that had to be confronted from time to time, but on the whole it is generally agreed by all the major players that the transition from a paper regime to an electronic one was a relatively smooth one. The degree to which each facility actually became paperless varied in part because the operators and administrators of the homes did not necessarily have identical preferences regarding this matter, and the vendor could, within certain parameters, adapt the technology to meet these preferences.

Strictly from the standpoint of the technology, accordingly, the project met or surpassed virtually all threshold tests of success. This outcome was not preordained, and at the beginning of the demonstration project there were skeptics who, for one reason or another, doubted that in the end the project would pass these threshold tests. There is no gainsaying the fact that the success of the demonstration project, judged on technical grounds, was a remarkable achievement. There have been few health information technology projects of comparable scope, and the handful of large projects that have been undertaken have not always enjoyed comparable success.

For example, in 2002 Kaiser Permanente, in partnership with its unions, launched an effort called HealthConnect to install electronic health records (EHR) technologies throughout Kaiser's healthcare system. Initially, the project was budgeted at $1.8 billion. The authors of a recent study of the labor-management partnership at Kaiser Permanente documented the degree to which HealthConnect proved to be a success but also noted some of its weaknesses. They note that costs were grossly underestimated and by completion of the project will almost certainly reach $5 billion. Although the cost overruns were in part attributable to underestimating outlays for hardware and software, underestimating the need for training and "change management" were also responsible

for the ballooning costs. Moreover, the "seamless transfer of information" across Kaiser's vast healthcare system was hindered by the organization's highly decentralized structure. The implementation of HealthConnect also put a severe strain on the partnership between Kaiser and its unions (Kochan, et al., 2009, pp. 175-190).

The Kaiser technology project, of course, dwarfs the New York Nursing Home Demonstration Project in size and scope. But the New York project did not encounter the difficulties experienced by Kaiser. For example, costs were kept within the bounds of the funds allocated by the State and were carefully controlled. There was very little strain on the partnership between the nursing home operators and 1199SEIU, which continues to thrive.

However, the authors of this report believe that the major theme that emerges from the New York project is one of variation: although the EMR technology was successfully installed and implemented in all twenty homes, its effects on the workplace, the workforce, and the quality of healthcare varied substantially across the homes. In the following sections, we discuss that variation as well as other lessons that grow out of our research.

7.1.1 The Adoption and Implementation of EMR Varied Greatly across Homes. Although all the homes employed essentially the same technology, how they used the technology varied substantially from home to home. For some of the homes the use of electronic records did not differ measurably from their previous use of paper records. The administrators and staff in these homes appreciated the greater accessibility of resident records that EMR allowed, and they realized that electronic records had other benefits, such as timeliness and reduction in errors, that paper records did not afford.

Administrators in these homes generally recognized that the technology allowed them to monitor staff performance more carefully than they had been able to do using paper records. But these homes did not fully reap the potential benefits available from the use of the technology. They did not appreciate the analytical possibilities in having all resident records easily accessible in a common database.

In other nursing homes, by contrast, the administrators did understand that having resident records in electronic form permitted analysis of the data in ways that would have been nearly impossible when the records were in paper form. In at least a couple of homes, top administrators came to realize that the use of the records for assessing the operation of their homes was limited only by the boundaries of their imaginations. Some of the administrators apparently had some understanding of statistics and research methods, and they undertook "studies" of practices in their homes that they thought might lead to cost savings, more efficient use of staff, or improved resident care. In one home, a rigorous assessment of the use of certain medications led to some significant cost savings.

In sum, there was optimal use of EMR technology in some homes but suboptimal use in others. What accounted for this variation across homes?

7.1.2 The Optimal Use of EMR Is Largely a Function of Leadership and Management Strategy. We became persuaded, especially after our field interviews in ten of the homes, that the managerial style and strategy of a home's operators and top administrators largely determined how the home used the technology. If a nursing home's leaders had sufficient vision, then it was likely that the home would make optimal use of the EMR technology. In the best of cases, if the leadership in the home had developed a clear

strategy for the use of the technology, then the home came closer to realizing the full benefits of the technology. Having a well-defined strategy means that the homes' leaders can translate their vision for the use of the technology into meaningful goals and objectives, and then proceed to devise a plan that allows them to use the technology to achieve their objectives. A strong leader with a positive vision for the technology, seemed to affect not only the use of EMR technology in the nursing home but also the nature of most dimensions of employment and labor relations.

