

Missing Clinical Information During Primary Care Visits

Peter C. Smith, MD

Rodrigo Araya-Guerra, BA

Caroline Bublitz, MS

Bennett Parnes, MD

L. Miriam Dickinson, PhD

Rebecca Van Vorst, BA

John M. Westfall, MD, MPH

Wilson D. Pace, MD

EFFECTIVELY MANAGING CLINICAL information (patient information such as demographics, medical history, medications, test results, and family structure)¹ is an essential part of all medical care; it is particularly crucial for primary care to be able to fulfill what the Institute of Medicine and others consider to be its defining task of coordinating comprehensive care across the health care system.²⁻⁷ Unfortunately, multiple barriers complicate the collecting, synthesizing, recording, and sharing of clinical information, including privacy regulations, decentralized medical systems, inadequate interprofessional communication, the transfer of patients' care within and across care settings, and the rapid turnover of patients' insurance plans.⁸⁻¹⁴ Accordingly, physicians may not have clinical information available when it is important for a patient's care.

Missing clinical information has been implicated in injurious adverse events.^{9,11,15-21} Elder et al⁹ reported that missing clinical information was associated with 15.6% of all reported errors in primary care, most of which were perceived by clinicians as likely to be harmful, and was implicated in

For editorial comment see p 617.

Context The coordinating function of primary care is information-intensive and may be impeded by missing clinical information. However, missing clinical information has not been explicitly investigated in the primary care setting.

Objective To describe primary care clinicians' reports of missing clinical information.

Design, Setting, and Participants Cross-sectional survey conducted in 32 primary care clinics within State Networks of Colorado Ambulatory Practices and Partners (SNOCAP), a consortium of practice-based research networks participating in the Applied Strategies for Improving Patient Safety medical error reporting study. Two hundred fifty-three clinicians were surveyed about 1614 patient visits between May and December 2003. For every visit during 1 half-day session, each clinician completed a questionnaire about patient and visit characteristics and stated whether important clinical information had been missing. Clinician characteristics were also recorded.

Main Outcome Measures Reports of missing clinical information frequency, type, and presumed location; perceived likelihood of adverse effects, delays in care, and additional services; and time spent looking for missing information. Multivariate analysis was conducted to assess the relationship of missing information to patient, visit, or clinician characteristics, adjusting for potential confounders and effects of clustering.

Results Clinicians reported missing clinical information in 13.6% of visits; missing information included laboratory results (6.1% of all visits), letters/dictation (5.4%), radiology results (3.8%), history and physical examination (3.7%), and medications (3.2%). Missing clinical information was frequently reported to be located outside their clinical system but within the United States (52.3%), to be at least somewhat likely to adversely affect patients (44%), and to potentially result in delayed care or additional services (59.5%). Significant time was reportedly spent unsuccessfully searching for missing clinical information (5-10 minutes, 25.6%; >10 minutes, 10.4%). After adjustment, reported missing clinical information was more likely when patients were recent immigrants (odds ratio [OR], 1.78; 95% confidence interval [CI], 1.06-2.99), new patients (OR, 2.39; 95% CI, 1.70-3.35), or had multiple medical problems compared with no problems (1 problem: OR, 1.09; 95% CI, 0.69-1.73; 2-5 problems: OR, 1.87; 95% CI, 1.21-2.89; >5 problems: OR, 2.78; 95% CI, 1.61-4.80). Missing clinical information was less likely in rural practices (OR, 0.52; 95% CI, 0.29-0.92) and when individual clinicians reported having full electronic records (OR, 0.40; 95% CI, 0.17-0.94).

Conclusions Primary care clinicians report that missing clinical information is common, multifaceted, likely to consume time and other resources, and may adversely affect patients. Additional research on missing information is needed to focus on validating clinicians' perceptions and on conducting prospective studies of its causes and sequelae.

