Perceived Frequency and Impact of Missing Information at Pediatric Emergency and General Ambulatory Encounters

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Keywords

Medical records, primary care, health information exchange

Summary

Objective: To document the perceived frequency, type, and impact of unavailable ("missing") clinical information during pediatric emergency and general ambulatory encounters.

Methods: This prospective cohort set in the Emergency Department and General Ambulatory Pediatric Clinic at The Children's Hospital, Aurora, CO, assessed pediatric attending physician perceptions regarding missing information at emergency and general ambulatory encounters. The main outcome measures were the frequency of perceived missing information; its presumed location; time spent seeking; and the perceived effects on resource utilization and overall quality of care.

Results: Pediatric physicians reported missing information for 2% of emergency and 22% of general ambulatory encounters. Types of missing information at general ambulatory visits included immunization (34% of types), general past medical (29%), and disease or visit specific histories (13%). Missing information at ambulatory visits was sought 20% of the time, obtained 4% of the time, and rated "somewhat or very important for today's care" (73% of the time) and "somewhat or very important for future care" (84% of the time). For encounters with unattained missing information, physicians reported adverse affects on the efficiency of the visit (64%), physician's confidence in care (33%), patient/family satisfaction (17%), disposition decisions (8%), and recommended additional treatment (38%), laboratory studies (16%), and imaging (12%). For 57% of encounters with missing information, physicians perceived an adverse effect on overall quality of care. Missing information was associated with not having a primary care visit at TCH within 12 months of the encounter, (OR 2.8; 95% CI, 1.7, 4.5).

Conclusion: Pediatric physicians more commonly experience missing information at general ambulatory visits than emergency visits and report that missing information adversely impacts quality, efficiency, their confidence in care, patient and family satisfaction, and leads to potentially redundant resource utilization.

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1. Background

Patients frequently receive care at multiple institutions, private doctors' offices, and testing facilities resulting in scattered clinical information that is not readily accessible when needed (1). Over a 2-year period, 16% of the US population receives care in an emergency department (ED) and for approximately one-third their primary care physician was not informed of the emergency care received. Of the 'sickest' U.S. patients, 20% reported being sent for duplicate tests and 25% of all patients reported information not being available at the time of an ambulatory visit (1, 2).

Data regarding the prevalence and impact of missing information in clinical care is limited, especially for pediatric populations. Family medicine and general internal medicine clinicians report missing clinical information for 13.6% of outpatient visits (3). For visits where information was missing, physicians reported that patient care was at least somewhat likely to be adversely affected for 44% of visits and that care was delayed or additional services were required for 60% of visits. A lack of existing clinical information is frequently implicated as a cause of medical errors and adverse patient outcomes (4). Although likelihood of harm due to missing information was not addressed by Elder, et al, in this study physicians reported adverse effects on patient care in 24% of visits where any 'error' was identified, including missing information. Adverse outcomes occur for 62% of all hospital discharges, many of which are attributed to a lack of communication and integration of care between hospital and outpatient settings (5).

Patients presenting to emergency departments may be at even greater risk of harm due to missing information because they are often sicker, may have greater communication barriers due to acute illness, often receive care at multiple institutions, and receive "after-hours" care making inter-institutional information exchange difficult. Emergency physicians at a single general urban teaching hospital reported at least one 'information gap' for 32% of adult patient visits, half of which were considered essential for patient care. Patient length of stay was 1.2 hours longer for patients with an identified information gap (6).

The objective of this study was to assess the frequency and perceived impact of missing clinical information for pediatric encounters at an academic children's hospital.

2. Methods

Research assistants used a structured questionnaire to interview faculty physicians about missing clinical data for encounters in the pediatric emergency department and general pediatric clinic. This study was approved by the Colorado Institutional Review Board (COIRB), protocol number 05-0657 and is in compliance with ethical standards of the responsible committee on human experimentation and with the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects.

The authors of this manuscript do not have any potential conflict of interest with this study or its publication.

