



Characterizing after-hours hematology/oncology clinic calls

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Background: After-hour calls can be resource intensive and remain a significant challenge to medical practices, though they have historically been poorly or non-reimbursable services. This study reviews after-hour calls from hematology/oncology patients at a cancer center to characterize after-hour care needs, identify care gaps, and look for opportunities to improve outpatient healthcare delivery.

Methods: This descriptive, retrospective Institutional Review Board-approved study analyzed patient calls between June 2015 to February 2021 in an academic hematology/oncology practice. Data from 500 calls were reviewed and cataloged into a database including patient demographics, clinical history, and information surrounding the call (e.g., primary reason for the call, outcome of the call). Calls were also categorized as being urgent or not from a patient or provider's perspective.

Results: Among 500 calls, representing 398 unique patients, the average patient was 62 years old and 52% of calls were from females. Most calls were made to report symptoms (65%), followed by calls to follow-up on labs, tests, or imaging (13%), and clarifying treatment plans (10%). Oncology patients represented 67% of calls and hematology (malignant and benign) patients represented 33%. More specifically, patients with gastrointestinal cancer (25%), hematologic malignancies (24%), and thoracic cancer (13%) represented the diagnoses with the highest call volume.

Conclusions: This study explores the complexity and variety of after-hour cancer patient calls. By systematically exploring patient calls, this data can provide insight into patients' needs outside of regular clinic times and help practices develop strategies to anticipate these needs, reduce after-hour call burden, and improve overall quality of care.

Keywords: After-hour calls; overnight cancer issues; ambulatory care; hematology; oncology

Submitted Jan 20, 2023. Accepted for publication Dec 19, 2023. Published online Jan 10, 2024.

doi: 10.21037/apm-23-80

View this article at: <https://dx.doi.org/10.21037/apm-23-80>

Introduction

After-hour clinic calls typically occur between 5 p.m.–8 a.m. on weekdays, and throughout the entire day on weekends and holidays. While the on-call provider has access to the patient's electronic medical record (EMR), they must triage calls and are often contacted about patients who are

unknown to them. Providers are tasked with utilizing chart review and information provided by the patient to develop a plan for the posing question. This limited data may create concerns regarding patient safety, quality of care, and provider-to-provider communication (1). Furthermore, after-hour clinic calls are not billable and result in

additional, variable workload, depending on the acuity of the respective call (2).

Over the past two decades, the administration of chemotherapy to cancer patients has transitioned from the inpatient setting to primarily the outpatient setting (3,4). However, patients with cancer may develop acute symptoms at any time. Due to this shift in treatment venue, telephone communication is an increasingly important aspect of outpatient hematology/oncology patient care. Additionally, accessible telephone interventions appear to be helpful in reducing patient anxiety, fatigue, and emotional distress (5). Furthermore, by contacting the office for guidance, patients may ultimately avoid an emergency department (ED) visit (2). However, a recent study showed that in a cohort of cancer patients, six out of every ten ED visits were patient self-referrals without prior consultation with a provider. These patients often present to the ED with expected symptoms from either their disease process or its treatment (6). For example, cancer-associated pain and nausea were common chief complaints among cancer patients who visited the ED (7-9).

A study that explored the nature of hematology/oncology clinic calls found that the most common call for ambulatory oncology was to report a new symptom, while in ambulatory hematology, it was to request test results (2). Another study

that investigated after-hour calls in a radiation oncology practice showed that 65% of calls were about acute medical symptoms, and commonly patients called with expected radiation therapy related toxicities (1). In this study, we build on prior research by focusing on calls made after regular clinic hours as well as incorporating multiple types of calls to help characterize the nature of these calls with the hope of identifying potential care gaps and improve outpatient care.

Methods

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The Lifespan Institutional Review Board (IRB) approved this study. As this was a retrospective study, did not present greater than minimal risk to subjects, and uses aggregate reporting, patient consent was not recommended or requested by the Lifespan IRB.

This study utilizes after-hour clinic calls from the Lifespan Cancer Institute (LCI) in Providence, Rhode Island. After-hour calls were comprised of weekday calls from 5 p.m. to 8 a.m., weekends, and holidays. After-hours patient calls are initially received by a central operator, who routes calls to an on-call provider. This provider subsequently sends daily protected health information-encrypted emails regarding these calls to update the group practice. This study gathered information from these emails into a centralized database, which cataloged characteristics about the call.

