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Association Between Telephone Activity and Features of Patients with Inflammatory Bowel Disease

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Abstract

Background & Aims—Telephone communication is common between health care providers and patients with inflammatory bowel disease (IBD). We analyzed telephone activity at an IBD care center to identify disease and patient characteristics associated with high levels of telephone activity and determine if call volume could identify individuals at risk for future visits to the emergency department (ED) or hospitalization.

Methods—We performed a prospective observational study in which we categorized telephone calls received by nursing staff over 2 years at a tertiary care IBD clinic (2475 patients in 2009 and 3118 in 2010). We analyzed data on 21,979 ingoing and outgoing calls in 2009 and 32,667 calls in 2010 and assessed associations between clinical factors and logged telephone encounters, and between patterns of telephone encounters and future visits to the ED or hospitalization.

Results—Telephone encounters occurred twice as frequently as office visits; 15% of the patients generated >10 telephone encounters/y, and were responsible for half of all telephone encounters. A higher percentage of these high telephone encounter (HTE) patients were female, had Crohn's disease, received steroid treatment, had increased levels of C reactive protein and rates of erythrocyte sedimentation, had psychiatric co-morbidities, and had chronic abdominal pain than patients with lower telephone encounters. The HTE patients were also more frequently seen in the ED or hospitalized over the same time period and in subsequent years. Forty-two percent of patients with >8 telephone encounters within 30 days were seen in the ED or hospitalized within the subsequent 12 months.

Conclusions—Based on an analysis of phone records at an IBD clinic, 15% of patients account for half of all calls. These HTE patients are a heterogeneous group with refractory disease who are likely to visit the ED or be hospitalized.

Keywords

ulcerative colitis; electronic medical record; short inflammatory bowel disease questionnaire; anxiety; depression

Background

Telephone communication is essential in modern society and healthcare delivery in the U.S. Management of complex chronic diseases requires regular office visits, occasional emergency department (ED) use/hospitalizations and frequent telephone communication between patients, healthcare providers, pharmacies and insurers. The inflammatory bowel diseases (IBD; Crohn's disease (CD), ulcerative colitis (UC)) are lifelong chronic immunologically mediated inflammatory disorders of the gastrointestinal tract with variable clinical courses ranging from mild abdominal symptoms to life-threatening illness. Telephone communication in IBD care is common, and will involve reporting clinical status, treatment, reassurance as well as completion of healthcare forms and insurance authorization. There is limited information on telephone activity volume or the reasons for calls in the care of chronic illness, including IBD¹²³. Systematic study of telephone encounters as a predictor of adverse outcomes such as imminent emergency department (ED) use and hospitalization in IBD has not been pursued.

We hypothesized that telephone activity in IBD patients would be associated with active inflammation and/or difficulty in coping with their illness due to chronic pain and psychiatric co-morbidity, and that increased telephone activity might function as a “red flag” identifying patients at risk of high cost medical interventions such as ED use and hospitalization.

Methods

The study was performed in a tertiary referral IBD clinic where patients contacted the center via telephone regarding questions/concerns involving their care and health status. Nursing personnel handled all routine telephone calls involving the clinic population. There is approximately a 1:1 ratio of nursing support for each physician.

Telephone activity was quantified in two cohorts. In the first, all telephone calls received and performed by nursing staff were prospectively tabulated over a 2 year time period. Phone calls were categorized into 5 groups: problem/follow up (patients calling into the center), resolution/plan (nurse calls out of the center), refill request/pharmacy contact, insurance authorization, completion of forms and record requests. Calls made or received by nursing staff were tallied; answered and unanswered calls and answering machine messages were included.

The second measure analyzed telephone encounters logged into the electronic medical records (EMR) in consented subjects from a prospective IBD Research Registry. An initial analysis of the mean number of telephone encounters per year was calculated to determine the categories of annual telephone encounters for subsequent analysis¹. Patients were stratified based on the rates of annual telephone encounters: 0-1 phone encounters/year (low telephone encounters (LTE)), 2-5 phone encounters/year, 6-10 phone encounters/year and >10 phone encounters/ year (high telephone encounters (HTE)). Patient data abstracted from the EMR included demographics, type of IBD (i.e. CD vs. non-CD (i.e. UC and indeterminate colitis)), duration of disease (years), history/ number of IBD surgeries (lifetime), annual number of clinic encounters, ED visits and hospitalizations, active medications, laboratory parameters and history of neuropsychiatric co-morbidity (i.e. anxiety, depression, chronic pain). Psychiatric co-morbidity was determined by review of treating physician records as documented in the EMR.

