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Research and Applications

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Computer use, language, and literacy in safety net clinic communication

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ABSTRACT

Objective: Patients with limited health literacy (LHL) and limited English proficiency (LEP) experience suboptimal communication and health outcomes. Electronic health record implementation in safety net clinics may affect communication with LHL and LEP patients.

We investigated the associations between safety net clinician computer use and patient-provider communication for patients with LEP and LHL.

Materials and Methods: We video-recorded encounters at 5 academically affiliated US public hospital clinics between English- and Spanish-speaking patients with chronic conditions and their primary and specialty care clinicians. We analyzed changes in communication behaviors (coded with the Roter Interaction Analysis System) with each additional point on a clinician computer use score, controlling for clinician type and visit length and stratified by English proficiency and health literacy status.

Results: Greater clinician computer use was associated with more biomedical statements (+12.4, $P = .03$) and less positive affect (−0.6, $P < .01$) from LEP/LHL patients. In visits with patients with adequate English proficiency/health literacy, greater clinician computer use was associated with less positive patient affect (−0.9, $P < .01$), fewer clinician psychosocial statements (−3.5, $P < .05$), greater clinician verbal dominance (+0.09, $P < .01$), and lower ratings on quality of care and communication.

Conclusion: Higher clinician computer use was associated with more biomedical focus with LEP/LHL patients, and clinician verbal dominance and lower ratings with patients with adequate English proficiency and health literacy.

Discussion: Implementation research should explore interventions to enhance relationship-centered communication for diverse patient populations in the computer era.

Key words: electronic health records, health communication, limited English proficiency, health literacy, chronic disease, primary care, specialty care, safety net providers

BACKGROUND AND SIGNIFICANCE

US safety net clinics serve many patients with limited English proficiency (LEP) and limited health literacy (LHL), vulnerable populations shown to experience disparities in access to care, receipt of preventive services, treatment adherence, adverse safety events, and health outcomes.[1–12] Communication barriers during medical encounters may potentiate these health disparities, with studies showing that providers engage with these patients less effectively.[13–16]

Electronic health records (EHRs) complicate patient-clinician communication. With the 2009 Health Information Technology for Economic and Clinical Health Act, clinics began implementing EHRs, requiring intensive computer use for maintaining documentation, prescribing medications, ordering and reviewing tests, and providing interdisciplinary communication.[17,18] Evidence for how EHRs impact quality of care is mixed,[18–23] with little known about their effects on safety net patient-clinician communication. Research suggests that clinician EHR use may change the patterns and patient-centeredness of clinician-patient communication,[24–28] but no studies have focused on LEP or LHL populations or patients with chronic disease seeking specialty care. EHRs could facilitate communication with LEP and LHL patients by providing information about care received across multiple settings or visual tools for patient education. Alternatively, computer use could amplify the communication challenges vulnerable patients experience. Thus, it is important to study how safety net EHR use may affect communication with ethnically diverse, vulnerable populations with chronic disease.

OBJECTIVE

In a recent observational study in safety net primary and specialty care, we reported that higher clinician computer use was associated with lower patient ratings of quality of care, greater patient-clinician chitchat, and more disagreements between clinicans and patients.[29] In this analysis, we examined associations between clinician computer use and communication behaviors for patients with LEP and LHL.

METHODS

Study setting and population

We conducted this observational study from November 1, 2011, to November 30, 2013, at a large, urban, academically affiliated US public hospital using a "basic EHR," prior to implementation of a "fully functional EHR" certified by the federal incentive program.[30] Eligible patients included English- or Spanish-speaking adults (age >18) with at least 1 of 3 chronic medical conditions (diabetes, congestive heart failure, or rheumatoid arthritis) who received primary care in the adult internal medicine or family medicine clinic AND subspecialty care at a diabetes, cardiology, or rheumatology clinic. During this study, all clinicians used the EHR to review diagnostic test results, track health care maintenance delivery, prescribe medications, and submit electronic referrals. The adult internal medicine and diabetes clinics mandated documentation of EHR visit notes, while this was optional in family medicine, cardiology, and rheumatology. Eligible clinicians included physicians, nurse practitioners, fellows, and residents.

Participant recruitment

Eligible participants were informed that the study focused on "how using computers affects the way patients and clinicians talk to each other." We emailed eligible clinicians lists of eligible patients generated from upcoming appointments, as well as 3 preexisting cohorts of patients with diabetes, congestive heart failure, or rheumatoid arthritis from prior studies.[31–34] Clinicians could decline participation for themselves or designate particular patients as ineligible based on the criteria above.