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every major category of medical error. In the only research studying missing clinical information directly,²² Canadian emergency department physicians reported that 15.3% of visits had

Author Affiliations: Department of Family Medicine, University of Colorado Health Sciences Center, Denver.
Corresponding Author: Peter C. Smith, MD, Department of Family Medicine, University of Colorado Health Sciences Center at Fitzsimons, PO Box 6508, Mail Stop F496, 12474 E 19th Ave, Bldg 402, Aurora, CO 80045-0508 (peter.smith@uchsc.edu).

important information missing at the time of the encounter that was very likely to result in patient harm. Such harm could include otherwise avoidable drug interactions or duplications, missed or delayed diagnoses, missed immunizations, unnecessary testing and procedures, and the downstream effects of such events.²³

Despite its potential impact on the essential coordination function of primary care, missing clinical information has not yet been explicitly investigated in this setting. To begin to describe this phenomenon, we surveyed primary care clinicians about clinical information reported as missing during patient care visits.

METHODS

Setting

This study was conducted within the State Networks of Colorado Ambulatory Practices and Partners (SNOCAP), a consortium of Colorado practices and practice-based research networks. These include practices from the Colorado Research Network (CaReNet) and the High Plains Research Network (HPRN). Although CaReNet focuses on the care of underserved patients,²⁴ it has a diverse membership including academic, private, and community practices and encompasses both private and publicly funded entities. HPRN settings are in rural and frontier communities across northeastern Colorado.²⁵ All 38 SNOCAP practices participating in the Applied Strategies for Improving Patient Safety error reporting project²⁶ were invited to participate. Six practices with only 1 clinician were excluded to protect anonymity, and first-year residents were excluded because they were unlikely to be familiar with practice information systems. Clinicians in CaReNet were surveyed between May and August 2003 and those in HPRN between August and December 2003.

Measurement

A 2-part cross-sectional survey of primary care clinicians was created using a modified Delphi technique.²⁷ For each visit, an anonymous study question-

naire asked the clinician about patient variables, including age and sex; whether the patient had moved to the United States within the last 5 years; and the number of active medical problems. The respondent was also asked whether this was the patient's first visit to the practice, if he or she was the patient's usual primary clinician, and "Do any communication barriers exist with this patient?" (a broad question intended to include such barriers as language discrepancy, severe dementia, and developmental delay). The clinician was asked to indicate patient race (all that apply: white, black, Asian, Native American, do not know) and ethnicity (Hispanic, non-Hispanic, do not know) to determine if these variables were associated with missing clinical information.

The respondent was then asked, "Was any existing information, important for the care of this patient, unavailable at the time of the visit?" The questionnaire explained that this referred only to information known to exist. The term "important for the care of this patient" was not further defined but was intended to capture essential but not necessarily urgent information. To study the entire scope of missing information, we included information that might not always be reasonably expected to be available at the visit. For example, we asked whether missing clinical information was located outside the practice (eg, in the hospital or in another state) or inside the practice (eg, a misplaced chart or malfunctioning electronic systems). Because we wanted to assess information missing at the time that most medical decisions are made, clinicians completed the questionnaire at the end of each visit. Thus, clinical information initially missing but found prior to the end of the visit was not classified as missing, whereas information found after the visit had ended was still classified as missing.

If clinical information was reported missing, clinicians answered additional questions pertaining to that information. They chose among nonmutually exclusive, fixed-response options that also had an "other" option accompanied by space for free text. These questions in-

cluded (1) the type of information reported as missing; (2) whether they thought the missing information likely resided within or outside their clinical system (defined as their practice and any associated hospital, university, or community health system) or within or outside the United States; (3) whether, as a consequence of the information being missing, they thought the patient was likely to have a delay in care or require additional medical services; and (4) whether the clinician or a staff member had attempted to find the information, and if not, why not. If clinicians searched for the missing information but didn't find it during the visit, they were asked to estimate the time spent looking (<1, 1-4, 5-10, or >10 minutes). Finally, they recorded on a 5-point Likert scale their estimate of "How likely is this missing information to adversely affect the patient's well being?", with anchors ranging from "not at all likely" to "very likely." The questionnaire instructions asked only that this be considered in the context of the patient's medical care but did not define "adversely affect." These estimates of adverse effects were not confirmed or otherwise characterized.

