Effects of exam room EHR use on doctor–patient communication: a systematic literature review

Zainab Kazmi
MBChB '16, University of Manchester, Oxford Rd, Manchester, Greater Manchester, M13 9PL, UK

ABSTRACT

Background High levels of funding have been invested in health information technologies, especially electronic health records (EHRs), in an effort to coordinate and organize patient health data. However, the effect of EHRs in the exam room on doctor–patient communication has not been sufficiently explored.

Objective The purpose of this systematic review was to determine how physician use of EHRs in medical consultations affects doctor–patient communication, both in terms of patient perceptions and actual physician behaviours.

Method The reviewer conducted a comprehensive online database search in March 2013 of EMBASE, MEDLINE, and SCOPUS, using a combination of synonyms of the terms “patient”, “doctor”, “communication”, and “EHR” or “computing”. For inclusion in this review, articles had to be published in English, take place in an outpatient setting and demonstrate an empirical investigation into whether EHRs affect doctor–patient communication. The reviewer then analysed 13 articles that met the inclusion criteria.

Results Studies showed EHR use encouraged biomedical questioning of the patient, and encouraged patient-led questioning and doctor-led information provision. EHR-related behaviours such as keyboarding and screen gaze impaired relationships with patients, by reducing eye contact, rapport, and provision of emotional support. EHRs negatively affected physician-led patient-centred communication. Computer use may have amplified existing physician behaviours regarding medical record use.

Conclusion We noted both positive and negative effects of EHR use. This review highlights the need for increased EHR-specific communication training to mitigate adverse effects and for continued acknowledgement of patient perspectives.

Keywords: computerised medical records systems, electronic health records, health communication, medical informatics, physician–patient relations, professional–patient relations, primary health care

What does this paper add?

• More information pertaining to biomedical outcomes is given in the presence of EHR use; both in terms of biomedical questioning and patient clarification.
• Reduced emphasis on psychosocial questioning and relationship maintenance is seen in the presence of EHR use.
• Strong evidence that technological training can reduce adverse behavioural effects of EHR use.
• Reinforces need for clinicians to be aware of how patients—the most important stakeholder in healthcare provision—perceive the new technologies they implement in their offices.
INTRODUCTION

Effective physician communication and patient health data management form the foundation of high quality healthcare. Communication skills have dependably been shown to influence patient satisfaction, and which in turn is used to evaluate efficacy of healthcare delivery and is used as a proxy for doctor–patient relationship quality. Poor communication acts as a barrier to the achievement of patient-centred health outcomes. With the relationship between clinicians and patients lying at the heart of healthcare delivery, both parties have a strong incentive to maintain or improve the dialogue that exists between them.

Practitioners and patients alike have had concerns about the possibilities of computing technologies adversely affecting the doctor–patient relationship. Healthcare providers believe that electronic health record (EHR) use will limit errors and enhance efficiency of care. There is hope that an EHR system could increase time clinicians are able to spend with patients, and in turn, improve the level of care provided. However, as physicians increase the duration of time they spend utilizing computer-based health record systems, there is also worry that this reduces the time they have to meaningfully communicate with their patients. Explicit concerns of physicians regarding adverse effects on physician–patient interaction include: reduced eye contact, increased chance of discussion of psychosocial topics, and reduced cognizance of patient reactions due to unawareness of the patient's nonverbal communication behaviours. Patient responses to the introduction of technology into the doctor–patient relationship have generally been positive, and patients, as a whole, tend to approve of the introduction of computer use into their healthcare delivery, as demonstrated repeatedly in studies conducted since the 1980s showing either minimal or positive change in patient satisfaction with their physicians once the physician began to use a computer in a clinical setting. However, patients also may fear that computer use in clinical encounters will make their relationship with their doctor less personal.

While previous systematic reviews have been conducted with regard to patient and physician perceptions of EHRs and the effect of health information technologies on patient satisfaction with physicians and quality of care, no recent systematic review has been conducted focussing on the EHR’s effects on doctor–patient communication in the medical consultation. We conducted this review to understand the full effect of EHR use by clinicians in outpatient medical consultations on doctor–patient communication.