We mailed letters to eligible patients offering the opportunity to decline participation. Research assistants then enrolled patients and obtained informed consent by phone before scheduled visits.

Clinicians and patients gave written informed consent. A native Spanish-speaking research analyst translated all patient materials and consent forms into Spanish. The University of California, San Francisco (UCSF) Committee on Human Research approved this study.

Data collection

During patient enrollment calls, research assistants conducted structured previsit interviews. During the subsequent visit, the clinician-patient encounter was videotaped, and post-visit patient interviews occurred in person or via telephone. Native Spanish speakers translated and back-translated Spanish interview items into English.

Clinician participants also completed baseline and post-visit paper or online questionnaires.

LEP and LHL: We measured patient English proficiency and health literacy using scales previously validated in similar populations.[2,35,36] We categorized Spanish-speaking patients who reported English proficiency as less than "very well" as having LEP.[2] We categorized patients who were "somewhat," "a little bit," or "not at all" "confident filling out medical forms by yourself" as having LHL.[2,35,36]

Clinician Computer Use: The independent variable was clinician computer use, rated by video coders using an instrument developed from a literature review of computer use behaviors.[24–28] For this score, 4 ratings were summed: amount of computer use to review data, amount of typing/clicking, eye contact with the patient, and noninteractive pauses. Scale response options range from none (0) to high (3), with "eye contact" reversed. Scores ranged from 0–12 (Cronbach's α 0.67). Higher scores indicated more computer use. On 4 videos, the average interrater reliability was 0.90 by Pearson correlation coefficient. To validate this measure, we also calculated the correlation (0.66) between this computer rating and the total number of statements that included concurrent clinician computer use during 33 encounters. We did not use these statement counts as the predictor, because they omitted computer use during silences.

Patient and Clinician Communication Behaviors: We analyzed videos using the Roter Interaction Analysis System (RIAS), a valid and reliable system to assess patient and clinician communication behaviors during encounters.[37–40] Analysts assigned 1 of 37 mutually exclusive and exhaustive categories to each complete thought expressed by patients and clinicians. Codes were combined in categories including *rapport-building*, *biomedical talk* (illness and therapy), and *psychosocial/lifestyle talk* (patient experience and life situation). Five investigators coded 71 visits. A native Spanish speaker coded encounters with spoken Spanish. The average interrater reliability was 0.74 by Spearman's correlation coefficient on 4 videos.

Patient-centeredness is calculated by summing RIAS codes promoting the patient's socioemotional, psychosocial, and biomedical agenda and dividing this by the sum of codes related to the

Table 1. Patients and clinicians in a study of communication behaviors by clinician computer use in safety net encounters

Patients ($n = 47$)	
Mean (SD) age, years	56.5 (11.4)
Women, *n* (%)	26 (55)
Self-reported race/ethnicity, *n* (%)	
Hispanic	27 (57)
African-American	8 (17)
Caucasian	3 (6)
Asian	7 (15)
Multiethnic	2 (4)
Primary language Spanish, *n* (%)	26 (55)
Education, *n* (%)	
≤8th grade	12 (26)
Some high school or graduate/GED	13 (28)
Some college or college graduate	22 (47)
Income ≤$20 000/year, *n* (%)	43 (92)
Primary recruitment condition, *n* (%)	
Diabetes	17 (36)
Rheumatoid arthritis	15 (32)
Congestive heart failure	15 (32)
Limited English proficiency,[a] *n* (%)	13 (28)
Inadequate health literacy[b]	14 (30)
Limited English proficiency OR inadequate health literacy	21 (45)
Clinicians ($n = 39$)	
Age (SD), years	43.7 (11.3)
Women, *n* (%)	25 (64)
Primary care[a], *n* (%)	28 (72)
Specialty[a], *n* (%)	11 (28)
Diabetes	5 (13)
Cardiology	2 (5)
Rheumatology	3 (8)
Degree, *n* (%)	
Physician	27 (72)
Nurse practitioner or physician assistant	11 (28)
Resident, *n* (%)	8 (21)
Years since professional degree, mean (SD)	13.9 (10.0)
Spoke Spanish during an encounter, *n* (%)	16 (41)
Encounters ($n = 71$)	
Relationship length years, *n* (%)[c]	
<1 year	11 (16)
1–5 years	37 (54)
>5 years	21 (30)
Mean visit length, minutes (SD)	24.6 (10.0)
Language concordant, *n* (%)	
English	42 (59)
Spanish	25 (35)
Interpreter	4 (6)