2.1 Setting and Participants

This study was conducted at two clinical sites within The Children's Hospital, Aurora Colorado, the pediatric emergency department (ED) and general pediatric ambulatory clinic (AC). Attending pediatric emergency medicine and general pediatric physicians were consented to participate. An attempt was made to include all sequential encounters during selected shifts or half-day clinics. At the time of the study, an electronic health record (EHR) system had been in place in the ED and AC for 13 and 6 months, respectively. Although not implemented institution-wide, many specialty clinics were using the EHR system. The EHR was used for both inpatient and outpatient care, and included clinical and procedural notes, laboratory and radiology results, medication lists, allergies, active problem lists, and past medical/past surgical histories, For departments not yet up on the system, dictated clinical notes were available as text files in the system. A consolidated immunization information system (Colorado Immunization Information System), to which The Children's Hospital contributes information, maintained immunization records for 78% of all children under the age of six in Colorado at the time

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of this study (7). This system is available online via a secure link within the EHR and clerks in the AC typically print an immunization summary for each child with a scheduled AC visit.

2.2 Survey Development

A structured interview was adapted from a self-administered questionnaire used for a primary care physicians' office study (3) and other studies seeking to assess the prevalence of missing information in emergency department settings (4, 6). To enhance reliability and maximize face and content validity the questions were pilot tested with 4 to 5 experienced physicians at each site and revised.

2.3 Data Collection

Physicians were surveyed in the ED from December, 2005 to February, 2006, and in the AC from March to June, 2006. Shift and clinic half-days were sampled to vary both their timing (shifts: day, night, weekend; clinic half-days: morning or afternoon) and the participating physicians. The only exclusion criterion for a patient encounter was having had an encounter in this study within the previous 14 days, as it was felt that the results gleamed from the two closely occurring encounters were unlikely to be independent and could therefore not be analyzed independently.

2.4 Definitions and Measures

2.4.1 Frequency of Missing Information

The research assistant asked, "Was there any clinical information that you desired for the care of this patient that was either unavailable to you, you could not locate, or that you had to request from an outside entity?" as soon as the attending assessment was complete. The phrase "desired for the care of the patient", was not further defined but was intended to capture any information the physician may have wanted regardless of its perceived importance, urgency, location, or the likelihood of obtaining the information.

For encounters without missing information, no further questions were asked. For encounters with identified missing information, remaining questions were completed prior to the end of the shift at a time convenient to the physician. In most cases, research assistants interviewed physicians for this information; some physicians self-administered the follow-up questions.

2.4.2 Type, Presumed Location, and Seeking of Missing Information

The remaining questions addressed:

1. the type(s) of missing information,
2. its presumed location,
3. whether or not the information was sought by the physician or a staff member,
4. whether it was obtained,
5. if not sought, the reasons for not seeking it, and
6. the time spent requesting/searching and waiting for sought information.

2.4.3 Importance and Perceived Impact of Missing Information

For clinical information identified as missing, physicians were asked to rate the importance of the information both to the "care provided today" and to "the future care" as "very" "somewhat" or "not too" important. Physicians were asked to indicate "yes" or "no" to the following items, "In your opinion, did NOT having this information adversely affect any of the following:

1. the disposition decision,
2. the efficiency of the visit,
3. the patient/family satisfaction, and
4. your confidence in the care you provided".

Physicians responded to the following series of questions "If you do not now have this information, assuming you never receive it, in your opinion, how would this contribute to any of the following:

1. additional imaging ordered,
2. additional labs ordered,

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3. additional treatment,
4. the decision to admit the patient, and
5. other.

Physicians were asked to provide details when they reported that a lack of information affected their management plan. Lastly, physicians were asked, "In your opinion, how likely is it that the absence of information adversely affected the patient's overall quality of care, where 1 is "not at all likely" and 4 is "very likely"?