METHODS

Data sources and search strategy

The reviewer performed an online literature search of MEDLINE, EMBASE, and SciVerse Scopus, using the keywords “electronic health record,” “computer,” “patient,” “doctor,” and “communication,” and synonyms of these keywords, strung together via Boolean queries. These three databases were selected under the guidance of the senior academic liaison librarian, based on availability and suitability for the subject. This search yielded 190 records in a combined search of MEDLINE and EMBASE, and 113 records in a search of Scopus, both conducted on 1 March 2013, non-exclusively. The search was then restricted to English language journal articles and was de-duplicated. Two additional articles were found via reverse snowballing, whereby the citation tracking tool allowed for the discovery of more recent articles that had been cited in other articles found within the search of MEDLINE, EMBASE, and Scopus databases.

Inclusion/exclusion criteria

After the searches were conducted, the full texts of all the selected papers were manually read and reviewed. The selection criteria for articles included in this systematic review were as follows: (1) investigations conducted were empirical in nature; (2) description of doctor EHR uses in an outpatient setting; and (3) demonstration of direct impact of EHRs on doctor–patient communication. Following application of the inclusion/exclusion criteria, the number of articles available for inclusion in this review reduced to 13.

Quality assessment

All 13 articles analysed in this systematic review were assessed using the PRISMA 2009 checklist, which consists of 27 checklist items concerning the content of a systematic review, including the title, abstract, methods, results, discussion, and funding. This is used to guarantee unbiased and fair reporting in this systematic review.

Data extraction

Data (setting, design, population sample, data collection method, data analysis method, and key findings) were extracted from the 13 selected articles, using a structured format based on the PRISMA 2009 checklist.

RESULTS

Literature searching overview

A total of 303 records were identified through database searching, with an additional two records identified via reverse snowballing, giving a total of 305 records initially identified. Following de-duplication, 175 records remained, which were then all screened; 138 of those records were excluded because they did not meet the inclusion criteria; leaving 37 full-text articles that were read and assessed for eligibility. 24 of those articles were excluded, because they did not occur in an outpatient setting, were still in progress, or did not investigate communication outcomes in sufficient depth. This left 13 studies that were selected for further analysis as part of this systematic review.

Study designs

Although three studies took place at multiple sites, the remainder were single-site studies. All studies took place in outpatient primary care settings, of which, most took place in general outpatient settings, though one took place in a paediatric outpatient setting, and one took place in a psychiatric outpatient setting.
The majority of these studies took place in North America, particularly Canada\(^8\) and the United States,\(^8,15,16,18,20–24\) Two studies took place in Israel\(^14,17\) and one study took place in Denmark.\(^25\)

**Study participants**

The mean age and gender proportions of the participants varied greatly\(^8,14–16,18–23,25\) and were generally reported, with the exception of the study of Warschawsky, which took place in a paediatric outpatient setting,\(^17\) where the ages and sex of the participants were not reported.

It is worth noting that of the 13 studies selected for this systematic review, three took place in outpatient medical settings overseen by the United States Department of Veteran Affairs, and as a result, their patient participants were predominantly elderly white males.\(^21,22,24\)

The ages of the physicians involved in the study were not consistently reported, nor were their genders.

**Patient recruitment methods**

Two studies did not state their methods of patient recruitment.\(^16,17\) Three of the studies used convenience samples of patients\(^20,22,24\) Two additional studies also had a non-random (though non-convenience) sampling of participants.\(^21,25\) The remaining six studies utilized random selection,\(^8,14,15,18,19,23\) with exceptions made for first time patients (to prevent bias)\(^14\) and gynaecological visits (where video-recording would have been inappropriate).\(^22\)

**Data collection methods**

Three methods of data collection were observed in the studies chosen: (1) self-reported questionnaires or interviews; (2) behavioural analysis (qualitative or quantitative) of videotaped physician–patient encounters; and (3) ethnographic analysis.