[a]Spanish-speaking patients who reported English proficiency less than "very well" [b]Somewhat, a little bit, or not at all confident "filling out medical forms by yourself" [c]Sixty-nine responses

clinician's biomedical agenda. Values greater than 1 are more patient-centered and values less than 1 are more clinician-centered biomedically oriented encounters.[41–45] A clinician *verbal dominance ratio* was calculated by dividing all clinician statements by all patient statements.[46] Finally, clinician and patient *positive affect* was calculated by summing coders' overall ratings for "attentiveness," "friendliness," "engagement," and "empathy"; for clinicians, the score was totaled after subtracting the rating for "hurried."[40,46,47]

Patient Perceptions: Patients rated clinician communication over the prior 6 months using the Interpersonal Processes of Care (IPC) instrument, which averages items over 6 domains: communicating clearly, eliciting/responding to concerns, explaining results, sharing decision-making, having a compassionate/respectful style, and experiencing discrimination.[48,49] Higher subscale averages (range 0–5) for "lacks clarity" and "perceives discrimination" were worse, while higher averages for other domains represented better communication. IPC subscale differences ranging from 0.06–0.47 have been reported as significant beta-coefficients associated with patient satisfaction with physicians and care in a diverse patient sample.[50]

Data Analysis

All regression analyses used generalized estimating equations (GEEs) to account for within-clinician correlations.[52] Multilevel regression to investigate within-patient correlations yielded nearly identical results to GEE analyses; given the non-nested nature of the sample levels and the minimal effects of within-patient correlations, we chose GEE as a more accurate approach. We controlled for observable patient, clinician, and relationship characteristics ($P < .10$) associated with clinician computer use in bivariate analyses, except for educational attainment, which can over-adjust and obscure differences with health literacy/English proficiency.[53] As is standard in RIAS analyses, we also controlled for visit length, although it was not associated with amount of computer use. Analyses were conducted using Stata/SE Version 12.1 (College Station, TX, USA).

We first stratified all analyses by English proficiency and health literacy separately. Because findings were similar across analyses and 6 patients (8%) had BOTH LEP and LHL, we created a separate indicator for patients with LEP OR LHL (21 patients in 34 encounters). Thus, the final analyses examined the association between computer use and the outcomes, stratified by LEP OR LHL vs patients with adequate English proficiency AND health literacy.

RESULTS

Participants

Among 78 primary care clinicians, 44 lacked eligible consenting patients. Among the remaining 34, 28 (82%) participated and 6 (18%) declined. Among 22 specialty care clinicians, 9 lacked eligible consenting patients. Among the remaining 13, 11 (85%) participated and 2 (15%) declined. Among 165 initially screened patients, clinicians deemed 33 of them ineligible and 7 were deceased. Among the remaining 125 patients, 47 (38%) participated, 1 (1%) dropped out prior to full enrollment, 13 (10%) declined, and 64 (51%) could not be contacted.

We recorded 71 encounters among 47 patients and 39 clinicians. Table 1 describes the characteristics of patients and clinicians, and their relationships.

Among patients, 13 (28%) had LEP and 14 (30%) had LHL. Six (8%) had both LEP and LHL. Twenty-one (45%) had limited English proficiency, inadequate health literacy, or both. Analyses below were stratified across encounters for these 21 patients vs the 26 patients who had adequate English proficiency AND adequate health literacy.

Amount of clinician computer use

Observed scores covered the 0–12 range. The average and median clinician computer use scores were 6.3 (SD 2.9) and 6. In bivariate analyses, higher computer use was associated with $P < .10$ with nurse practitioners (vs physicians), fewer clinician years in practice, and certain clinics (general medicine, family medicine, and diabetes). Thus we controlled for these variables and visit length in multivariate analyses.