A second clinician questionnaire asked for the clinicians' own demographic information and specialty, whether they were physicians or midlevel clinicians (nurse practitioner or physician assistant), and whether they were residents. The questionnaire also asked the respondents to choose the single best description of their practice's information system: paper charts, partial or hybrid electronic medical records (EMRs), or full (EMRs). Finally, clinicians reported whether or not they had electronic access in their office to patient data from their primary hospital. We did not assess the extent to which each respondent used any existing electronic systems.

The survey was reviewed by experts in medical error and communication to maximize face and content validity and was pilot tested by experienced clinicians.²⁸ The study questionnaire was limited to 1 page to maximize response rate; average completion time was less than 1 minute. No patient or

clinician identifying information was included on the questionnaires, and the study was approved as exempt by the Colorado Multiple Institutional Review Board and all necessary local institutional review boards.

Data Collection

Each participating clinician completed the study questionnaire at the end of every consecutive patient visit during 1 half-day clinic session. Each clinician also completed 1 anonymous clinician questionnaire. Recent preexisting network surveys provided data on practice size, estimated by the number of full-time equivalent clinicians at each practice. Network data were used to determine which of these were residency practices to assess whether their unique structure influenced missing clinical information independent of the behavior of resident vs nonresident physicians. Because residents are frequently away from the clinics, they were considered 0.3 full-time equivalents. The month of data collection for each practice was recorded.

Statistical Analysis

Missing clinical information rates, frequency distributions, and means (SDs) were calculated for all variables of interest. The intraclass correlation coefficient was computed to assess potential clustering effects. The intraclass correlation coefficient for patients within physicians was 0.076, indicating the need to use methods appropriate for clustered data. To determine whether missing clinical information was associated with patient demographics, visit characteristics, and practice or clinician factors, generalized linear mixed models (multi-level models) were used with missing clinical information (yes/no) as the outcome (logit link) to extend the traditional logistic regression model to accommodate the hierarchical structure of the data (SAS Proc MIXED with GLIMMIX macro).²⁹ Variance components at each level were examined to determine whether random effects should be retained (clinician, practice). After accounting for clinician-level variability, variability at the practice level was not

significant ($P > .20$). Thus a 2-level model was used (patient, clinician). Sensitivity analyses were performed by strata when cell frequencies were adequate.

Significance from the generalized linear mixed models was determined using the F statistic, a joint significance test of global differences among any categories. Statistical significance was defined as $P < .05$ (2-tailed test). To study characteristics associated with reported missing clinical information, power calculations indicated that a sample of 340 events of missing information per group was necessary to detect a 10% absolute difference in rates of missing clinical information in a 2-group comparison with 80% power, assuming an intraclass correlation coefficient of 0.08 (variance inflation factor, 1.48) and a missing information rate of 13% in 1 group. All analyses were performed using SAS 8.2 (SAS Institute Inc, Cary, NC).

RESULTS

A total of 253 clinicians in 32 practices returned study questionnaires for 1614 visits. Eight of these practices were rural HPRN sites and 24 were urban/suburban CaReNet practices. Six invited practices, representing 34 clinicians, did not participate; reasons included extreme weather, an influenza outbreak, and being too busy with practice or concomitant surveys. Participating and nonparticipating practices did not differ significantly in size ($P = .26$), rurality ($P = .33$), or whether they were residency practices ($P = .64$). Although the number of clinicians within the networks is constantly changing, we estimated that the 253 participants represent 71% of all network clinician full-time equivalents. Of these 253 clinicians, 7 did not complete the clinician survey, leaving 51 patient visits without clinician information. As a result, clinician information was available for 1563 patient visits (96.8%).

The results of univariate analyses of patient, visit, clinician, and practice characteristics are shown in TABLE 1 and TABLE 2. Diverse age groups and both sexes were well-represented. Clinicians characterized most patients as