7.1.3 The Belief that the Workforce in Nursing Homes Is a Barrier to Successful EMR Implementation Is a Myth. In June 2009 we conducted a workshop dealing with the New York Nursing Home Demonstration Project at a conference sponsored by the American Health Information Management Association in Baltimore, Maryland. One of the participants in our workshop, a top administrator from a major nursing home, expressed her viewpoint in roughly the following terms: "We all know that the kind of staff we have in our homes won't be able to learn to use EMR effectively. We are better off using paper records." At the inception of the New York project, some of those involved also believed that learning how to use the technology would be a challenging—and perhaps impossible—task for many of the nursing home employees. As we noted earlier, a substantial proportion of the workforce in the New York homes (45 percent at the start of the project) had less than a high school education and many were recent immigrants who were not fully proficient in English. Many of the employees did not have a computer in their homes and had not used a computer on previous jobs. It ought to be clear in the findings we have reported that these workforce characteristics were, for the most part, not a barrier to the successful adoption and implementation of EMR. We did find that the

amount of time an employee had spent on a computer outside of work prior to the adoption of EMR significantly affected the employee's view of the ease of using the technology at work. But other variables, such as job satisfaction, organizational commitment, and union leadership were more important in explaining employee attitudes about the new technology.

The vast majority of the employees across all homes successfully completed training in the use of the technology and later reported that they preferred to use EMR rather than paper. A handful of the rank-and-file CNAs became so skilled in the use of the technology that they assumed responsibility for training their peers. Only a very small number (in our survey results fewer than 20) left their nursing home jobs because of their unhappiness with the technology. Also, our findings on employee acceptance of the technology showed that factors such as age, gender, and education level had no significant effect on employee attitudes about the use of the technology. In sum, we uncovered no evidence in our research suggesting that the nature of the nursing home workforce was a barrier to the adoption and implementation of EMR.

7.1.4 Union and Employee Participation in EMR Adoption Is Important. Several facets of our research underscored the importance of employee participation in the adoption, implementation, and use of EMR technology. The union was probably the major vehicle for employee participation in decision making in the homes, and in our interviews in the field both top administrators and rank-and-file employees agreed that without the union's commitment to the project it would have been more difficult for the project to succeed. The vast majority of employees in the healthcare industry are not represented by a union. The U.S. Bureau of Labor Statistics reports that in 2006 about 7 percent of the employees

in the "healthcare and social assistance" industry were unionized—about one million union members out of 14.3 million employees in the industry (U.S. Bureau of Labor Statistics, 2007). Unpublished data collected by Michigan State shows that about 20 percent of registered nurses and 12 percent of licensed practical nurses are represented by a union. The critical role the union played in the New York project suggests that in healthcare facilities in which employees are not represented by a union the transition to EMR might not go as smoothly. In nonunion facilities, the change to EMR might be facilitated if other means are devised to allow employees to participate in the adoption process.

In New York, there was clearly political risk for 1199SEIU's leaders to engage in a partnership with the nursing home operators in a project designed to support the adoption of EMR. That risk was mitigated by a relationship between the parties in collective bargaining that had been evolving over many years in the direction of cooperation. Although it must be acknowledged that the collective bargaining relationship was not free of conflict, nevertheless there had been a growing recognition by both sides that cooperative problem solving was usually a more fruitful approach to the parties' principal challenges than an adversarial one. Some of the factors that helped to promote a cooperative relationship were factors that have affected the healthcare sector more generally: escalating costs, growing concerns over medical errors, increasing regulation, restructuring of the industry, shortages of skilled professionals, high rates of turnover, and the looming prospect of national healthcare reform. It was also universally acknowledged by all the major players that the arbitrator who served as chair of the

QCOC had played a unique and especially important role in fostering a cooperative relationship between the parties.

In launching the demonstration project, the operators and the union agreed that it was important to have a labor-management committee at each of the participating homes that would oversee the introduction of the new technology. A facilitator from the 1199SEIU Training and Employment Funds was assigned to each of the local committees. Although the authors of this report could not conduct a full evaluation of these labor-management committees, they were able to sit in on several committee meetings during their field visits. In our field interviews, we also asked our interviewees about the operation of these labor-management committees. The evidence we have suggests that the performance of these committees varied from home to home.

In homes pursuing an empowerment strategy the labor-management committees seemed to work most effectively, while in homes pursuing a command strategy the local committees seemed to work least effectively. In one of the command homes we visited, we observed that the labor-management committee was more a forum for airing grievances than it was a means of facilitating the introduction of EMR technology. In one of the empowerment homes we visited, we observed that the labor-management committee played an integral role in planning and implementing the new technology; both administrators and union representatives in this home lauded the work of the joint committee. Some of the committees helped to ease the anxieties employees had about the effects of the new technology.