Four studies extracted data from self-reported questionnaires and/or interviews conducted with physicians and patients\(^18–21\) (see Table 1). In three of these studies, mostly positive outcomes from the use of EHRs in the outpatient consultation were reported,\(^20,21\) while one study showed no statistically significant change in attitudes.\(^18\)

Four studies extracted quantitative data from videotaped encounters\(^8,14,15,17\) (see Table 2). Three studies demonstrated EHRs had mixed impacts on doctor–patient communication,\(^8,15,17\) and one found negative results.\(^13\)

Three studies qualitatively analysed transcripts and footage from videotaped encounters\(^22–24\) (see Table 3). Two studies\(^22,24\) found overall positive results regarding the impact of exam room EHR use on doctor–patient communication, while one study\(^23\) demonstrated mixed results.

Two studies used an ethnographic study design to gather and evaluate data\(^16,25\) (see Table 4). One study found EHR had mixed impacts on doctor–patient communication,\(^25\) whereas the other study found inconclusive results.\(^16\)

Overall, out of these 13 studies, five showed overall positive results with regard to the impact of EHRs on doctor–patient communication in an outpatient setting, one study showed no statistically significant change, six studies showed overall mixed results, and one study showed overall negative results.

**DISCUSSION**

**Principal findings**

**EHR as amplifier of existing physician communication behaviours**

Two of the four pre-/post-implementation studies suggest that existing behaviours are increased rather than changed by EHR use.\(^14,23\) Frankel et al. suggested that clinician baseline communication skills are not altered, but instead *amplified* by introduction of EHRs, and positive communication practices were further improved and negative behaviours further deteriorated.\(^23\) As well, Margalit et al. suggested that due to increased exchanges caused by increased disclosure with EHR use, both positive talk (agreements, approvals, laughter, and jokes) and negative talk (disapprovals and criticisms) increased.\(^14\)

**Achievement of communication goals of consultation**

There are four major communication goals of medical consultation: (1) acquisition of clinical information by physician; (2) provision of information to patient, which may also manifest itself as patient education and counselling; (3) creation and maintenance of a beneficial relationship between patient and clinician; and (4) encouraging participation of and engaging patients in their own healthcare.\(^26\)

**Clinical information gathering from the patient**

All of the studies measuring physician–led biomedical questioning demonstrated a positive outcome (i.e., increased questioning) from EHR use. Margalit et al. found that keyboarding (as part of EMR use) was positively related to both the number of closed questions posed by physicians regarding a patient’s therapeutic regimen and level of patients’ disclosure of biomedical information.\(^14\) Warschawsky et al. reported patients felt that EHRs aided physicians in maintaining comprehensive medical records.\(^17\)

**Clinical information provision to the patient**

Three studies demonstrated improved medical counseling and education, particularly for pharmaceutical information, when EHRs were used.\(^14,20,22\) Hsu et al. reported an improved medical counselling, according to patients, and improved patient’s understanding of decisions made during the consultation.\(^20\) Arar et al. found that use of EHR facilitated the process and content of medication counselling.\(^22\) Makoul et al. state that physicians using EMRs were more effective in encouraging patient questions and clarifying biomedical information.\(^8\)

**Maintaining a positive relationship with the patient**

The maintenance of a positive relationship can be subdivided into building and sustaining rapport and the provision of emotional support.
Two studies noted adverse effects of EHR use on flow of conversation between patient and provider. Margalit et al. found that keyboarding and screen gaze had an inverse relationship with physician use of orientation statements (i.e., transition statements, instructions, and directions), adversely affecting the flow of conversation.14 Warshawsky et al. found that the style of the interaction in the consultation shifted from a “conversational” to a “blocked” style to accommodate physician data entry and limited rapport.17

Furthermore, Margalit et al. found that screen gaze was inversely proportional to a physician’s use of psychosocial questioning.14 Asan et al. discovered that keyboarding during the consultation, even when done by technologically apt physicians, was disruptive to patient satisfaction and was associated with lower levels of patient trust, two factors affecting the doctor–patient relationship.15 Makoul et al. demonstrated that, compared with paper record users, physicians using EMR were less effective at exploring psychosocial and emotional issues.8