Table 2. Differences in communication behaviors with each increasing point in clinician computer use score, stratified by limited vs adequate English proficiency/health literacy ($n = 71$)

		Limited ($n = 34$)[a]		Adequate ($n = 37$)[a]	
		Difference (SD)	*P*-value	Difference (SD)	*P*-value
Patient communication	Rapport-building	+2.0 (1.8)	.27	−1.5 (1.5)	.34
	Biomedical information	+12.4 (5.8)	.03	+4.0 (5.5)	.46
	Psychosocial information	−0.8 (2.9)	.77	+0.6 (1.7)	.72
	Positive affect score	−0.6 (0.2)	<.01	−0.9 (0.2)	<.01
Clinician communication	Rapport-building	+0.5 (4.0)	.89	−0.9 (1.3)	.49
	Biomedical information	+8.3 (7.5)	.27	−3.5 (3.8)	.35
	Psychosocial information	+0.4 (1.0)	.71	−3.5 (1.3)	<.05
	Positive affect score	−0.4 (0.3)	.10	−0.1 (0.2)	.52
Verbal dominance		+0.04 (0.06)	.52	+0.09 (0.03)	<.01
Patient-centeredness score		−0.04 (0.05)	.36	−0.03 (0.04)	.47

[a]In stratified analyses, limited = patients with limited English proficiency OR limited health literacy; adequate = patients with adequate English proficiency AND adequate health literacy. All analyses were adjusted for clinician years in practice, clinician type (physician vs nurse practitioner vs physician assistant), clinic, and visit length.

Table 3. Differences in patient ratings with increasing each point in clinician computer use score, stratified by limited vs adequate English proficiency/health literacy ($n = 71$)

Interpersonal processes of care[a]	Limited ($n = 34$)[b]		Adequate ($n = 37$)[b]	
	Difference (SD)	*P*-value	Difference (SD)	*P*-value
Lacks clarity	−0.01 (0.04)	.76	+0.01 (0.05)	.80
Elicits/responds to concerns	−0.01 (0.01)	.24	−0.11 (0.04)	<.01
Explains results	−0.01 (0.01)	.24	−0.19 (0.07)	<.01
Shares decision-making	+0.03 (0.06)	.63	−0.16 (0.04)	<.01
Compassionate/respectful	−0.01 (0.01)	.34	−0.11 (0.04)	<.01
Discrimination	0.00 (0.00)	.71	0.00 (0.00)	<.01
Quality of care	AOR (SE)	*P*-value	AOR (SE)	*P*-value
Excellent	1.16 (0.21)	.41	0.46 (0.14)	.01

[a]Average for items in IPC subscale. Higher subscale averages for "lacks clarity" and "perceives discrimination" are worse, while higher averages for other domains represent better communication.

[b]In stratified analyses, limited = patients with limited English proficiency OR limited health literacy; adequate = patients with adequate English proficiency AND adequate health literacy. All analyses were adjusted for clinician years in practice, clinician type (physician vs nurse practitioner vs physician assistant), clinic, and visit length.

Differences from low computer use encounters

Tables 2 and 3 show differences in communication behaviors and patient ratings with each additional point in the clinician computer use score, stratified by patient English proficiency/health literacy.

In encounters for patients with *limited English proficiency OR health literacy*, greater clinician computer use was associated with more patient biomedical statements (+12.4, $P = .03$) and less positive patient affect (−0.6, $P < .01$). Patient ratings were not significantly associated with clinician computer use.

In encounters with patients with *adequate English proficiency AND health literacy*, greater clinician computer use was associated with less positive patient affect (−0.9, $P < .01$), fewer clinician psychosocial statements (−3.5, $P < .05$), and greater verbal dominance by clinicians (+0.09, $P < .01$). Greater clinician computer use was also associated with lower patient ratings for eliciting/responding to concerns (−0.11, $P < .01$), explaining results (−0.19, $P < .01$), sharing decision-making (−0.16, $P < .01$), demonstrating compassion/respect (−0.11, $P < .01$), and overall quality of care (AOR for "excellent" rating 0.46, $P < .01$)

DISCUSSION

In this safety net study of chronic disease communication, for patients at the highest risk for communication challenges, greater clinician computer use was associated with greater focus on biomedical information and less positive affect during the encounter. However, patients with adequate health literacy and English proficiency experienced greater verbal dominance and offered lower ratings of their clinicians.