An IBD specific quality of life measure (valid for both CD and UC), the short inflammatory bowel disease questionnaire (SIBDQ) was obtained prospectively at each clinic visit. The SIBDQ total score ranges from a low score of 10 (poor quality of life) to a highest score of 70 (excellent quality of life) in 10 categories reflecting bowel symptoms, systemic and social function and emotional well-being⁴. A patient-specific mean SIBDQ total score generated from all annual clinic encounters was used to dichotomize the study population into those with a mean score of 50 or higher (good quality of life) from those with a score < 50 (poor quality of life)⁵⁶. In addition, we analyzed component data from an SIBDQ abdominal pain sub-score to dichotomize patients into groups with more and less abdominal pain. The abdominal pain score ranges from 1 (all of the time) to 7 (none of the time). A

mean annual score was generated and a value of < 5 was used to define more frequent abdominal pain, which was labeled chronic abdominal pain.

Active inflammation during the calendar year was approximated by identifying elevation in the serologic biomarkers C reactive protein (CRP) and erythrocyte sedimentation rate (ESR) which reflects inflammatory activity in IBD⁷. We analyzed all CRP and ESR values obtained over the course of one year and then categorized the patient into one of two groups: 1) those with all normal values and 2) those with any elevation detected.

Statistical analysis

Pearson's Chi-square test was performed to assess associations across the four categories of phone call frequencies. One-way ANOVA was used to test for overall differences between the four categories' means. Post-hoc comparisons using the Bonferroni test were used to determine if there were significant pair-wise differences between the means of the four categories of phone call frequencies. All tests were 2-sided, with statistical significance set at $\alpha=0.05$. Univariable logistic regression was performed to assess associations between telephone encounters (HTE vs. non-HTE) and hospital admissions/ED visits among patients from 2009 followed into 2010. The relationship between number of phone calls in a 30 day period (1, 2-4, 5-7 or 8 phone call in a 30 day period) and patient risk of hospital admission or ED visit over the subsequent 12 months was assessed with Kaplan- Meier analysis and Cox regression adjusting for medications (biologics and/or immunomodulators). Data were analyzed using IBM SPSS Statistical Software (Version 20.0. Armonk, NY) and Stata Statistical Software (Version 12. StataCorp LP, College Station, TX).

This study was approved by the University of Pittsburgh Institutional Review Board. (Protocol #012090284)

Results

The IBD Center cared for 2,475 patients in 2009 and 3,118 in 2010 which corresponded with 21,979 ingoing and outgoing calls in 2009 and 32,667 calls in 2010. No specific month demonstrated peak telephone activity during the two-year study period (Figure 1.A).

The telephone activity pattern remained stable over the two-year period: 52% - patient generated calls regarding problem/follow up; 25% - nurse generated calls with a resolution/plan; 12% - refill requests; 10% - insurance authorizations; 1% - form completion and record requests. The mean number of calls handled by nursing staff annually involving all aspects of patient care was 8.9 in 2009 and 10.5 in 2010 per patient (Figure 1.B).

Telephone encounters in IBD: Patient specific characteristics

A consented subgroup of patients (IBD Registry; 52% female) was used to analyze specific clinical characteristics associated with EMR recorded telephone encounters.

In 2009, 764 IBD registry patients were responsible for 4,401 telephone encounters logged in the EMR (mean number of telephone encounters per patient = 5.8 ± 6.5 S.D.; range 0 - 41) and 87.3 % of the patients had at least one telephone encounter during that year. In

2010, 801 registry patients were responsible for 4,500 phone encounters (mean number of telephone encounters per patient = 5.6 ± 7.1 S.D.; range 0 - 61) and 82.8% of these patients had at least one telephone encounter. Telephone encounters occurred twice as frequently as office visits, which totaled 1,810 in 2009 and 2,007 in 2010.