Table 1. Patient and Visit Characteristics*

Characteristic	Visits, No. (% of Total) (n = 1614)
Age, y	
≤17	422 (26.1)
18-39	473 (29.3)
40-64	469 (29.1)
≥65	235 (14.6)
Incomplete	15 (0.9)
Sex	
Male	554 (34.3)
Female	1051 (65.1)
Incomplete	9 (0.6)
Race	
White	1204 (74.6)
Nonwhite	227 (14.1)
Unknown or incomplete	183 (11.3)
Ethnicity	
Hispanic	538 (33.3)
Non-Hispanic	846 (52.4)
Unknown or incomplete	230 (14.3)
Moved to United States in last 5 y	
Yes	83 (5.1)
No	1399 (86.7)
Unknown or incomplete	132 (8.2)
Active medical problems	
0	259 (16.0)
1	503 (31.2)
2-5	654 (40.5)
>5	152 (9.4)
Incomplete	46 (2.9)
First visit to the practice	
Yes	210 (13.0)
No	1389 (86.1)
Unknown or incomplete	15 (0.9)
Usual care clinician	
Yes	1011 (62.6)
No	555 (34.4)
Unknown or incomplete	48 (3.0)
Communication barriers exist	
Yes	156 (9.7)
No	1424 (88.2)
Unknown or incomplete	34 (2.1)

*All data are by clinician report.

white (74.6%) but one third of patients as Hispanic. Half of all patients had at least 2 active medical problems, while relatively few were characterized as first-time patients (13.0%) or recent immigrants (5.1%). Most respondents were family physicians. Most practices were nonrural and reported electronic access to inpatient data.

Clinical information considered important was reported to be missing at the time of the visit in 220 (13.6%) of 1614 visits, and many visits had more than 1 type of information missing (TABLE 3). Clinicians reported that the types of information missing included (as a percentage of total visits) laboratory results (6.1%), letters/dictation (5.4%), radiology results (3.8%), history and physical examination (3.7%), and medi-

Table 2. Clinician and Practice Characteristics*

Characteristic	Clinicians, No. (% of Total) (n = 253)
Clinician type	
Nurse practitioner	14 (5.5)
Physician assistant	23 (9.1)
Physician	209 (82.6)
Incomplete	7 (2.8)
Specialty	
Family physician	203 (80.2)
General internist	18 (7.1)
General pediatrician	19 (7.5)
Obstetrician	1 (0.4)
Incomplete	12 (4.8)
Resident	
Yes	106 (41.9)
No	132 (52.2)
Incomplete	15 (5.9)
Rural practice	
Yes	28 (11.1)
No	225 (88.9)
Medical records	
Paper	144 (56.9)
Partial/hybrid electronic	84 (33.2)
Full electronic	17 (6.7)
Incomplete	8 (3.2)
Electronic access to inpatient data	
Yes	214 (84.6)
No	29 (11.5)
Do not know/incomplete	10 (3.9)

*All data are by clinician report.

cations (3.2%). In 97 (44.0%) of these visits, clinicians reported that missing information was at least somewhat likely to adversely affect the patient (Table 3). Clinicians believed the missing information was outside their clinical system in 57.3% of visits with missing information. They also reported that someone attempted to find the missing information in 125 (56.8%) of these visits. For 45 (36.0%) of these 125 visits, clinicians reported spending at least 5 minutes looking for missing clinical information. They also reported that during 36 (28.8%) of the 125 visits, staff spent at least 5 minutes looking for missing information. Clinicians believed that missing information would likely result in either delayed care or at least 1 duplicative medical service in 59.5% of visits with missing information (Table 3).

Associations between missing clinical information and patient, visit, clinician, and practice characteristics, separately and in combination, were tested using multilevel models adjusted for clustering of patients within physicians (TABLE 4). Increased reporting of missing clinical information was signifi-

cantly associated with first visit (odds ratio [OR], 2.39; 95% confidence interval [CI], 1.70-3.35), rural clinician (OR, 0.52; 95% CI, 0.29-0.92), immigration within 5 years (OR, 1.78; 95% CI, 1.06-2.99), and number of active medical problems (no problems vs 1 problem: OR, 1.09; 95% CI, 0.69-1.73; 2-5 problems: OR, 1.87; 95% CI, 1.21-2.89; >5 problems: OR, 2.78; 95% CI, 1.61-4.80). Clinical information was equally likely to be reported missing regardless of electronic access to information at one's primary hospital, the size of the practice, the month of data collection, whether physicians were residents, or whether the setting was a residency practice. Family physicians had rates of visits with missing information similar to those of other physicians (13.2% vs 14.4%; $P = .61$). While physicians had a smaller percentage of missing clinical information than did midlevel clinicians (13.4% vs 26.5%), the small numbers of visits for which midlevel clinicians reported missing information ($n=9$) precluded further analysis.