This study was approved by the Institutional Review Board at Lifespan Health System and examined calls that occurred between June 2015 to February 2021. First, calls were manually reviewed by the research team and coded based on the characteristics of the call itself (i.e., reason for call) and the subsequent response by the healthcare provider. These calls were then cross-referenced with the patient's EMR for demographic information and characteristics about their health condition such as having a hematological versus oncological diagnosis, receiving disease-directed treatment within 2 months prior to the call, palliative care involvement, hospice enrollment, and if a hospital admission occurred either 30 days before or 30 days after the call.

A sense of urgency was calculated for patients and providers. Specifically, patients calling about new symptoms or requesting appointment changes were classified as urgent (denoted 1), because of the stress of new symptoms and the

Highlight box

Key findings

- Hematology/oncology patients called for a wide variety of reasons, though most calls were to discuss symptoms (65%), followed by questions about labs or imaging (13%), and medication refills (10%). These responses were often addressed through patient education (28%), recommendation to be seen in the emergency department or urgent care (17%), or treated with medications (17%).
- Patients, more often than providers, tended to view these after-hour calls as being urgent.

What is known and what is new?

- Patients can develop issues or concerns at any time; after-hour calls are a poorly understood, yet resource-intensive challenge to medical practices.
- This study seeks to systematically review after-hour calls to one academic hematology/oncology practice.

What is the implication, and what should change now?

- Although after-hour concerns varied widely, reviewing trends about the types of patients (e.g., primary diagnosis), reasons for calls, and most common responses from providers can offer meaningful insight for other practices to anticipate and react to their patients' needs.

Table 1 Reasons for patient calls, reported by percentage

Reason for call	Percentage of calls (N=500), %
Report symptoms	65
Follow-up lab, test, or imaging	13
Medication refill	10
Clarify treatment plan	9
FYI to Heme/Onc office	2
Hospice related	1
Scheduling request	0.4

FYI, for your information; Heme/Onc, hematology/oncology.

Table 2 Outcomes for patient calls, reported by percentage

Outcome of call	Percentage of calls (N=500), %
Patient education	28
Recommend evaluation in emergency department or urgent care	17
Treat with medication (prescription or over the counter)	17
Schedule follow-up appointment/concern will be addressed in office	14
Daytime staff will call to follow-up	11
Acknowledge, no specific action	6
Monitor or provide reassurance	5
Request other providers or ancillary services	3

time sensitive nature of scheduling. All other call types were considered non-urgent (denoted 0). Regarding outcomes, calls receiving recommendations to go to the ED were classified as urgent (denoted 1). Calls were considered non-urgent (denoted 0) if they resulted in follow-up with the day team, were later addressed in office visits, or required no subsequent action outside of acknowledgement of patients' concerns. Lastly, calls that included providing patient education, further testing, or requests for other types of providers, were all considered moderately urgent (denoted 0.5). Generalized vector regression was used to model call urgency; where the modeled outcome is not a single value but a vector of observations, including the patient's reason for calling and the subsequent provider response (10). Further details about the quantitative methods are included in a quantitative methods supplement.

Table 3 Primary diagnosis of calls, reported by percentage

Diagnosis	Percentage of calls (N=500), %
Gastrointestinal cancer	25
Malignant hematology	24
Thoracic cancer	13
Genitourinary cancer	11
Breast cancer	7
Non-malignant hematology	6
Head and neck cancer	4
Gynecologic cancer	3
Sickle cell	3
Sarcoma	1
Skin cancer	1
Central nervous system cancer	1

Results

Between June 2015 and February 2021, a total of 500 calls were logged, representing 398 unique patients. Of these calls, 102 were from patients who had multiple calls in this sample. The average age of patients was 62 years old; females represented 52% of calls. A total of 81% were White or Caucasian, 7% Black or African American, 5% Hispanic or Latino, 1% Asian, and 6% identified as "Other". This distribution was similar to the overall composition of LCI's hematology/oncology patient panel.

The reasons for calls are summarized in *Table 1*. The majority of calls (65%) were made to discuss one or more symptoms, followed by questions regarding test results (13%), and requests for medication refills (10%).

Patient calls commonly only required patient education (28%); however, 17% of calls resulted in a referral to the ED or an urgent care facility. Other frequent actions taken by responding providers are outlined in *Table 2* and include prescribing medications (17%) or planning to have the patient come into the clinic to be evaluated (14%).