Stratification of IBD patients by telephone encounter frequency

IBD registry patients were stratified based on frequency of telephone encounters. The LTE patients (0-1 total calls per patient/year) represented 26.7% of the total registry population in 2009 and 30% in 2010. Although these individuals comprised over one quarter of the study population, they were responsible for only 2% of telephone encounters each year. The IBD patients with HTE (>10 total calls per patient/year) were 16% of the registry population in 2009 and 15% in 2010. These HTE IBD patients were responsible for a disproportionate percentage of telephone encounters, which ranged from 48% in 2009 to 51% in 2010. (Figure 1.C – 1.D).

This pattern of HTE activity in the IBD patients was dynamic over time. Only 32% of the HTE IBD patients seen in 2009 who were followed into 2010, remained in the HTE category, while the remaining 68% of patients dropped into lower telephone encounter categories.

Clinical factors associated with telephone encounters in IBD

Increased telephone encounters were associated with female gender, a diagnosis of CD, a greater number of previous IBD surgeries and with an increased number of yearly clinic visits. HTE patients had an average of 5 clinic visits compared to an average of 1 for the LTE patients ($P < .001$) (Table 2). Chronologic age and duration of IBD were not associated with increased telephone encounters (Table 1- 2). Disease severity was approximated by need for treatment with anti-TNF biologic therapy which was associated with increased telephone encounters in patients with CD but not UC (Table 1).

Active inflammation was demonstrated in subgroups of IBD patients which included CRP elevation (32.2% in 2009 and 32.9% in 2010), ESR elevation (23.1% in 2009 and 25.8% in 2010) and prednisone use (28.5% in 2009 and 28.2% in 2010). Increased yearly telephone encounters were associated with increased inflammatory activity, including CRP elevation ($P < .001$), ESR elevation ($P < .001$) and prednisone prescriptions ($P < .001$) (Figure 2. A, Supplemental table).

There were subgroups of IBD patients with chronic abdominal pain (38.2% in 2009 and 36.6% in 2010), narcotic use (14.3% in 2009 and 17.1% in 2010) and neuropsychiatric co-morbidity (28% in 2009 and 27.1% in 2010). Increased telephone encounters were associated with higher levels of abdominal pain ($P < .001$), narcotic prescriptions ($P < .001$) and neuropsychiatric co-morbidity ($P < .001$) in both years (Figure 2. B, Supplemental table).

IBD registry patients with poor quality of life included 40.6% in 2009 and 38.7% in 2010. Quality of life was worse among subjects with greater telephone encounters ($P < .001$) (Figure 2.C, Supplemental table) compared with patient groups with lower number of telephone encounters in both 2009 and 2010.

Association of telephone encounters with health care utilization: Emergency department (ED) visits and hospitalizations

In 2009, 16.3% of IBD registry patients were seen in the ED. The frequency of ED use was 6.4% of the LTE group, 13.6% of the 2-5 calls/year group, 18.2% of the 6-10 calls/year group and 36.4% of the HTE; $\chi^2(3, P<.001)$. Approximately 16% of the 2009 IBD registry patients required hospitalization. This included 3.9% of the LTE patients, 13.2% of the 2-5 calls/year group, 20% of the 6-10 calls/year group and 39.7% of the HTE patients; $\chi^2(3, P<.001)$. Similar patterns of ED use and hospitalization were identified in 2010 (Figure 2. C).

We analyzed the relationship between inflammation, chronic abdominal pain and psychiatric co-morbidity in the IBD registry patients requiring hospitalization in 2009 and 2010, Venn diagrams demonstrating the overlap of these clinical factors are shown in Supplemental Figure. Among the 2009 HTE patients requiring hospitalization, an overlap of inflammation, pain and psychiatric co-morbidity was identified in 23% (11 out of 48) of these individuals (Supplemental Figure. A) compared with 6% of the non-HTE patients (5 out of 77; $P<.01$; Supplemental Figure. B). This pattern was also seen in 2010, where inflammation, pain and psychiatric co-morbidity was found in 31% of the hospitalized HTE patients (14 out of 45) compared with 6% of the hospitalized non-HTE patients (6 out of 106; $P<.001$).

Patterns of telephone encounters and subsequent ED visits and hospitalization

HTE patients in 2009 had a higher probability of ED use (OR 2.24, (95% CI 1.42 – 3.53); $P<.001$) and hospitalization (OR 1.65, (95% CI 1.01 – 2.68); $p=.04$) in 2010 compared with LTE patients.