Within a given practice, there was only 81% agreement on average among clinicians on how to classify the practice's charting system. Accordingly, we assessed practices' charting systems using both individual clinician report and clinician concurrence, determined by taking the response most often reported by the clinicians within each practice. Only 17 clinicians indicated that their offices had full EMRs. When compared with respondents who reported having hybrid EMRs or paper records, clinicians who reported having full EMRs were significantly less likely to report missing clinical information (Table 4), while reporting a partial EMR did not confer a difference (OR, 0.88; 95% CI, 0.60-1.28). However, when using the practice-level variable of clinician concurrence rather than individual report, no benefit was seen for practices determined to have full EMRs (OR, 0.60; 95% CI, 0.25-1.40).

COMMENT

We studied primary care clinicians' reports about missing clinical informa-

tion during patient visits and their beliefs about its potential consequences. In nearly 1 in 7 visits, they reported that clinical information important for the patient's care was missing. Although laboratory reports and dictations or letters predominated, clinicians reported that the missing information originated from a variety of sources and often included more than 1 type. In 44% of the visits with missing information, clinicians believed the patient would be at least somewhat likely to be adversely affected. If validated by future research, these results could have serious implications for the 220 million primary care visits that occur in the United States each year.³⁰

Poon et al³¹ found that 83% of surveyed physicians had reviewed at least 1 test result in the previous 2 months that they would have wanted to know about earlier, despite having fairly advanced electronic information systems. It is not surprising that in our study clinicians and staff spent significant amounts of time looking for missing information, especially when they believe it often leads to delayed care, duplicative services, or potential adverse effects for their patients. We did not validate these time estimates, and based on other research³² clinicians may have overestimated the amount of time spent unsuccessfully looking for missing information. However, by excluding any time spent during the visit that resulted in finding the information (so that it was not classified as missing), or time spent looking for missing information after the visit was over, we may have underestimated the total lost time related to searching. This may represent less time available for direct patient care, a further reduction in a resource that is already under threat from other competing demands.

We found relatively few predictors of missing clinical information. Clinicians were more likely to report missing clinical information during visits in which the patient had recently moved to the United States, was new to a practice, or had multiple medical problems. These factors have been implicated in missing information-related medical errors and adverse events in other settings.^{10,12,15,33}

Rural clinicians were less likely to report missing information than urban or suburban clinicians, perhaps because of simpler and more self-contained systems of care, with fewer clinicians and facilities compared with urban areas. It is possible that the influence of broader systemic factors on missing clinical information that could not be discerned in this study may overwhelm such patient, clinician, or practice factors.

Clinicians reporting a full EMR in their practice were significantly less likely to report missing clinical information, but this did not eliminate the problem. Missing information was believed more likely to be outside the clinical system than within it and therefore may be beyond the reach of an EMR. The lack of impact of partial EMRs and electronic access to hospital data on adverse events has been found in other settings.^{11,18} We found no difference in reports of missing information when we used the concurrence among clinicians within a practice to determine the EMR variable. This difference from individual report may indicate that familiarity with or actual use of an EMR is a better predictor of effective information management than the mere presence of an EMR.

This study has several important limitations. The data are cross-sectional and based on clinician report, including patient race and ethnicity, which may be less accurate than patient self-identification. Several network practices reported being too busy to participate. Although this number was small, had they participated the rate of reported missing clinical information may have been slightly higher. There was no independent verification that questionnaires were completed on every consecutive patient in each clinic session. The definition of information that was "important for the care of this patient" was open to broad interpretation by the respondent. Such information may be both important and urgent (eg, an allergy to a newly prescribed medication) or important but not urgent (eg, a written advance directive for a patient with dementia, or urinary microalbumin results for a patient with diabetes).