2.4.4 Patient Encounter Characteristics

Research assistants later collected demographic and medical history information from the electronic medical records, including: patient's age, gender, preferred language, insurance type, visit type (preventive or illness-orientated in the AC), primary diagnosis in the ED, all chronic medical conditions, and most recent date of other TCH inpatient, emergency and other ambulatory visits. Additional information collected in the ED included; outpatient oxygen use, emergency services to ED and TCH site-specific non-validated nurse triage and nurse acuity discharge scores. The TCH nurse triage score at arrival varies from 1 to 3 (Level 1/emergent, Level 2/urgent, Level 3/non-urgent), and the TCH nursing acuity score at discharge varies from 1 to 8 (where Level "1" is no nursing intervention required and "8" is for an unstable patient requiring maximal lifesaving intensive care or trauma interventions). Both the arrival triage and the discharge acuity score are non-validated measures used at TCH. Ethnicity and race were not included due to the optional nature of this data collection, at the time of this study, resulting in inaccurate and incomplete data.

2.5 Analysis

Descriptive statistics were computed as appropriate. Bivariate logistic regression was used to assess unadjusted odds-ratios (OR) and p-values for the encounter characteristics outlined in ▶Table 2, where the dependent variable was an encounter with missing information. Multivariate backward logistic regression was used to model the likelihood of missing information. Variables anticipated to effect the presence of missing information and with a bivariate p-value of less than or equal to 0.2 were included in the model. Variables were removed from the model based on their effect on the -2 log likelihood. Potential confounding was assessed by variable affect on the adjusted odds ratios of the remaining variables. Statistical significance was defined as a p-value of <0.05, 2-tailed.

Using SAS Proc Mixed module and Proc GLIMMIX macro, multilevel analyses were conducted to account for clustering of sampled patients among physicians for the outcome of missing information. The distribution of missing information among physicians was sparse such that the variation due to physician effect could not be estimated. Sample size issues prevented stable estimates when physician was adjusted for in a standard logistic regression analysis as a fixed effect. As a result, we were unable to effectively adjust for a possible physician effect in our model.

All analyses were performed using SAS version 9.1 statistical software package (© 2002-2003 by SAS Institute Inc., Cary, NC, USA).

3. Results

Eight pediatric emergency medicine physicians completed 197 encounters during 12 ED shifts (6 day, 5 evening, and 1 weekend) and 15 general pediatricians completed 502 encounters, during 26 AC shifts (14 morning and 12 afternoon, all weekdays). For the 8 ED providers, the range of surveyed encounters was 16 to 39, with a median of 21. For the AC providers the range was 5 to 88, with a median of 27. For all designated shifts and physicians surveyed, 2 of 199 ED and 1 of 503 AC encounters were not surveyed.

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3.1 Pediatric Emergency Department

3.1.1 ED Encounter Characteristics

ED patient encounter characteristics are presented in ▶Table 1. The Nurse Triage Score upon arrival was "Level 1/emergent" for 4% of encounters; the remaining encounters were "Level 2/urgent" (45%) and "Level 3/non-urgent" (51%). The median Nurse Acuity Score at discharge was 4, (IQR, 25% = 3, and 75% = 5) where 93% of encounters were give a score from 2 to 5 (13% of the encounters were 2, 21% were 3, 28% were 4, and 31% were 5).

The most common chronic medical conditions for patients at ED encounters were asthma/reactive airway disease (15%), neuromuscular (11%), congenital heart (4%), mental health disorders (4%), and mental retardation-cerebral palsy (3%). The most common acute diagnoses were acute trauma/injury (22%); pneumonia/bronchiolitis (14%); gastroenteritis (12%); upper respiratory illness (8%); other infectious disease (5%); asthma/reactive airway disease (4%); otitis media, seizure, abdominal pain, other-gastrointestinal, other-pain and non-URI viral syndrome (all 3-4%).

3.1.2 Frequency of Missing Information

ED physicians identified only 3 instances of missing clinical information in 197 encounters. Due to the low rate of perceived missing information the study was halted after 197 encounters. The information was considered to be "very important" for patient care in 2 instances, and "somewhat important" in the 3rd instance. The information deemed "very important" was an ultrasound (unknown which part of the body) and a hematocrit result. The information deemed "somewhat important" was a primary care provider's plan for a chronic problem.