The operators and the union also delegated another key function to the labor-management committees. The parties and the vendor developed a strategy for

introducing the technology in each of the homes that focused on preparing the staff in each home for the transition to EMR. The labor-management committees were delegated significant responsibility for implementing this strategy. Training was, of course, an important part of the preparation for the transition, but another important element focused on communication: an effort was made in each home to market or "sell" the technology to the members of the staff, and this marketing effort was designed not only to assuage anxieties about the new technology but also to excite the staff about the advantages they would enjoy in a paperless world. The labor-management committee played a major role in overseeing the marketing effort. In each home, a week or so before the launch of training, the committee would organize a party to celebrate the coming transition to electronic records. In our field interviews we heard many favorable comments about these parties. In most of the homes, the committees prepared posters, signs, and banners heralding the coming of the new era of electronic records. Absent a more systematic assessment of the work of these committees, it is difficult to gauge the net effect of all of their efforts on the adoption and implementation of EMR. But we do have the impression that the most effective committees made a positive contribution to the successful transition to EMR.

Because employee participation in the New York project was principally channeled through the union, we have only limited evidence on the role that direct employee participation in decision making played in the transition to EMR. Based on our field interviews, however, we do believe that homes that pursued an employee empowerment strategy were more likely to optimize the use of EMR technology than homes that pursued a command strategy. In sum, our evidence suggests that the union

role in the success of the New York project was especially important. To the extent that employee participation can be expressed through a union, to that extent we can infer that employee participation is an important ingredient in the successful transition to EMR.

7.1.5 Guaranteeing Job Security Is Also Important. At the inception of the New York project, the QCOC required, as a condition for participation in the demonstration project, that no member of a bargaining unit would lose his or her job as a consequence of the introduction of EMR. We believe this requirement was a factor that contributed significantly to the success of the New York project. In particular, the job security condition helped to sustain the union's commitment to the project throughout its duration. Shortly after the project was launched, we attended a meeting the QCOC organized with a large group of union officers and representatives. At that meeting the major concern expressed by union representatives was the fear that the introduction of EMR would lead to a reduction in the number of union jobs in the nursing homes. The chairman of the QCOC emphatically assured the union representatives that he would strictly enforce the job security requirement. In our site visits we observed that the assurance that EMR would not result in the loss of union jobs was a message that had been carried to the rank- and-file by the union representatives. To our knowledge, the nursing home operators and administrators fully complied with the job security condition throughout the project.

The job security agreement, however, did not apply to members of the nursing home staffs that were not represented by the union. In several of the homes there were nonunion employees who were assigned record entry and recordkeeping responsibilities. These employees were not protected by the job security agreement, and in some of the homes the employees were reassigned, or the jobs were eliminated by attrition or layoff.

7.1.6 EMR Probably Reduces Medical Errors. Our statistical findings showed that the number of survey respondents reporting that they had observed medical errors declined significantly after the introduction of EMR. Of those respondents reporting errors, the mean number of errors they observed also declined significantly (from 6.3 errors in the three months prior to our Time 1 survey to 4.5 in the three months prior to our Time 2 survey). By contrast there was no significant change in these measures in the control homes. Of course, these statistics do not necessarily measure actual errors but are errors frontline staff reported they had observed at the time we conducted our surveys. We have no way of gauging the extent to which errors reported by staff correspond to "actual" errors (as verified by hard evidence), and it is possible that the widespread expectation that EMR would lead to reductions in errors resulted in staff perceptions that in fact errors had actually been reduced. Absent evidence to the contrary, however, it appears that EMR probably does reduce the number of medical errors.

7.1.7 EMR Can Free Up Time for Staff to Devote to Residents. We found that EMR had several important effects on how work was organized and performed in the nursing homes. For example, our survey respondents told us that EMR technology had reduced the amount of discretion they had in performing their work. We did not expect this result, but with hindsight it is not surprising. In a world of paper documentation, the flexibility frontline staff had in recording resident information was substantial, but in a world of laptop computers and PDAs, that flexibility was by design considerably reduced.