We examined the relationship between clusters of telephone encounters and subsequent ED use and/or hospitalization. The maximum number of phone encounters over any 30 day time period was identified in the 2009 patients and patterns of ED use and hospitalization over the ensuing 12 months were characterized (1 telephone encounter /147 patients (25.6%), 2-4 telephone encounters / 301 patients (52.4%), 5-7 telephone encounters/ 95 patients (16.6%) and 8 telephone encounters/ 31 patients (5.4%)). Increasing telephone activity over 30 days was associated with subsequent ED use/hospitalization (Logrank $P<.001$) (Figure 3). After adjusting for biologic and/ or immunomodulator therapy (via a Cox regression model), there was a statistically significant increase in the risk of ED use/hospitalization for patients with 5-7 telephone encounters (HR 2.53; $p=.003$; CI (95%) 1.37 – 4.65) and 8 telephone encounters (HR 3.86; $p<.001$; CI (95%) 1.84 – 8.09) compared to those with only 1 telephone encounter. (Table 3)

Discussion

Telephone communication is essential in modern society as an estimated 85% of American adults use cell phones regularly¹⁷, but there is limited information regarding the scope and characteristics of telephone activity in the care of a specific chronic illness. In this analysis of telephone activity in the care of patients with IBD, we identified the following: 1) the total number of telephone calls in the overall care of an IBD patient averages 8 – 10 per

year; 2) over 10% of annual telephone activity involves insurance authorization and healthcare form completion; 3) telephone encounters logged in the EMR are twice as common as office visits; 4) the distribution of telephone encounters among IBD patients is skewed with one sixth of the patient population accounting for half of telephone encounters; 5) over 10 telephone encounters annually (HTE) in IBD is associated with female gender, increased inflammatory activity, corticosteroid administration, abdominal pain, narcotic use, concomitant psychiatric illness and poor quality of life; 6) HTE corresponds with increased healthcare utilization (clinic visits, ED use and hospitalizations) during the same year and may function as a predictor of high utilization in subsequent years. Thus, telephone activity in IBD, specifically the record of telephone encounters in the EMR, may function as a surrogate marker of disease severity and the ability of patients to cope with their illness as well as a harbinger of impending high cost health care utilization.

Early investigation of telephone activity in healthcare sought to determine the patterns of telephone consultations provided by physicians ², and also evaluated the potential role of telephone encounters as a strategy to decrease the need for office visits as a cost-containing measure¹². More recent studies have investigated smaller populations of patients to determine the clinical characteristics of high frequency calling patients and patients who call after hours¹³. Our study attempted a more ambitious goal, specifically characterizing the entire spectrum of telephone activity occurring in the care of patients with a specific chronic illness over a multi-year time period, focusing on calls handled by nursing support staff.

Our study has several important implications. The ability to optimally monitor clinical status in IBD care, to gauge treatment effectiveness and to predict which patients are at risk of complications is an important and active area of investigation. Although the inflammatory biomarker CRP is routinely available and often helpful, it was elevated in only 32.2% of IBD outpatients during 2009 and in 58% of those who required hospitalization during that year. Likewise, ED use and hospitalization are objective markers identifying more severe IBD, but these events occur too late to function as early markers of at-risk patients. We found that telephone encounters recorded in the EMR functioned well as an easily identifiable “red flag,” pinpointing IBD patients struggling to cope with their illness, as we instruct our patients to call the office if they need assistance. Secondly, our study demonstrates that IBD patients with HTE suffered from heterogeneous clinical issues which included increased inflammatory activity, chronic pain and co-morbidities of anxiety/depression^{14, 18}. These findings are in agreement with a randomized controlled trial investigating immunosuppressive treatment in CD demonstrating that 18% of enrolled patients who qualified based on self reported well-being, abdominal pain and diarrhea failed to demonstrate objective evidence of inflammation on endoscopic assessment¹⁵. HTE was a simple clinical marker of IBD patients at risk of deterioration requiring high cost ED assessment and/or hospitalization during the same and subsequent calendar years. Thus, monitoring of telephone activity in the care of IBD may function as a clinical “barometer,” identifying patients at risk of deterioration and needing high cost care. What is unknown is whether these heterogeneous, at-risk, HTE IBD patients could be targeted for tailored interventions which would more effectively address the specific clinical factors (i.e. refractory inflammation, pain, psychiatric co-morbidity) which were contributing to their poor clinical status.