3.2 General Pediatric Ambulatory Clinic

3.2.1 AC Encounter Characteristics

AC encounter characteristics are displayed in ▶Table 2. The most common chronic medical conditions were asthma/reactive airway disease (5%); developmental disorder (4%); allergic rhinitis (4%), and gastro-intestinal, mental health, endocrinologic/metabolic, and neurological disorders each occurring in 2-3% of the patients.

3.2.2 Frequency of Missing Information

In the AC setting, perceived missing clinical information was identified for 22% (95% CI, [18, 25]) (109 of 502) encounters. The individual AC provider rate of missing information varied from 10% to 33%, with a mean of 22%, median 21%, and standard deviation of 7%. More than 1 piece of missing information was identified for 5% of encounters, where 4% had 2 pieces of missing information and 1% had 3 pieces of missing information.

3.2.3 Type, Presumed Location, and Seeking of Missing Information at AC encounters

Immunization records were the most frequently desired type of missing information, accounting for 34% (▶Table 3). Approximately 70% of the missing information was thought to exist within Colorado, and 14% within TCH.

Missing information was sought for 20% (n = 22 of 109) encounters with missing information and obtained for 4% of encounters (5 items for 4 encounters). Reasons reported for not seeking missing information were: parents/guardians provided a reliable history (58% of encounters where missing information was not sought), not important to today's visit (24%), will seek later (21%), and unattainable due to unknown location or out of the country (13%). Lack of time was reported only once as a reason for not seeking missing information. When missing information was sought, physicians reported they spent 2-5 minutes requesting or searching for it for 55% of encounters, 6-10 minutes for 9%, and 11-20 minutes for 27% of encounters, with time estimates missing in two encounters. The time spent by physicians waiting for requested information ranged from 5 to 60 minutes for 9 encounters, with 13 encounters still waiting at the time of survey completion.

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3.2.4 Importance and Perceived Impact of Missing Information at AC encounters

Overall, physicians rated missing information as "somewhat or very important for today's care" and "for future care", 73% and 84% of the time, respectively. The perceived impact of unattained missing information is presented in Table ▶4, where physician thought that the absence of information adversely affected the efficiency of the visit (64% of encounters) and their confidence in care (33% of the encounters). Physicians indicated that overall quality of care was impacted when information was absent for approximately 57% of encounters.

For the 12 encounters where potentially additional or duplicate imaging studies were requested, physicians reported ordering the following studies: brain CT or MRI (n = 5), other CT (n = 3), echocardiogram (n = 2), upper GI study (n = 2), EEG (n = 2), ultrasound (n = 1), swallowing study (n = 1), c-spine films (n = 1). For the 17 encounters where potentially duplicate laboratory studies were requested physicians reported ordering the following: full workup or other labs (7), genetic and metabolic testing (4), vaccination titers (2), evaluation for failure to thrive (1), screening tests (1), pulmonary function testing (1), blood cultures (1). Lastly, for the 39 encounters where physicians reported effects on therapy recommendations the following details were provided: repeat immunizations (27), affect prescribed medication choice or dose (6), speech therapy (2), decreased time to next follow-up evaluation (2) repeat antibiotic treatment (2).

3.2.5 Predictors of AC Encounters with Missing Information

Absence of a TCH primary care visit during the 12 months prior to the encounter was the strongest predictor of having identified missing information, (adjusted odds ratio (OR), 2.8; 95% CI, [1.7, 4.5]). Age categories greater than 3 months and less than 10 years were less likely to have missing information; for age ≥3 months to <1 year the adjusted OR was 0.38; 95% [0.17, 0.85], for ≥1 year to <3 yrs the adjusted OR was 0.33; 95% CI, [0.16-0.69]), and for ages ≥3 yrs to <10 yrs the OR was 0.38; 95% [0.20,0.70], where 10 years or greater was the referent group. There was a trend towards increased likelihood of missing information when visits addressed both prevention and an illness, adjusted OR, 1.7; 95% CI, [0.95, 2.9].