Table 3 shows the distribution of patient calls by diagnosis. Oncology patients represented 67% of calls and hematology (malignant and benign) patients represented 33% of calls. Patients who comprised the highest percentage of calls included patients with gastrointestinal cancer (25%), hematologic malignancies (24%), and thoracic cancer (13%). Of note, in 2020 hematology (benign and malignant)

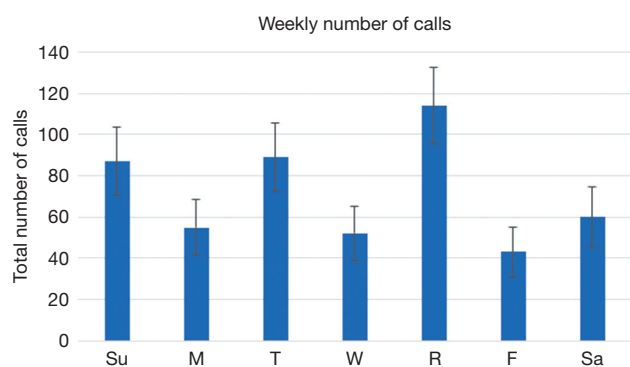


Figure 1 Total number of calls reported by days of the week. Error bars represent 95% confidence interval around estimate. X-axis lists days of the week as Su: Sunday, M: Monday, T: Tuesday, W: Wednesday, R: Thursday, F: Friday, and Sa: Saturday respectively.

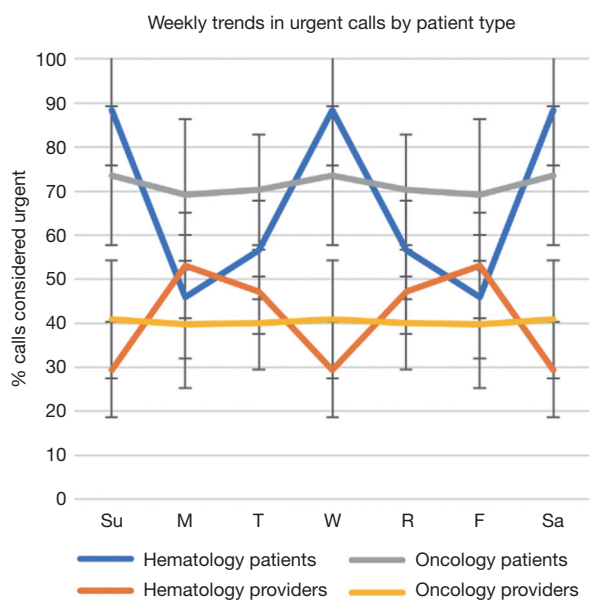


Figure 2 Percentage of calls considered urgent across days of the week, categorized by hematology vs. oncology patients and providers. Error bars represent 95% confidence interval around estimate. X-axis lists days of the week as Su: Sunday, M: Monday, T: Tuesday, W: Wednesday, R: Thursday, F: Friday, and Sa: Saturday respectively.

comprised only 14% of all patients in the LCI. The center did not provide bone marrow transplants at the time of this study.

Among all patients, 75% had received treatment related to their disease within the 30 days prior to their call. A

high percentage of oncology patients (66%) had metastatic disease at the time of their call. Thursday night had the highest number of calls, though there was considerable variation in volume of calls among days of the week (*Figure 1*).

A total of 26% of patients were followed by palliative care for symptom management and 3% of calls were for patients who had already been enrolled in hospice at the time of their call. In terms of hospitalizations, 29% of patients had been admitted within 30 days prior to their call; relatedly 34% of patients were admitted within 30 days after their call. Interestingly, for patients who called to report a symptom, if the on-call provider recommended evaluation in the ED, 59% of these patients ended up being admitted within the next 30 days.

Figure 2 outlines the level of urgency for calls across days of the week by hematology and oncology patients compared to providers. Oncology patients tended to have calls of similar levels of urgency across the week, though oncology providers tended to think these calls were less urgent ($P=0.0030$). Hematology patients and providers had greater variation in their perception of call urgency during the week. On weekends and the middle of the weekday, hematology patients felt that their calls were more urgent, while providers generally viewed these calls as being less urgent ($P<0.0001$).

There was a larger contrast between the perception of urgent calls from patients and providers for patients with metastatic disease ($P=0.0045$), as outlined in *Figure 3*. Patients with stage 4 lymphoma were categorized as having metastatic hematologic conditions in this context.