**Activating and partnering with patients**

Engaging patients with their healthcare is a central tenet of patient-centred care.27 Makoul et al. found physicians using EHRs performed more poorly in engaging patient-centred conversation, discussing effects of a medical condition on a patient’s life and engaging in psychosocial and emotional discussions.8 Margalit et al. suggested that there is an inverse relationship between keyboarding and screen gaze, and patient-centredness.14

**Implications of the findings**

**Implications for clinical practice**

Any adverse effects that EHR use may have on the doctor–patient relationship or communication should be mitigated by increasing clinician familiarity with EHRs and providing EHR-specific training. Patients respond favourably to physicians who they deem to be skilled at utilizing computing technologies.1 When computer-based software is utilized in consultations, patients expect clinicians to be proficient in its use, specifically being able to type with ease.1,28 Two studies explore clinician familiarity with EHR technology.15,21 While one study suggested that patient satisfaction with their physician’s ability to communicate while using EHRs increases with experience (in terms of both healthcare delivery and EHR use),21 another suggested that physicians experienced with utilizing computers become technology focussed, which is detrimental to communication and patient satisfaction.15 It should be remembered that the effects of EHR use are very context-dependent,18 though steps can be taken so that concerns of the EHR’s adverse impact on the relationship between doctor and patient are not wholly realized.

**Implications for medical education**

Morrow et al. found that first year medical students who were formally taught EHR communication skills demonstrated satisfactory communication skills whilst utilizing a computer in their consultations22 when compared with those who were not provided with the same training. As EHR use will only increase with increased digitization, necessary training in medical schools will help to overcome these challenges.

**Comparison with the literature**

Amplification of existing behaviours may be explained by a cognitive psychology phenomenon known as the “bottleneck effect” whereby an individual can perform finite number of intellectually demanding activities concurrently and will only be able to concentrate on a single task at a time.8 Computer-specific skills such as keyboarding may require more cognitive effort,30 perhaps explaining why some behaviours are amplified.

EHR increases provision of information to patients due to its structured format, helping patients with explanation of health topics.8 With regard to clinical information gathering from the patient, the results found in this review are aligned with the literature on CPOE (computerized physician/provider order entry), which acts as a digital checklist, prompting providers to include complete patient biomedical details into the EHR.15,16,31

Eye contact remains an important non-verbal tool in establishing mutual understanding and common ground in the encounter32 and this is demonstrated in articles in this review. Poor eye contact impairs the relationship between doctor and patient and reduces physician cognizance of the patient’s psychosocial concerns.14

**Limitations of the method**

**Limitations of search strategy**

Non-English language articles were not reviewed and this excluded potentially useful research in other languages. Although the search strategy was designed to include all relevant studies, there are many synonyms available for “doctor,” “patient,” “communication,” and “EHR,” and relevant studies may have been omitted due to phrasing variations. Furthermore, only three databases were used for the searches; use of more databases may have yielded a greater number of useful studies.

**Limitations of review methodology**

This review only has one author, and as such, there was no additional reviewer who assisted in assessment of the papers found in the search. The assistance of another reviewer would have aided in ensuring no bias in the screening process.

As well, prior to completion, this review was not registered on PROSPERO, the international body overseeing prospective systematic review protocol registration. Registration on PROSPERO would have increased transparency in reporting findings and reduced the risk of duplicating pre-existing research; as such, it should be considered for future reviews on this topic.

There was also no critical appraisal tool used to systematically assess the risk of bias or quality of each individual paper. Doing so would have given this review greater transparency in reporting findings.

**Limitations based on study designs and methodologies**

Only four studies included in this review were pre-/post-intervention studies,17,18,20,23 the study design best suited to
reveal changes following EHR implementation. Furthermore, only one study used a longitudinal design, allowing us to see EHR’s effects over time. Most of the studies in this review were cross-sectional studies, which only provide a “snapshot” of EHR’s effect on communication.

Limitations based on patient selection
Three studies took place in a Veteran Affairs (USA) clinic, thus utilizing a patient population sample predominantly composed of elderly males. This is of note as the literature suggests men are more likely to have favourable views of their clinicians than women, and this divergence in views increases in older patients. Selection bias was noted as some studies utilized convenience samples, whose findings may not be scientifically applicable to the general population. As well, only six studies confirmed participants were randomly selected. In addition, merely one study utilized a control group.