4. Discussion

The frequency of perceived missing information during ED encounters was ~1.5%, but missing information was identified for 1 in 5 general pediatric encounters. Among general pediatric encounters with missing information, 57% of physicians reported that care was at least somewhat likely to be adversely affected. Missing information adversely affected the efficiency of care and physician confidence in care for 64% and 33% of encounters with unattained missing information, respectively. With over 116 million pediatric visits in 2004, this has the potential for substantial effects on cost and care quality (8).

Although 58% of missing information was thought to reside within the state of CO, 14% of missing information was thought to reside at TCH, where the patient was being seen. At the time of this study, an institution-wide EHR implementation was underway, having been completed in both sites participating in this study. Although all clinical departments did not yet use the EHR, all institutional laboratory and radiology reports, and clinic notes were available electronically. We did not query whether missing information within the institution was thought to exist on paper or digitally, but even information available electronically may be functionally "missing" when providers cannot locate it. These findings suggest that long-term solutions to scattered clinical information such as efficient, interoperable health information exchange (9) or development of patient-centric medical record, such as that modeled by the Continuity of Care record (10) are warranted. Currently functioning health information exchanges offer a variety of different functions, the most common being:

1. results delivery (sending laboratory or diagnostic study results to ordering and other relevant providers),
2. results look up for individual patients by connecting to EHRs or data repositories compiled from disparate information sources,
3. clinical documentation, (4) electronic ordering of tests or referrals,
4. alerts to providers, and
5. electronic prescribing (11).

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A results look-up feature allowing access to clinical notes, medication, diagnostic test results, and immunization histories via EHR or registry access would have satisfied the majority of physician information needs. A health information exchange acting as a clinical messenger may also provide a mechanism for automated, real-time immunization registry updates thereby eliminating the manual effort which is often a barrier to maintaining u p to date registry information.

Approximately 34% of all reported missing information types, accounting for missing information at 7% of all general pediatric encounters, was related to immunizations despite the availability of a functioning and dynamic immunization registry, the Colorado Immunization Information System (7). As the current general pediatric clinic workflow is to have non-provider staff print out immunization summaries from the registry for all patients with available registry information, this may have averted a good proportion of information needs. It is important to note that the EHR was fairly new in this practice setting and would therefore not contain information on immunizations administered prior to the system's implementation unless they had been manually entered in the EHR. "Record scatter", or the receipt and documentation of immunizations at multiple sites, has been associated with both under and over immunization (12-14). The benefit of registries to consolidate immunization records among various sites and thereby improve the percent of children with up to date vaccination status has been well established (15-17). It is anticipated that without the immunization registry there would have been an even greater need for immunization information, although we did not collect data on registry value to support this assumption. Of note, only 30% of the immunization needs occurred in children less than 6 years of age, for whom the registry has information on approximately 78% of all children in Colorado. Still the rate of completeness of the immunization registry for children in the registry is not known. The infrequent occurrence of missing information in the pediatric emergency department was unexpected. Although we anticipated that physicians involved in primary care would have broader information desires and therefore, would be more likely to identify missing information, we also anticipated that children visiting the emergency department would have complex medical histories, fragmented care, and scattered medical information leading to the desire for missing information.

Prior ED studies report that patients frequently receive care at multiple hospital systems. A study of "cross-rates" in the Indianapolis metropolitan area found that 25% of patients with more than 1 ED visit also visited one of 5 other hospital systems within the prior 12-`month period (18). Several factors could explain our finding of low perceived missing information in the ED. First, 44% of the patients seen in the ED had been evaluated at the same institution within the prior 12 months, including 11% with PCP visits, 24% with specialty visits, and 11% with an inpatient visit, increasing the likelihood that critical clinical information related to the reason for ED encounter was available via the electronic medical record. Second, almost 50% of the ED visits were for trauma/injury (22%) or upper/lower respiratory infections (22%), diagnoses that can usually be treated without access to information beyond that supplied by the child's caretaker. Third, although we did not limit the scope or definition of missing information, physicians may mention as "missing" only what they typically anticipate receiving. It is likely that ED clinicians are accustomed to making clinical decisions with lower expectations for outside information. These results are in contrast to a Canadian ED where physicians reported "information gaps" for 32% of visits (6). The Canadian ED's patient population was mainly adult, with a mean patient age of 52 years (standard deviation 22 years), which likely represents a more medically complex patient cohort and few children. Also, the market predominance of a single dedicated pediatric emergency department within a community may drive emergency care "continuity", as children and their families may preferentially use the dedicated pediatric emergency department over other non-pediatric emergency departments. This would not be the case for adults, who could choose from many "adult" emergency departments.