We also expected that EMR would reduce the amount of time caregivers needed to devote to documentation, but our survey results showed that the proportion of

respondents (40 percent) who thought they needed to spend more time on documentation was about equal to the proportion (39 percent) who thought they needed to spend less time. Why was it that our survey results did not more fully conform to our expectations? Our interviews in the nursing homes suggest that even after training was completed many employees had still not mastered the use of the technology and were learning on the job. If on-the-job learning was important for a substantial number of employees, then that factor helps explain why a large proportion of our respondents reported that they needed to spend more time on documentation. The amount of effort required for on-the-job learning, however, should decline over time as the use of the technology becomes more embedded in the facility. A future survey will be able to confirm whether our expectation that the proportion of employees reporting a decline in time devoted to documentation increases.

Of those employees who did report a decline in time devoted to documentation, a very high proportion (83 percent) reported that they used the time they saved to spend with residents; over two-thirds (69 percent) also reported that they used some of the time saved to help co-workers. The sponsors of the New York project hoped that the use of EMR technology would have these beneficial effects. The net effect of our survey findings suggests that about one-third (.39 x .83) of the frontline staff in the nursing homes that installed EMR spent an hour or more daily with residents than they had before the use of EMR. At the same time, however, the fact that 40 percent of the respondents reported spending more time on documentation (and presumably less time with residents and co-workers) implies that on balance EMR had virtually no effect on the allocation of staff effort. But if we are correct in assuming that over time EMR will allow a higher

proportion of staff to spend significantly less time on documentation and more time with residents, then it is reasonable to believe that in the long run EMR will have a positive effect on the quality of resident care.

7.1.8 EMR Appears to Reduce Conflict in Nursing Homes and to Increase Communication. Our statistical findings suggest that EMR may have an effect on workplace conflict and communication. Our survey results show that EMR was associated with significant declines in all the types of conflict we attempted to measure: the respondents' conflict with supervisors, with others within the unit, with other units, and with residents. When we disaggregated our data, we found that workplace conflict declined significantly in most of the homes in our treatment sample. However, these reported types of conflict also declined significantly in our control homes, casting doubt on whether the use of EMR actually caused a decline in conflict in the treatment homes. On the other hand, our survey results showed that employees reported a significant increase in the frequency of communication they had with their supervisors—a result we did not find in the control homes. It is possible, but not verifiable at the moment, that EMR resulted in enhanced communication, which in turn led to reduced conflict.

Most people probably believe that if EMR caused a decline in workplace conflict, that would be a good result. But many social scientists maintain that the absence of conflict in an organization is not necessarily a desirable condition. Workplace conflict can have both positive and negative effects. On the one hand, conflict can disrupt or destroy relationships, and it can impose significant costs on both the organization and its employees (especially if the conflict escalates into litigation). On the other hand, conflict can uncover disagreements about how work is performed and who has the authority to

make those decisions. If conflict leads to a serious dialogue on important questions, it may very well have a beneficial effect on the organization and its members. Resolving conflict has often been associated with creative solutions to long-standing problems (for a discussion of the positive and negative aspects of conflict, see, for example, Rahim, 2001, pp. 1-33). The relationship between conflict and organizational outcomes is a complex one, and clearly more research is needed not only on whether EMR affects workplace conflict but precisely what those effects are.

7.1.9 Staff Acceptance of EMR Technology Can Be Influenced by the Organization. In our study we examined the factors that influence staff acceptance of EMR technology, using three measures of technology acceptance: usefulness, ease of use, and organizational support. Overall, we found that staff acceptance of the technology was relatively high on all three of the dimensions we measured. However, there was a great deal of variation in staff acceptance across the nursing homes in the New York demonstration project. There was, in fact, a fairly close correspondence between the style of management used in the home and the level of staff acceptance of the technology. In the homes that we placed in the empowerment category staff acceptance of the technology was relatively high, whereas in the homes we placed in the command category staff acceptance was lower. Regression analysis revealed that certain independent variables significantly affected staff acceptance of the technology, although there was no consistent pattern across the measures of technology acceptance we used. In most of our regression models, employment status had a significant effect on technology acceptance: not surprisingly, full-time employees had higher levels of acceptance than part-time employees. Depending on the dependent variable used in the

model, variables such as job satisfaction, employees' commitment to their union, and organizational trust had significant effects on technology acceptance. At the same time, the respondents' personal characteristics (such as age, gender, education, and seniority) had no effect on acceptance.

These results suggest to us that technology acceptance is very much an organizational phenomenon and is largely not dependent on the personal characteristics of the workforce. If that is the case, then the acceptance of EMR technology is largely under the control of the administrators and managers of the organization (and of union leaders, if there is a union). To the extent that managers and union leaders can build trust and commitment on the part of their employees, to that extent the employees will be better prepared to accept new technologies.