A notable exception to patients having a higher sense of urgency for their calls than providers, is with hematological patients after the coronavirus disease 2019 (COVID-19) pandemic began. Patients with hematologic malignancies tended to see their issues as less urgent ($P=0.0152$) and providers viewed their complaints as more urgent ($P=0.0332$) during the COVID-19 pandemic. This is further detailed in *Appendix 1* and *Table S1*.

Discussion

After-hour clinic calls represent a significant component of patient care for hematology/oncology patients. Patient call volume has increased due to new complex treatments, better technology to connect patients to providers, the growth of telehealth in the COVID-19 era, and a push toward ambulatory chemotherapy management. In

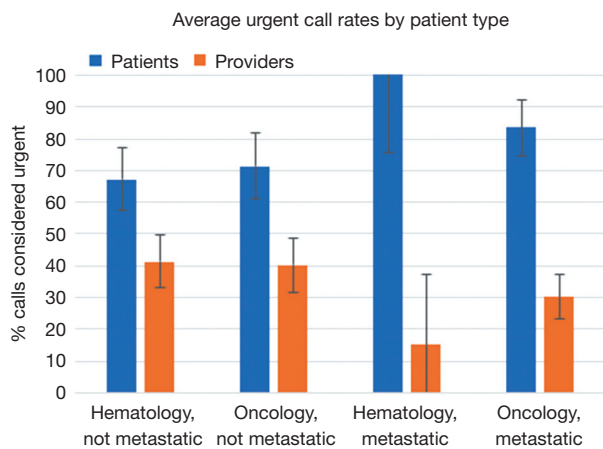


Figure 3 Percentage of calls considered urgent, separated by hematology versus oncology patients, with and without metastatic disease. Blue bars represent urgent calls from the patient's perspective based on reason for call, while orange bars represent urgent calls from provider's perspective, based on response to call. Error bars represent 95% confidence interval around estimate.

response, cancer centers have initiated varying approaches to try to meet greater outpatient needs, such as using telephone triage systems, creating nurse response protocols, 24-hour continuity clinic, or digital symptom monitoring programs (11). These findings are reflected in this study, as most calls (65%) were made to discuss new or persistent symptoms. This study differs from prior studies that found that oncology patients called to report symptoms, while hematology patients called more to discuss test results, laboratory work, or imaging (2,12). In this study, hematology patients did call more often than oncology patients about test and lab results (21% versus 9% respectively), but both groups still called primarily about symptoms (56% versus 70% respectively). Considering that approximately one in six after-hour calls were recommended to go to the emergency room (ER) and that the majority of callers who received recommendations to go to the ER ended up being admitted within 30 days of the call, these results emphasize the importance of close primary team follow-up for after-hour concerns.

Regarding symptom-based calls, the types of symptoms reported ranged widely during this time, but similar to other adult hematology/oncology centers, patients consistently called to discuss fever, nausea/vomiting, pain, fatigue, or shortness of breath (13). The reporting of symptoms fluctuated between one symptom being mentioned or a collection of symptoms being mentioned together during

the initial call. In the case of fevers, patients were neither clear on the definition of what constituted a clinically significant fever, nor were they clear on what symptoms warranted a visit to the ED. Providers must spend time educating patients on appropriate definitions of what constitutes a fever, evaluate risk for immunosuppression and neutropenia, and discuss what warning signs would require immediate evaluation (14,15). Outcomes included prescribing antipyretics or antibiotics, scheduling patients for next-day clinic visits, or ED referral. Calls with patients reporting shortness of breath were almost universally sent to the ED for further evaluation.

In this study, the highest volume of calls occurred between Thursday night and Friday morning. Another study also showed wide variation of calls from day-to-day but noted the highest call volume to be on Monday (2). This suggests that the volume and pattern of calls across the week during business hours do not necessarily translate to call patterns after-hours.