Our results in the ambulatory setting are consistent with Smith, et al. (3), who reported missing information at 13.6% of outpatient visits in mainly family medicine practices that care for underserved, rural, and frontier populations. In this setting, approximately 75% of the population was adult, and the most frequent type of missing information was laboratory results (45%). We found that for 28% of encounters with missing information, or 6% of all encounters, physicians reported doing additional laboratory or imagining studies. Based on 2006 Medicare RVU reimbursement data (18, 19) the reported additionally ordered imaging tests, including the 2 reported EEGs, cost approximately 3,120 US dollars. This is roughly $6.20 of additional costs per pediatric AC encounter.

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We had few instances where physicians actively sought information that was missing, but still the time spent waiting for information was substantial and a good portion of those seeking information were still waiting at the end of their half- day clinic or shift. Our studies did not address barriers to seeking missing clinical data, but the tyranny of time is often used to describe the competing demands on physician time and the choices they make in using time efficiently. We did not follow up with providers who were still waiting at the end of the shift for information, as we felt the most important outcome was whether providers had the requested information at the time of care.

Our study had some important limitations. Our study was conducted at one academic health center, with a newly, but not fully implemented, enterprise-level EHR system. We could not directly measure the impact of the missing information on patient care, but relied instead on physician's actions and perceptions. However, physician actions (i.e., ordering additional tests), perceived confidence in care and patient/family satisfaction are meaningful outcome measures. We did not validate or further characterize potential duplicate tests or adverse clinical outcomes due to missing information. However, prior studies regarding the impact of missing information on care have supported the associations with duplicate testing and adverse outcomes (19-22). Both the recognition of missing information and its perceived impact on patient care may be dependent on the conscientiousness of the physician. Clustered analysis at the provider level was planned to assess the contribution of individual physician practice styles but could not be computed due to the small number of recognized missing information occurrences and surveyed encounters for several providers.

Time estimates were not validated in this study, and based on prior research physicians may over estimate the amount of time they spend searching for information (22). Waiting for information is not necessarily wasted time as physicians may perform other duties while waiting; after an acceptable period of time, clinicians may decide to forge ahead making a clinical decision without the information.

Missing information was common at general pediatric visits in our setting. It impacted several important aspects of care including efficiency and physician confidence in care. Missing information contributed to additional laboratory testing, imaging, and other evaluative procedures and may contribute to unnecessary therapy. Information systems that consolidate clinical information across institutions, such as health information exchanges, are likely to address many information needs.

5. Conclusion

Pediatric physicians at general ambulatory visits more commonly perceive information to be missing than at emergency visits and they report that missing information adversely impacts quality, efficiency, their confidence in care, patient and family satisfaction, and leads to potentially redundant resource utilization.

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Table 1 Emergency Department Encounter Patient and Visit Characteristics, TCH, 2006.

		% (n = 197)
Patient Age	0 – <3 mo	9
	≥3 – <12 mo	14
	≥1 – <3 years	24
	≥3 – <10 years	28
	≥10 years	25
Patient Gender – Female		43
Patient Insurance	Private	48
	Public (Medicaid, SCHIP, etc)	36
	None/Self-Pay	16
Preferred Language	English	84
	Spanish	15
	Other	1
Any Chronic Medical Condition		58
Arrival via Emergency Medical Services		18
Visit encounter resulted in inpatient/observation admission		25
Prior TCH encounter type within 12 mo	Primary care	11
	Specialty visit	24
	Inpatient/observation	11
	ED/Urgent care	28
	Any visit type	44

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Table 2 General Pediatric Ambulatory Encounter Characteristics for Encounters with and without Missing Information, TCH, 2006.