7.2 Implications for Policy Makers

The American Reinvestment and Recovery Act, passed by Congress and signed into law by President Obama in February 2009, was designed to stimulate the American economy and help it recover from the deep economic recession that began in 2008. Title XIII of the Act consists of the Health Information Technology for Economic and Clinical Health Act, also called the HITECH Act. The objective of the HITECH Act is to encourage the adoption of electronic health records (EHRs), including EMRs, by providing incentive payments to physicians and healthcare institutions. (The principal difference between EHR and EMR is that EHR allows patients or residents to have access, within the limits of confidentiality, to their healthcare records.) For example, starting in 2011 physicians will be eligible to receive up to $44,000 in incentive payments from Medicare if they can show that they have made "meaningful use" of a certified

EHR; physicians reimbursed by Medicaid may receive up to $63,750 based on guidelines defined by the state in which they practice.

Although the media have generally reported that $19 billion is available under the ARRA to subsidize the introduction of EHRs, the incentive schedules built into the Act could potentially drive that number to $51 billion. The HITECH Act requires healthcare providers to use "qualified EHR" that provides meaningful use of the technology, but does not define the meaning of either "qualified EHR" or "meaningful use." It authorizes the U.S. Department of Health and Human Services (HHS) to set guidelines for determining the meaning of these terms. HHS has been working throughout this year (2009) to establish criteria for certifying EHR systems and hopes to announce a directive by December for implementation in 2010.

We believe our research on the New York nursing home demonstration project contains findings that can help inform the policy makers who are shaping the criteria that will guide the allocation of billions of dollars under the HITECH Act. In this section of our report we attempt to link the lessons of our study to the current effort to stimulate the use of EHRs.

7.2.1 The Meaning of "Meaningful Use." Within HHS, the Centers for Medicare and Medicaid Services (CMS) have been considering a number of alternative definitions of "meaningful use," ranging from "self-attestation of providers that they comply with meaningful use requirements to requiring the reporting of electronic data that demonstrates meaningful use" (CMS Sheds Light on Meaningful Use, accessed on September 22, 2009 at http://www.healthdatamanagement.com/news/stimulus-38817-1.html). CMS is relying on advice from the HIT Policy Committee, a federal advisory

body. It should be noted that to date the Committee appears to be focusing on guidelines suitable for physicians rather than guidelines for hospitals and other healthcare institutions. The Committee released a first draft of its recommendations in June 2009, which listed several objectives it hoped the criteria on meaningful use would achieve. In our view these objectives are quite narrow, focusing on the nature of the documents the Committee believes should be included in an EHR system. For example, the Committee recommends that all EHR systems include "an active medication list," incorporate laboratory test results, and document "a patient progress note for each encounter" (AMNews: August 3, 2009 accessed on September 22, 2009 at http://www.ama-assn.org/amednews/2009/08/03/gvsb0803.htm). Also, the Committee recognizes that the effectiveness of EHR depends in part on the establishment of networks that link physicians, hospitals, and other healthcare providers. Thus, it appears that the federal government will define "meaningful use" largely in technical terms. In our view a technical definition of meaningful use is certainly a necessary but by no means a sufficient method of allocating taxpayer dollars to support the use of EHRs.

7.2.2   Organizational Factors Determine Success.   Our study of New York nursing homes strongly leads to the conclusion that the meaning of meaningful use needs to take into account not only the technical specifications of EHR but also the organizational characteristics of the physician practices and healthcare facilities receiving the stimulus money. At this point in our report the reader is thoroughly familiar with one of our central themes, namely, that healthcare organizations (including physicians' practices) vary in their capacity and ability to make optimal use of health information technology. Identical technologies installed at identical costs in different facilities are likely to

produce different healthcare outcomes. The extent and nature of the training provided to the workforce in the facility is certainly a critical determinant of the success of the technology, but in the New York project the nature of the training was identical across all the facilities. The difference in the results obtained from using the technology was largely a function (once again) of the leadership and management strategy of the facility receiving the technology and its organizational characteristics.

We recognize that a government agency, charged with allocating billions of dollars of public funds to thousands of facilities, cannot possibly do an in-depth study of each of the facilities that are candidates for the funds. In the case of the HITECH Act, allocation of the funds will be delegated to regional organizations. But even regionalization of the task will not allow public officials to identify easily the leadership and management traits that we believe are associated with the optimal use of the technology. Public agencies virtually always rely on objective—or seemingly objective—factors to allocate public funds, and developing a set of objective factors that are capable of capturing traits associated with visionary and strategic managers would be, to say the least, a daunting task.