There were several strengths to our study. We accumulated two years of comprehensive data regarding all patients followed in a large chronic disease management clinic and supplemented this with additional information from a consented registry with prospectively accumulated data. The similar patterns of annual telephone activity over both years served as an internal validation of our research strategy. However, there were important limitations in our study. Our findings were generated from a single referral center and a subgroup of research registry patients and may not be reflective of the general IBD population. Our stratification of call volume was arbitrarily based on the average number of annual calls per patient. In addition, we stratified IBD patients based on patterns of laboratory findings (i.e. CRP elevation), mean quality of life scores, mean pain scores and patterns of corticosteroid and narcotic use which are reasonable clinical markers, but have not been well validated as measures of severity in IBD clinical investigation. We chose this approach because there is no uniformly accepted IBD severity index which accurately reflects the long term burden of illness experienced by patients¹⁶. Correlating poor clinical outcome with telephone calls in patients who are instructed to contact our clinic if they are experiencing problems can be criticized as being tautological. We acknowledge this, but point out that the goal of our study was to identify a common clinical “red flag” which would function for all heterogeneous subgroups of IBD patients (i.e. those suffering from inflammation, pain and/or psychiatric co-morbidity) who were at risk of complications. Our findings were strengthened by the demonstration of a substantial lag between the increased cluster of telephone encounters in IBD patients and subsequent ED use/hospitalization, suggesting an opportunity for intervention and/or prevention.

The rationale for characterizing telephone activity in patients with IBD was twofold. In addition to identifying a clinical “barometer” which would function to gauge clinical status, we also sought to quantify the currently unrecognized and unreimbursed effort which is made by clinic support staff in handling phone calls in the care of IBD. Our report underscores the importance of telephone communication based on the sheer volume of calls, their ability to predict costly hospital based care and highlights a need to recognize and support this infrastructure. Greater than 10% of telephone communication handled by nursing staff involved insurance authorization and healthcare form completion. The substantial telephone effort required for insurance authorization may represent an important area for improving efficiency of healthcare delivery.

Overall, our report highlights the analysis of telephone activity as a novel strategy to gauge clinical status and provide insight into the contributing factors which drive increased healthcare utilization in IBD. More importantly, increased telephone encounters recorded in the EMR may function as an early warning mechanism to identify at risk IBD patients who may benefit from improved inflammatory and multidisciplinary treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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David G. Binion had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Abbreviations

CD	Crohn's disease
CRP	C reactive protein
ED	emergency department
EMR	electronic medical record
ESR	erythrocyte sedimentation rate
HTE	high telephone encounter
IBD	inflammatory bowel disease
LTE	low telephone encounter
SIBDQ	short inflammatory bowel disease questionnaire
UC	ulcerative colitis

A)

B)

C)

D)

Figure 1.

A) Monthly log of outgoing and incoming telephone activity recorded by nursing staff at an IBD center during 2009 and 2010. The rise in call volume corresponded with a 26% rise in the IBD center's patient population from 2,475 patients in 2009 to 3,118 patients in 2010.

B) Telephone activity prospectively recorded in categories by nursing staff in 2009 and 2010.

C) Distribution of IBD registry patients based on their patterns of annual telephone encounters logged in the electronic medical record in 2009 and 2010. IBD patients were

grouped into 4 categories: 0-1 calls/year (low telephone encounter (LTE)), 2-5 calls/year, 6-10 calls/year and > 10 calls/year (high telephone encounter (HTE)).

D) Distribution of total telephone encounters across the four categories of annual telephone encounter frequency. Patients in the LTE group were responsible for only 2% of the total number of telephone encounters in both 2009 and 2010. In contrast, patients in the HTE groups (15-16% of the total IBD registry population (**Figure C**)) were responsible for half of the telephone encounters each year.

A) **B)** **C)** **Figure 2.**

Increasing annual telephone encounters in IBD patients were associated with CRP elevation ($P<.001$), increased ESR ($P<.001$), prednisone use ($P<.001$) (A), abdominal pain ($P<.001$), narcotic use ($P<.001$), neuropsychiatric co-morbidity ($P<.001$) (B), poor quality of life ($P<.001$), ED visits ($P<.001$) and hospital admissions ($P<.001$) (C) in both 2009 and 2010.