Limitations of various data collection methods
Studies using questionnaires and interviews observed a greater proportion of overall positive outcomes (75%) compared with this review overall (38%). Patients who have a positive relationship with their physician are more likely to approve of their physician’s EHR use, causing a positive skew of results, as patients wish to portray their relationship with doctors favourably.

Call for further research
The effect of increased technological prevalence
As early as 1988, Rethans et al. reported that patients approved of the presence of computers in the examination room. Garrison et al suggest that the pervasiveness of computers today may cause patients to associate their use in a clinic with medical advancement. Today, online eHealth resource access amongst post-secondary students is high, and in 2012, 67% of British adults accessed a computer daily. Current research suggests that a patient’s personal use of and familiarity with computers often has negative impact on their satisfaction with computer use during the visit. Reasons for this are not fully understood and further research is required to evaluate changing perceptions.

Continued focus of the effect on patients
While political interest remains on EHR’s intended benefits, patients’ wishes are often ignored in decisions of implementation. Beyond the opinions of government agencies and medical professionals, studies on EHR should consider the viewpoints of the general public, as they are affected most by these decisions. Patients should be involved in all decision-making and their opinions on EHRs acknowledged in future research and policy.

CONCLUSION
The findings of this review demonstrate that EHR use has had positive effects on biomedical dialogue between doctors and patients, though an adverse effect has been observed on psychosocial discussion, and as an extension, on the doctor–patient relationship. However, more high quality studies are still needed on the effect of EHR use on doctor–patient communication in the medical consultation. This review emphasizes that patient experiences should be a principal consideration when implementing new information technologies in the exam room, and doctors should be cognizant of any adverse social effects of these new computer systems.

REFERENCES


10. Sullivan F and Mitchell E. Has general practitioner computing made a difference to patient care? A systematic review of...


APPENDIX

PRISMA 2009 Flow Diagram

Records identified through database searching (n = 303)

Additional records identified through other sources (n = 2)

Records after duplicates removed (n = 175)

Records screened (n = 175)  
Records excluded (n = 138)

Full-text articles assessed for eligibility (n = 37)  
Full-text articles excluded, with reasons (n = 24)

Studies included in qualitative synthesis (n = 13)

Studies included in quantitative synthesis (meta-analysis) (n = N/A)

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### Table 1 Description of studies that used responses to self-reported questionnaires or interviews as method of data collection

<table>
<thead>
<tr>
<th>Study authors</th>
<th>Setting and design</th>
<th>Population sample (n)</th>
<th>Outcome measures</th>
<th>Data collection method</th>
<th>Data analysis method</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hsu et al (2005)</td>
<td>Longitudinal qualitative study using pre-visit and post-visit surveys in 1 freestanding Oregon (USA) Kaiser Permanente medical office</td>
<td>Eight primary care providers and 313 patients</td>
<td>Patient satisfaction as measured by satisfaction with visit components, comprehension of visit, perceptions of physician’s use of computer</td>
<td>One pre- and two post-visit patient questionnaires, videotaped patient-physician interactions, videotaped computer screens</td>
<td>Multivariate logistic and ordinal logistic regression models</td>
<td>Overall patient satisfaction with medical encounter increased</td>
</tr>
<tr>
<td>Lelievre and Schultz (2010)</td>
<td>Cross-sectional mailed survey measuring influence of physician computer use on patient satisfaction of patient-physician encounter at a University Medical Centre in Ontario (Canada)</td>
<td>No data on physicians; 300 surveys sent out to patients with response rate of 58.3% (175 respondents total)</td>
<td>Patient preference for or against computer use by the physician and effect of computer use on various aspects of patient-physician interaction</td>
<td>Mailed post-visit patient questionnaires</td>
<td>Fisher exact tests, $\chi^2$ tests</td>
<td>Most respondents had no preference regarding computer usage but had high degree of satisfaction with encounter. Respondents stated that most aspects of encounter were positively affected by computer use</td>
</tr>
<tr>
<td>Rouf et al (2007)</td>
<td>Cross-sectional survey of patients and physicians in 1 New York (USA) Veteran Affairs primary care clinic</td>
<td>Eleven faculty physician and 12 medical residents (giving a total of 23 clinicians); 155 patients</td>
<td>Physician and patient assessment of the effect of the computer on the clinical encounter</td>
<td>Three questionnaires, 1 for patients, 1 for physicians as baseline; and 1 for physicians post-visit</td>
<td>$\chi^2$ and t-tests, as needed</td>
<td>Only 8% of patients reported adverse change in encounter. Lower levels of satisfaction more likely if seeing resident than physician.</td>
</tr>
<tr>
<td>Stewart et al (2010)</td>
<td>Quasi-experimental pre- and post-test design based on exposure to either paper or electronic charting based on results from surveys completed by psychiatric outpatients in New Mexico (USA)</td>
<td>161 pre-implementation subjects and 141 post-implementation subjects</td>
<td>Patient satisfaction on quality of patient-physician relationship</td>
<td>Pre- and post-implementation questionnaires</td>
<td>$\chi^2$ and t-tests, Cronbach’s coefficient alpha</td>
<td>No statistically significant differences seen between pre-implementation and post-implementation groups</td>
</tr>
</tbody>
</table>
Table 2 Description of studies that used quantitative behavioural analysis of video-recordings as method of data collection