Table 3. Missing Clinical Information: Categories, Visit Characteristics, and Perceived Consequences

Variable	Visits, No. (%)
Categories of Missing Clinical Information (n = 220)*	
Laboratory results†	99 (45.0)
Letters/dictation	87 (39.5)
Radiology results	62 (28.2)
History and physical examination	59 (26.8)
Current and prior medications	51 (23.2)
Pathology results‡	33 (15.0)
Immunization records	27 (12.3)
Procedures	16 (7.3)
Other§	11 (5.0)
Visit Characteristics	
Perceived likelihood of missing clinical information to adversely affect the patient's well-being (n = 220)	
1 (Not at all likely)	52 (23.6)
2 (Not very likely)	68 (30.9)
3 (Somewhat likely)	52 (23.6)
4 (Likely)	30 (13.6)
5 (Very likely)	15 (6.8)
Incomplete	3 (1.4)
Where is information likely to reside? (n = 220)*	
Within own clinical system	92 (41.8)
Outside clinical system but in United States	115 (52.3)
Outside United States	11 (5.0)
Do not know	5 (2.3)
Attempted to obtain the information? (n = 220)	
No (clinician or staff)	95 (43.2)
Why not? (n = 95)	
Not critical	55 (57.9)
Unlikely to succeed	32 (33.7)
Too busy	17 (17.9)
Other	14 (14.7)
Yes (clinician or staff)	125 (56.8)
Reported time clinician spent looking unsuccessfully, min (n = 125)	
<1	23 (18.4)
1-4	53 (42.4)
5-10	32 (25.6)
>10	13 (10.4)
Incomplete	4 (3.2)
Reported time staff spent looking unsuccessfully, min (n = 125)	
<1	39 (31.2)
1-4	23 (18.4)
5-10	20 (16.0)
>10	16 (12.8)
Incomplete	27 (21.6)
Perceived Consequences of Missing Clinical Information (n = 220)¶	
Delay(s) in care	56 (25.5)
Additional laboratory testing	49 (22.3)
Additional visit(s)	46 (20.9)
Additional imaging	24 (10.9)
Other#	18 (8.2)

*Percentages total more than 100% because questionnaire options were not mutually exclusive.

†Blood chemistry, urinalysis, and hematology.

‡Biopsy specimens and cytology, including Papanicolaou smears.

§Includes pediatric growth data, notes about telephone calls, and parts of charts or entire charts.

||A visit may have had 2 or more pieces of missing information residing in different places.

¶Questionnaire items were not mutually exclusive. Either a delay in care or an additional medical service was reported as a likely outcome in 131 (59.5%) of 220 visits.

#Included additional time spent by patients and clinicians looking for the missing information and communicating it on the telephone with hospitals, specialists, pharmacies, and each other; additional time spent reconciling divergent information; problems with missing information that will not be resolved by the next visit; potentially missed diagnoses or improper therapeutics; and potentially duplicated vaccinations.

To explore the widest possible scope of the problem of missing clinical information, there was no requirement that having the information available during the visit was reasonable. Expecting prior medical records at a first visit may not yet be realistic in many practices, and primary efforts to remedy the problem may best focus on limiting missing information for existing patients. However, these findings suggest that robust, long-term solutions may need to

include transfers of care across care settings, even across international borders.³⁴ One model for a solution is the Continuity of Care Record, a data standard that enables diverse information systems to share a minimal clinical data set whose components closely mirror the types of missing information reported in this study,³⁵ that has the potential to be disseminated via portable memory devices or secure e-mail or Web servers, and that can be printed and given directly to patients or new clinicians.

Because clinicians were not given a specific definition of an adverse effect from missing clinical information, their responses may have considered outcomes ranging from minor inconvenience to financial hardship to actual physical injury. We did not validate or characterize these estimates of potential adverse effects. Although other studies have demonstrated that errors related to missing clinical information are common and can adversely affect patients,^{8,9,11,15,20,36-38} future research should focus on the actual impact of missing information on patients, clinicians, practices, and systems of care.