Figure 3.

Relationship between the maximum numbers of IBD patients' telephone encounters over 30 days and subsequent emergency department (ED) use and/or hospitalization over the next 12 months (Kaplan- Meier plot). Increasing telephone activity over 30 days was associated with subsequent ED use/hospitalization (Logrank $P < .001$).

Table 1
Demographic and treatment characteristics of IBD patients stratified by annual telephone encounters in 2009 and 2010

		2009					2010				
		0-1 telephone encounters	2-5 telephone encounters	6-10 telephone encounters	>10 telephone encounters	P value	0-1 telephone encounters	2-5 telephone encounters	6-10 telephone encounters	> 10 telephone encounters	P value
Gender	male	56.1% (115)	49.5% (135)	43.6% (72)	36.4% (44)	0.004	56.9% (141)	44.9% (123)	42.5% (68)	42% (50)	0.006
	female	43.9% (90)	50.5% (138)	56.4% (93)	63.6% (77)		43.1% (107)	55.1% (151)	57.5% (92)	58% (69)	
Type of IBD	Crohn's disease	51.7% (106)	65.6% (179)	60% (99)	72.7% (88)	0.001	56% (139)	57.7% (158)	65.6% (105)	70.6% (84)	0.02
	Non CD	48.3% (99)	34.4% (94)	40% (66)	27.3% (33)		44% (109)	42.3% (116)	34.4% (55)	29.4% (35)	
Biologics	CD	24.5% (26)	29.1% (52)	38.4% (38)	63.6% (56)	<.001	26.6% (37)	42.4% (67)	61% (64)	53.6% (45)	<.001
	Non CD	14.1%(14)	16% (15)	16.7% (11)	27.3% (9)	0.37	11% (12)	17.2% (20)	14.5% (8)	28.6% (10)	0.09

IBD severity was approximated with the need for active treatment with anti-TNF biologic agents (i.e. infliximab, adalimumab, certolizumab pegol).

Table 2
Clinical characteristics of IBD patients stratified by annual telephone encounters (age, annual clinic visits, disease duration and mean number of surgeries)

	2009					2010						
	0-1 telephone encounters	2-5 telephone encounters	6-10 telephone encounters	>10 telephone encounters	F	P value	0-1 telephone encounters	2-5 telephone encounters	6-10 telephone encounters	>10 telephone encounters	F	P value
mean age	45	43	42	40	3.63	.01	46	44	43	43	1.93	.12
mean # of clinic visits	1	2	3	5	81.9	<.001	1	2	3	4	86.63	<.001
Mean # of years with disease	15.77	14.17	14.18	14.27	1.13	.34	13.81	14.07	13.79	12.69	0.52	.66
Surgeries (lifetime)	0.49	0.77	0.81	1.37	17.2	<.001	0.59	0.65	1.20	1.10	14.8	<.001

Table 3
Hazard Ratios for emergency department use/ or hospitalization in IBD patients stratified by 30 day telephone encounter patterns

	Total N	Haz. ratio	P value	[95% Conf. Interval]
2-4 telephone encounters	301	1.61	.08 (NS)	0.94- 2.78
5-7 telephone encounters	95	2.62	.002	1.43- 4.82
8 telephone encounters	31	1.58	.000	2.08- 8.85
<i>Adjusting for medications (biologics and/or immunomodulators)</i>				
2-4 telephone encounters	301	1.60	.08 (NS)	0.92- 2.77
5-7 telephone encounters	95	2.53	.003	1.37- 4.65
8 telephone encounters	31	3.86	.000	1.84- 8.09

Cox regression was used to determine the association of phone calls over 30 days and risk of ED use/hospitalization over the next 365 days. After adjusting for medications the association of phone call clusters and increased risk for ED use and/or hospitalization was significant for both, the 5-7 telephone encounter cluster (HR 2.53 (1.37-4.65, P=.003)) and for patients with 8 or more telephone encounters over a 30 day period (HR 3.86 (1.8- 8.09, P< .001)). The patient group with 1 phone call over 30 days (n=147) comprised the reference population.