<table>
<thead>
<tr>
<th>Study authors</th>
<th>Setting and design</th>
<th>Population sample (n)</th>
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<th>Data collection method</th>
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<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asan and Montague (2012)</td>
<td>Cross-sectional descriptive study utilizing video footage of physician interactions with patients via utilizing EHR in five primary care clinics</td>
<td>Ten primary care physicians, 100 patients</td>
<td>Physician gaze at computer and typing behaviours</td>
<td>Videotaped physician–patient interactions, post-visit patient questionnaire</td>
<td>Videos were temporally coded and subject to cluster analysis, and patient responses were matched to physician style, which were determined by qualitative thematic analysis</td>
<td>Three styles of physician interaction with EHR during consultations were identified: technology-centred, human-centred, and both</td>
</tr>
<tr>
<td>Makoul et al (2001)</td>
<td>Exploratory, controlled observational study using analysis of videotaped encounters, questionnaires and reviews of health records in outpatient general internal medical practice in Chicago, IL (USA) medical practice</td>
<td>Six physicians: three using EMR system and three using paper record (control group); 204 patients</td>
<td>Content analysis of whether physicians accomplished communication tasks during encounters; qualitative analysis of how EMR physicians used the EMR and how control physicians used the paper chart</td>
<td>Post-visit patient questionnaires, medical record reviews, Videotaped physician–patient interactions</td>
<td>Content analysis to determine if communication tasks were adequately completed; qualitative analysis to determine how physician used respective system; t-tests and ANOVA</td>
<td>Both groups of physicians were focussed on record at beginning of encounter. EMR physician more active in clarifying information and ensuring completeness, however, EMR physicians also less active in patient-centred communication</td>
</tr>
<tr>
<td>Margalit et al (2006)</td>
<td>Analysis of randomized selection of videotaped physician–patient interactions from three Israeli primary care clinics</td>
<td>Three physicians, with 10 patients each (giving a total of 30 patients)</td>
<td>Extent of computer use, communication dynamics</td>
<td>Videotaped physician–patient interactions</td>
<td>RIAS, which is a standardized method of analysing medical communication, and partial correlation coefficient and product-moment coefficients, which measure dependence; ANOVA</td>
<td>Physicians spent significant time looking at screen and keyboarding; level of keyboarding activity inversely proportional to dialogue and patient-centred communication</td>
</tr>
<tr>
<td>Warshawsky (1994)</td>
<td>One group pre-/post-intervention study</td>
<td>Four paediatric physicians, 200 “encounters”, of which 132 were analysed</td>
<td>Total encounter time, time of different phases of encounter, record use, and non-interaction time (NIT) between physician and patient</td>
<td>Videotaped physician–patient interactions</td>
<td>The following variables were analysed: “total encounter time, time of different phases of encounter, record use and non-interaction time between physician and patient”</td>
<td>Mean encounter times were not affected, though lengths of encounter components and record use were. Physician work style shifted from “conversational” to “blocked” style</td>
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Table 3 Description of studies that used qualitative behavioural analysis of video-recordings as method of data collection