		% of Encounters		Unadjusted Odds Ratio (95% Confidence Interval)*	p-value‡
		With Missing Information n = 109	Without Missing Information n = 393		
Patient Age	0 – <3 months	11.9	11.7	0.45 (0.20 – 0.97)	<0.01
	≥3 mo – <1year	11.0	18.1	0.27 (0.12 – 0.58)	
	≥1yr – <3 yrs	15.6	22.9	0.30 (0.15 – 0.60)	
	≥3 yrs – <10 yrs	34.9	35.6	0.43 (0.24 – 0.77)	
	≥10 yrs	26.6	11.7	Reference	
Patient Gender-Female		48.6	49.9	0.95 (0.62 – 1.45) Reference = male	0.82
Patient Insurance	None/Self-Pay	10.1	11.0	0.96 (0.47 – 1.94)	0.43
	Private	12.8	8.7	1.55 (0.79 – 3.01)	
	Public (Medicaid, SCHIP, etc)	77.1	80.4	Reference	
Preferred Language	English	82.6	78.6	Reference	0.37
	Spanish/Other	17.4	21.4	0.78 (0.45 – 1.35)	
Have a Chronic Medical Condition		28.4	24.0	1.26 (0.78 – 2.03) Reference = none	0.34
Concerns Addressed at Visit	Preventive only	28.7	34.2	0.96 (0.75 – 1.6)	0.05
	Illness-orientated only	40.7	46.4	Reference	
	Both	30.6	19.4	1.8 (1.1 – 3.0) n	
Primary care visit within 12 mo	No	59.6	33.1	2.99 (1.93 – 4.62)	<0.001
	Yes	40.4	66.9	Reference	
Specialty clinic visit within 12 mo	No	81.6	80.7	0.94 (0.54 – 1.62)	.82
	Yes	18.4	19.3	Reference	
Inpatient/observation visit within 12 mo	No	89.0	89.1	1.00 (0.51 – 1.98)	.98
	Yes	11.0	10.9	Reference	
ED/Urgent care visit within 12 mo	No	62.4	56.2	1.29 (0.84 – 2.00)	.25
	Yes	37.6	43.8	Reference	
Any visit within 12 mo	No	33.0	21.9	1.76 (1.10– 2.80)	0.02
	Yes	67.0	78.1	Reference	

*Bivariate logistic regression; ‡p-values represent significance of Chi square statistic

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Table3 Characteristics of 139 Missing Information Items at 109 General Pediatric Ambulatory Encounters, TCH , 2006

Characteristics	% (n = 139)
Type of information missing	
Immunization record	34
General past medical history	29
Disease or visit specific past medical history	13
Procedure reports	9
Birth or newborn past medical history	8
Laboratory results	3
Imaging results	3
Medication history	1
Referral information	1
Location of MI*	
TCH (index site)	14
Metro-Denver (Regional)	52
Outside Metro-Denver, within CO	7
Outside CO, within US	12
Outside US	2
Unknown	13
*All categories mutually exclusive	

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Table4 Perceived Impact of Unattained Missing Information on 104* General Pediatric Ambulatory Encounters, TCH, 2006

Impact	% (n = 104)
The absence of information adversely affected the following	
Efficiency of the visit	64
Physician's confidence in care	33
Patient/family satisfaction	17
Disposition decision	8
The absence of information affected management decisions by contributing to	
Recommended additional treatment	37.5
Ordering additional laboratory studies	16.3
Ordering additional imaging studies	11.5
The decision to admit	0
Other‡	12.5
Overall quality of care was adversely affected	
1 (not at all)	43.3
2	41.3
3	12.5
4 (very likely)	2.9

*This information was not provided for 1 encounter with unattained missing information; ‡Other (n = 13): Make referral/consultation (7); recommend increased follow up (2); increased communication with family to understand family history; administer PPD; possibly not give needed immunization; contributed to the plan of care.

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