But we believe there may be a set of proxies sufficient to help guide public officials who want to identify facilities likely to make the best use of the technology. In the case of the nursing homes in our study, two simple proxies that come to mind are 1) the turnover rate in the facility and 2) the portion of agency or temporary employees employed by the facility. Nursing homes that have low turnover rates and a high proportion of permanent staff are likely to make better use of the technology than homes without these characteristics. Also, staff participation in decision making appears to have

an important influence on the optimal use of the technology. That participation might be through a union, but in a nonunion facility it could be through committees or other mechanisms that promote employee participation. Healthcare facilities that also promote the training and professional development of their staffs are probably also in a better position to make productive use of EHRs than facilities that do not provide such opportunities. We do not argue here that proxies of this type should be dispositive but only that they might provide guidelines public officials can use in making their decisions.

Allocating public funds on the basis of workforce characteristics would at the very least be inappropriate and might possibly be unlawful. But our study makes clear that workforce characteristics, such as age, gender, and race, are not related to the use of the technology. Policy makers and public officials should take some comfort in knowing that it is organizational and not workforce characteristics that determine the optimal use of EHR technology.

8. REFERENCES

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9. ENDNOTES

[1] In the Matter of the Interest Arbitration between Southern New York Associates, L.L.C., et al., and 1199SEIU United Health Care Workers East (Martin F. Scheinman, Impartial Chair), March 2006, p. 13.

[2] Ibid., p. 14.

[3] Ibid., p. 13.

[4] The term "integrative bargaining" was an important concept used by Richard Walton and Robert McKersie. See their book, *A Behavioral Theory of Labor Negotiations*, 2d ed. (Ithaca, NY: ILR Press), 1991.

[5] At the beginning of the demonstration project, the QCOC could only estimate the precise number of homes that would receive the technology. The budget for this evaluation allowed for fifteen homes to be included in our study, but ultimately the QCOC had enough funds to install the technology in twenty homes. Similarly, our decision to include five control homes in the evaluation was based principally on budgetary considerations.

[6] The interview population in the follow-up survey is larger than the population in our baseline survey because we included both employees who had left their nursing homes and employees who had been hired after the baseline survey, and in the aggregate the employment level across the twenty homes did not significantly change between the baseline and the follow-up survey.

[7] For economists, investment decisions in for-profit enterprises are always driven by motives different from investment decisions in not-for-profit and public organizations. Economists believe that market factors drive investment decisions in for-profit enterprises, whereas in organizations that are funded by tax dollars (for example) market factors play a much smaller role (if any) in investment decisions.

[8] The change from Time 1 to Time 2 for union commitment was marginally significant.

[9] It is important to note that our analysis is based on the entire population of employees in the four occupational groups studied and not just on those who responded to our survey.

[10] It is important to note that our Cornell colleagues, Karl Pillemer and Rhoda Meador conducted the evaluation regarding the effects of their EMR technology on nursing home residents and produced a final report detailing their findings. In general, they did not find a statistically significant EMR effect (positive or negative) on a variety of healthcare outcome measures.

[11] As noted above, Karl Pillemer and Rhoda Meador of Connell University conducted an evaluation designed to examine EMR effects on quality of care based on in-depth longitudinal resident assessments.

[12] Eleven models are presented below (and not 12) since our regression analysis of union-related variables did not include the organizational support TAM dimension. This dimension relates to the nursing home organizational support.

[13] In an earlier article on which this section is based we used the term "control" strategy instead of "command" strategy. To avoid confusion with our earlier use in this report of the terms "treatment" and

"control" homes, we have substituted the word "command" for "control." See Lipsky, Avgar, and Lamare, 2009.

[14] It should be noted that although the hardware and software implemented in each of the ten homes was the same, some of the nursing homes chose to implement different applications of the technology, making the range of EMR capabilities slightly different for some of the nursing homes. Nevertheless, the primary records keeping functions were identical across the ten organizations.

[15] This is not to say that wages and benefits were literally identical across the ten homes.

[16] One of the ten nursing homes included in our study is located in Orange County, NY, approximately 150 miles northwest of the New York City area.

[17] The reduction in clinical staffing positions was seen as a delicate issue. On the one hand, reducing unionized positions as a result of the EMR technology would violate the collective bargaining agreement and the spirit of the partnership. On the other hand, many of the administrators we interviewed alluded to their hopes that EMR technology would have some effect on required staffing levels.