<table>
<thead>
<tr>
<th>Study authors</th>
<th>Setting and design</th>
<th>Population sample (n)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Arar et al (2005)</td>
<td>Cross-sectional analysis of medication communication between patients and providers during outpatient primary care visits at a Veterans Affairs health clinic in Texas (USA)</td>
<td>Six physicians; 50 “encounters”</td>
<td>Process of care, themes discussed, names utilized for medications</td>
<td>Videotaped physician–patient interactions (which were later transcribed)</td>
<td>Content analysis via conversion analysis and ethnomethodology techniques</td>
<td>Use of EMRs encouraged communication about medications during primary care outpatient visits, by increasing number and duration of exchanges on the topic</td>
</tr>
<tr>
<td>Frankel et al (2005)</td>
<td>Longitudinal qualitative study using pre- and post-implementation videotaped encounters in primary care clinic</td>
<td>Six physicians, two physician assistants, one nurse practitioner (giving a total of nine clinicians); 54 patients</td>
<td>Impact of exam-room computers on communication between clinicians and patients</td>
<td>Videotaped and audio-recorded physician–patient interactions</td>
<td>Variant of grounded theory</td>
<td>Introduction of computers had impact on four domains of physician–patient communication: visit organization, verbal and nonverbal behaviour, computer navigation and mastery, and spatial organization of exam room. Baseline physician behaviours were “amplified” in presence of EMRs.</td>
</tr>
<tr>
<td>McGrath et al (2007)</td>
<td>Observational study using videotaped encounters in outpatient setting in Veterans' Administration hospital in South-western USA</td>
<td>Six physicians; 50 patients</td>
<td>Analysis of nonverbal communication behaviours: kinesics, vocalics, physical appearance, haptics, proxemics, chronemics, and artifacts</td>
<td>Videotaped physician–patient interactions</td>
<td>Researchers reviewed videos and made notes on four nonverbal behaviour categories: kinesics, proxemics, chronemics, and haptics</td>
<td>Spatial arrangement of computer in office with regards to patient impacted communication, with open arrangement considered best. EMR-utilizing physicians making use of “breakpoints” where they stopped computer use and made sustained eye contact used more nonverbal cues than those who did not. EMR use associated with long pauses in conversation between physician and patient, which may have positive impact on communication.</td>
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Table 4 Description of studies that used ethnographic techniques as method of data collection

<table>
<thead>
<tr>
<th>Study authors</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Als et al (1997)</td>
<td>Two part cross-sectional study including: (1) analysis of videotaped encounters of primary care medical consultation and (2) patient and doctor interviews while re-watching videotaped encounters</td>
<td>Five general practitioners (GPs); 39 outpatients</td>
<td>Patterns in use of desktop computers by GPs, and GP and patient perceptions regarding computer use</td>
<td>Videotaped physician–patient interactions, patient and doctor interviews</td>
<td>Qualitative inductive approach inspired by grounded theory</td>
<td>Computer identified as a “magic box” to which clinicians gesture when explaining facts, regardless of computer’s relevance in matter. Use of computer can cause interruptions in conversation, both as a “time-out” and as an abrupt pause</td>
</tr>
<tr>
<td>Ventres et al (2006)</td>
<td>Ethnographic analysis utilizing four qualitative study methods conducted at four primary care practices in Pacific Northwest (USA)</td>
<td>Twenty three physicians; one nurse-practitioner; 12 clinic staff members; and 52 patients</td>
<td>Themes and factors influencing EHR use and physician-patient encounters</td>
<td>Eighty hours of participant observation; 75 audiotaped individual and 5 audiotaped focus-group interviews; and 29 videotaped physician–patient interactions which were later reviewed with physician</td>
<td>Ethnographic techniques</td>
<td>Fourteen themes and factors were found to influence EHR use and physician–patient encounters, split into four broad categories: geographical, relational, educational, and structural</td>
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</table>