This study adds to the growing communication literature about EHR use, which suggests complex effects on patient-provider communication.[25,28] EHR implementation may amplify the positive aspects of clinicians' baseline communication style (eg, clinicians using computers to engage and educate patients) or the negative aspects (eg, distracting them from patients even more than paper records do).[25] On the positive side, keyboarding has been associated with increased patient education and patient disclosure of medical information.[27] However, a recent Veterans Affairs study found that more primary care providers with longer computer gaze times were rated as less patient-centered.[24]

Our cross-sectional study cannot draw causal inferences, but our findings suggest that greater clinician computer use could amplify communication challenges for LHL and LEP patients. Greater computer use by clinicians was associated with more biomedical information given by LHL/LEP patients. Because LHL and LEP patients are more vulnerable to misinformation and misunderstandings,[2–12] high-computer-use clinicians may be eliciting or clarifying information related to perceived gaps in patient knowledge revealed by the EHR. However, these exchanges could represent a high "health literacy demand" for patients.[54] In addition, a strong biomedical focus may shift the agenda away from patients' psychosocial concerns, values, and goals.[27] Prior studies have shown that LEP patients receive less facilitation and more often have their statements ignored by their providers,[13] while LHL patients ask fewer questions during encounters[14,15] and experience less shared decision-making.[14,16]

Thus, while EHRs may enhance clinician access to patient health information and patient educational materials, it is important to consider whether diverse patients can comprehend the content of these discussions or materials. Studies have found that health information available at the point of care and via online resources exceeds the literacy levels of the average US adult,[55–59] and one study found that patients have low levels of recall of the content of a typical EHR-generated after-visit summary.[59] Future research should study the spoken health literacy demands of EHR-driven conversations and whether health technologies are increasing rather than decreasing the confusion of vulnerable patients.

Moreover, our findings on patients with adequate English proficiency and health literacy are consistent with research showing differences in patient satisfaction associated with clinician computer use.[24] This may relate to the greater verbal dominance in greater computer use encounters with these patients. Although patients felt early-generation EHRs improved quality of care and remained satisfied with their providers' communication,[26,59,60] a more recent study found that patients rated their primary care providers as less effective when the providers spent more time looking at the computer.[24] Although patient affect was lower with greater clinician computer use for both groups, we did not find significant differences in LEP/LHL patient ratings by clinician computer use. In our prior research, ethnic minorities and LEP patients had more positive attitudes than their counterparts about the impact of computers on clinician communication.[61] Our findings suggest that future EHR research should not simply survey patients about their perspectives on computer use, but should use multimethod approaches, paying attention to measuring experiences in different populations.

Limitations of the study should be noted. First, our results may be affected by volunteer bias. Our sample size and participation rate are comparable to other studies using this video-recording methodology,[25,27] but the declining or nonreachable patients may have differed from our sample. Second, the computer use score includes 2 items (pausing and eye contact) that could be affected by noncomputer factors, such as the use of paper charts. In addition, pausing and eye contact represent specific types of clinician behaviors in the context of computer use, and a multitasking clinician with fluent typing skills could maintain conversation and eye contact with patients while using the computer. However, the computer use score's correlation with coding of computer use with concurrent statements suggests validity, and an advantage of the observer rating scale is that it accounts for computer use in the absence of verbal statements. Future research should explore how communication is affected by the style of computer use, as distinct from the degree of computer use, particularly to inform potential interventions for improving how clinicians use computers during patient encounters. (See Appendices 1 and 2 for the associations in the entire cohort between each score item and select communications outcomes and patient ratings.) Third, confounding by unmeasured factors, particularly at the clinic level, may have affected the results. However, overadjustment by some factors included in the multivariate analysis may obscure other differences attributable to computer use. Fourth, patient ratings had a 6-month recall time frame, but provider computer use may have varied over 6 months. Fifth, our sample size may not have been powered to detect modest differences by degree of computer use in stratified analyses, and the findings in this paper should be considered exploratory. Future research with larger numbers of patients is needed to determine whether the findings in this small study are replicable. Finally, this cross-sectional study cannot be used to make causal inferences.

The study strengths include the use of a validated communication coding system; communication scales validated for use in diverse populations; primary care and specialty care providers; physicians and nurse practitioners; and a socioeconomically and linguistically diverse safety net population.

CONCLUSION

In summary, greater clinician computer use in safety net primary and specialty care was associated with greater focus on biomedical information exchange for LEP/LHL patients, but with greater clinician verbal dominance and lower ratings by patients with adequate English proficiency and health literacy status.

Future implementation research should explore how clinician computer use impacts health outcomes among patients with communication barriers and whether EHR interfaces, infrastructural interventions, and skills-based curricula can foster relationship-centered communication with diverse patient populations.[62,63]

CONTRIBUTORS

N.R. had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: N.R., E.H.Y., D.S.

Acquisition, analysis, and interpretation of data: N.R., J.L.B., C.R.L., M.W., D.M.

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COMPETING INTERESTS

None declared.

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