Although we did not validate the accuracy of clinician report of missing clinical information, a recent direct-observation study indicated that primary care physicians' reports of events during patient visits are highly accurate.³² We did not confirm whether information reported as missing actually existed and, if it did, whether it was truly inaccessible to the clinician or was functionally missing (ie, actually available but not found when needed). Clinicians may have reported nonexistent information (such as a laboratory test ordered but never actually performed) as missing. Conversely, they may have reported information as missing that was actually at their fingertips but that they did not or could not access (such as results buried inside a thick paper record). We did not determine how well the practices' electronic systems were functioning or used during the study, which may have transiently altered the rate of missing information. However, busy clinicians making medical decisions during clinic

Table 4. Patient, Visit, Clinician, and Practice Characteristics Associated With Reported Missing Clinical Information

Variable	Visits With Missing Clinical Information, %	OR (95% CI)*	P Value†
Patient characteristics, y			
Age category			
≤17	11.4	0.67 (0.42-1.07)	.22
18-39	13.5	0.91 (0.59-1.38)	
40-64	14.7	1.00 (0.66-1.51)	
≥65	14.0	Reference	
Sex			
Male	15.0	1.20 (0.92-1.58)	.18
Female	12.7	Reference	
Race			
Nonwhite	14.5	1.09 (0.73-1.62)	.07
White	12.6	Reference	
Ethnicity			
Hispanic	13.0	0.82 (0.59-1.14)	.18
Unknown	17.0	1.23 (0.82-1.84)	
Non-Hispanic	13.1	Reference	
No. of active medical problems			
0	9.7	Reference	<.001
1	10.7	1.09 (0.69-1.73)	
2-5	15.9	1.87 (1.21-2.89)	
>5	19.1	2.78 (1.61-4.80)	
Moved to United States within last 5 y			
Yes	21.7	1.78 (1.06-2.99)	.03
No/unknown	12.9	Reference	
Visit characteristics			
First visit			
Yes	24.3	2.39 (1.70-3.35)	<.001
No/unknown	12.0	Reference	
Usual clinician			
Yes	12.6	0.81 (0.62-1.07)	.14
No/unknown	15.4	Reference	
Communication barriers			
Yes	16.7	1.30 (0.85-2.00)	.22
No/unknown	13.3	Reference	
Clinician and practice characteristics			
Resident physician			
Yes	12.7	0.93 (0.64-1.35)	.70
No	14.1	Reference	
Rural clinician			
Yes	8.2	0.52 (0.29-0.92)	.03
No	14.5	Reference	
Medical records‡			
Full electronic record	6.5	0.40 (0.17-0.94)	.04
Paper or partial electronic record	14.3	Reference	
Electronic access to inpatient data			
Yes	13.4	0.96 (0.61-1.52)	.87
No	15.1	Reference	

Abbreviations: CI, confidence interval; OR, odds ratio.

*Multilevel, univariate logistic regression adjusted for clustering of patients within physicians.

†P values represent significance of F statistic for all categories.

‡As reported by individual clinicians.

visits need information systems that are both effective and efficient. Because most medical decisions are made during patient visits, clinicians may not distinguish between actually missing and functionally missing information.

Although this is a state-level survey, our sample included diverse clinicians and patients from a variety of practices in multiple geographic, economic, and demographic settings. Although the racial and ethnic composition of our sample was different from national norms, we found no differential rates of missing clinical information based on race or ethnicity. We therefore believe that these results should be generalizable.

This is the first direct study of missing clinical information in primary care, in contrast to retrospective detection of missing information as the etiology of a medical error or adverse event. It demonstrates reports of a high frequency of missing important clinical information, with a wide array of potential impact on patient care. Additional research on missing clinical information should focus on validating clinicians' perceptions and conducting prospective studies of its actual causes and sequelae.

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Study concept and design: Smith, Araya-Guerra, Parnes, Westfall, Pace.

Acquisition of data: Smith, Araya-Guerra, Dickinson, Van Vorst, Westfall, Pace.

Analysis and interpretation of data: Smith, Araya-Guerra, Bublitz, Parnes, Dickinson, Westfall, Pace.

Drafting of the manuscript; critical revision of the manuscript for important intellectual content: Smith, Araya-Guerra, Bublitz, Parnes, Dickinson, Van Vorst, Westfall, Pace.

Statistical analysis: Araya-Guerra, Bublitz, Parnes, Dickinson, Van Vorst.

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