Oncology patients generally called with issues of similar levels of urgency across the week, while providers viewed a consistent subset of these calls as being urgent. Callers with gastrointestinal malignancies were especially prominent, as these patients encompassed a wide range of solid organ cancers, struggled with adequate nutrition, and had varying toxicities (such as neutropenic fever, nausea, and diarrhea) from multimodal therapies. In contrast, hematology patients and providers had greater variation in which calls were considered urgent, as well as providers' view about which calls required immediate evaluation. Additionally, hematology patients called at a disproportionately high frequency relative to their overall composition of the practice's patient panel. Although hematology patients (malignant and benign) comprised only 14% of LCI's practice, they represented 33% of total calls in this study. This suggests that hematology patients have high after-hour care needs. Of note though, hematology patients tended to have more urgent calls in the middle of the week and weekends. We suspect patients who start treatment or complete bloodwork at the beginning or middle of the week may have symptoms or results that lag a few days. Additionally, this may be related to the chronicity of non-malignant pathologies which allows for patients to group calls together. Similarly, patients with a malignant hematological diagnosis often undergo treatment induction and are admitted for extended periods of time (16-19). As a result, they may have had more time to learn about what symptoms should warrant a visit to the ED or call to

the clinic. However, the discrepancy between hematology patients and providers suggests that there is still much education to be done about what should constitute an urgent call.

The presence of metastases was associated with a higher likelihood of placing urgent after-hours calls. However, providers often viewed these calls as being less urgent and unlikely to require immediate overnight evaluation. We suspect that patients with metastatic disease had a higher likelihood of calling due to a greater symptomatology from increased disease burden as well as general concern and anxiety around having metastatic disease, which may make them more likely to seek out an immediate response (20). Additionally, patients, families, and providers alike may be especially hesitant to go to the ED as these visits are typically time-consuming, stressful, bring exposures to infectious diseases, and hospitalizations can represent significant declines in quality of life and treatment delays (21). A hospital admission during this time, may also not be in line with patients' goals of care, in so much so that ED visits near the end-of-life has been used as an indicator for poor-quality care for patients with cancer (22,23).

A theme to after-hour clinic calls was that patients typically viewed their calls as more urgent than providers; however, this trend was less prominent during the COVID-19 pandemic. This may in part reflect how with COVID-19, more in-person care was shifted to telehealth (24). COVID-19 added an extra layer of complexity to patient care; providers often felt uncomfortable managing acute symptoms over the phone and would have lower thresholds to ask certain patients to be seen in an urgent setting (25). The initial periods of the pandemic tended to reduce hospital use among people with many medical conditions but increased the frequency of visits for respiratory symptoms (26). This was reflected in this study when overnight calls reported symptoms concerning for COVID-19, with the vast majority of calls for shortness of breath being referred to the ED. However, this occurred in a time when many patients were reluctant to go to the hospital due to concerns of contracting an infection and when hospitals were particularly strained in resources (27).

Some limitations of this study include that the composition of hematology/oncology patients within our single institution may differ significantly to other practices in terms of demographics or composition of cases. For example, the LCI does not include a designated bone marrow transplant service. Another barrier involves the discussion of urgency in this study, which is an inherently

subjective concept (28). The classification of urgency in this study was used to describe acute symptoms or time-sensitive requests. This classification of urgency was used more to help make relative comparisons of types of calls for different types of patients (e.g., hematology versus oncology, patients with metastatic disease) and changes of types of calls over time.

Conclusions

For any practice, there will inherently be some calls placed for non-urgent questions or topics that could be discussed during the daytime with the patient's primary provider; however, reviewing why patients call can help predict and mitigate some of these requests. Some strategies to reduce after-hour calls could include adding targeted, anticipatory guidance to after visit summaries (AVS) (29). The AVS could also include reminders to request medication refills during regular business hours, when it would be more likely for their primary provider to review the request. Other studies have suggested that multiple physicians prescribing medications for patients increases the risk for side effects and medication interactions; in response to this, one study involving radiation oncology practices planned to implement departmental reminders for patients to preferentially ask questions and request medication refills during normal business hours (1,30). In part by using patient call behavior, LCI has attempted to identify patients with elevated risk for complications. For these patients, the group is utilizing more frequent clinic visits with advanced practice providers to attempt to bridge gaps in care between primary provider visits and reduce risk for hospitalization.

Overall, after-clinic hour care is an especially vulnerable time for hematology/oncology patients, when access to their primary provider is interrupted. This analysis highlights that patients call for an immensely wide range of reasons overnight—though most patients called to report new or persistent symptoms. Both hematology and oncology patients typically had a higher sense of urgency for calls than providers, which was especially true for patients with metastatic disease. In a sense, this study represents a success within our health system in that patients can readily access providers after hours for guidance, which may lead to fewer unnecessary hospitalizations, readmissions, or acute exacerbation of chronic disease. However, there are many opportunities to make systemic changes and educate patients to avoid calls that can be placed during the daytime and triaged to patients' primary hematology/oncology team.

While each practice will vary in its patient composition and unique services, this study offers insight into patient care after clinic-hours, with the goal of helping providers have a more holistic understanding of patient needs in and out of the clinic.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Annals of Palliative Medicine*, for the series “Palliative Care in GI Malignancies”. The article has undergone external peer review.

Data Sharing Statement: Available at <https://apm.amegroups.com/article/view/10.21037/apm-23-80/dss>

Peer Review File: Available at <https://apm.amegroups.com/article/view/10.21037/apm-23-80/prf>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://apm.amegroups.com/article/view/10.21037/apm-23-80/coif>). The series “Palliative Care in GI Malignancies” was commissioned by the editorial office without any funding or sponsorship. K.A. served as the unpaid Guest Editor of the series. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The Lifespan Institutional Review Board (IRB) approved this study. As this was a retrospective study, did not present greater than minimal risk to subjects, and uses aggregate reporting, patient consent was not recommended or requested by the Lifespan IRB.

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Cite this article as: Phung QH, Masel RH, Bijlani S, Tanzer JR, Hsu A, Almhanna K. Characterizing after-hours hematology/oncology clinic calls. *Ann Palliat Med* 2024;13(1):93-100. doi: 10.21037/apm-23-80

Appendix 1 Quantitative methods supplement

Generalized vector regression was used to model call urgency (10). In this method, the modeled outcome is not a single value but a vector of observations, including the patient's reason for calling and the subsequent provider response. Using this approach allows for the comparison of average differences based on a specified set of regressors (i.e., days of the week, patient health conditions), as well as the correlation modeled between repeated observations of the outcome. This allows for the identification of whether patients and providers tend to agree on the urgency of the calls, or if there may be a mismatch that requires careful de-escalation by providers. Restricted on a range from 0 (low urgency) to 1 (high urgency), this coding scheme was modeled as a binomial distribution with a logit link (5).

There was an initial, incorrect assumption that

more urgent calls occurred over the weekend. A visual examination of raw patient urgency ratings over the week indicated a “W” pattern, with proportionally more urgent calls occurring not just on the weekend, but also on Wednesday in particular. To address this, a weighted contrast was used, that modeled whether there were significantly more calls at the visually observed high points (i.e., Saturday, Sunday, and Wednesday; scored 2/7) relative to the rest of the week (Monday and Friday scored -2/7; Tuesday and Thursday scored -1/7; or if that was more likely an artifact of weekly variance (31).

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Table S1 Call urgency by patient and providers, separated by hematology versus oncology patients with and without metastatic disease. Urgency was further separated by calls placed prior to COVID-19 pandemic and calls after the start of the pandemic (defined as starting March 18, 2020, when state lockdowns began in Rhode Island)

	Weekly trend	Pre COVID		Post COVID	
		Patient	Provider	Patient	Provider
Hematology	PE	3.47	-2.54	-0.75	0.57
	SE	0.75	0.67	1.10	0.98
	Z	4.60	-3.79	-0.68	0.58
	P	<0.0001	0.0001	0.4935	0.5587
Oncology	PE	0.45	-0.53	1.10	0.97
	SE	1.07	0.93	-0.35	0.00
	Z	0.42	-0.58	0.72	1.00
	P	0.6722	0.5649	0.4686	0.3186
Hematology, metastatic	PE	7.26	-2.57	-7.57	6.21
	SE	5.46	4.58	3.12	2.91
	Z	1.33	-0.56	-2.43	2.13
	P	0.1837	0.5744	0.0152	0.0332
Oncology, metastatic	PE	0.95	-0.97	0.84	-0.81
	SE	0.67	0.60	0.63	0.57
	Z	1.41	-1.61	1.32	-1.42
	P	0.1597	0.1066	0.1859	0.1542

Note: PE represents parameter estimate, the extent to which calls were perceived as greater or lower urgency over the weekend and on Wednesday, the observed weekly trend. A positive value indicates greater perceived urgency during these high sensitivity days, and a negative value indicates lower perceived urgency. SE represents standard error, the precision of the estimate under PE. “Z” is a ratio of the parameter estimate divided by the standard error, and “P” represents the probability on a normal distribution of obtaining results at least as extreme, assuming there was no actual association. Probability less than 0.05 was considered significant. Because the model included all main effects and interactions, the linear combination matrix was used to infer and test the strength of weekly trends for each combination of rater, time period, and patient health circumstance.