

## Clinical Research and Methods

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# Patient Safety in After-hours Telephone Medicine

Shersten Killip, MD, MPH; Carol L. Ireson, RN, PhD; Margaret M. Love, PhD;  
Steven T. Fleming, PhD; Whitney Katirai, MPH; Katherine Sandford

**Objectives:** *This study analyzed our family medicine department's after-hours telephone medicine systems at an academic health center from a patient safety perspective. The research questions were (1) What are the threats to patient safety associated with after-hours telephone medicine and (2) What kinds of errors are made during after-hours telephone medicine?* **Methods:** *Subjects were patients at the University of Kentucky family medicine practice who called in to the after-hours answering service. Telephone interviews were conducted with 64 patients over 10 weeks. During the interviews, patients described their telephone medicine experience, identified any problems, and reported potential or actual harm (patient-identified threats to patient safety). Two registered nurses and one physician analyzed the patient narratives to identify threats to patient safety (medical personnel-identified threats to patient safety).* **Results:** *Sixty-three analyzable patient interviews identified four instances (6%) of temporary physical harm. Two separate after-hours calls (3%) involved four medical errors with potentially serious consequences to patient safety (wrong dose, serious illness not ruled out). Fourteen calls (22%) involved events that could have threatened patient safety.* **Conclusions:** *Situations that threaten patient safety occur frequently in telephone medicine. Although this study is too small to draw strong conclusions, it suggests that there are risks to patient safety associated with after-hours telephone medicine.*

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Telephone medicine is common. Radecki and colleagues estimated that telephone medicine accounts for up to 25% of patient encounters,<sup>1</sup> one fifth of which occur after hours. Taking the number of 2004 outpatient visits in the United States (roughly 9.9 billion), and multiplying by .05 (25% x 20% from above), this could mean there are more than 49 million after-hours telephone medicine encounters per year in the United States.

The research reported in this paper examined the practice of telephone medicine to find and characterize threats to patient safety. Threats to patient safety were suspected for several reasons. Telephone medicine removes visual cues. Clinicians use cues in the office setting, such as general appearance of patients, to decide which patients may be sicker than others.<sup>2</sup> Further, studies of telephone "triage" show discrepancies between diagnoses made over the phone versus in person.<sup>3-6</sup> Finally, after-hours telephone medicine may be conducted when the doctor is sleepy or distracted

and is often without access to patient records. The potential for harm to patients appears to be high.

The results of Medline searches for papers on telephone medicine can be broken down into several categories: triage studies, systems studies, and outcomes studies. Triage studies include many randomized, controlled trials showing that triage over the phone frequently misses significant illness.<sup>5,6</sup> Systems studies, such as Hildebrandt's study of an after-hours telephone service in primary care,<sup>7</sup> show that there can be simple and serious flaws in telephone systems that result in poor patient care. Studies about patient outcomes (rather than economic outcomes studies) can be broken down into three groups—compliance with nurse/physician recommendations,<sup>8</sup> diagnoses made in the emergency room after referral,<sup>9</sup> or patient-centered outcomes studies that look at what happened to all the patients who called.<sup>10,11</sup> Currently, there are no studies in the literature analyzing the potential for harm to patients in the content of after-hours phone calls between doctors and patients.<sup>12</sup>

## Methods

This project was done at the University of Kentucky's Department of Family and Community Medicine,

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From the Department of Family and Community Medicine (Drs Killip and Love) and the College of Public Health (Drs Ireson and Fleming, Ms Katirai, and Ms Sandford), University of Kentucky.

a 6-6-6 program (six residents per year, 18 residents total) and was approved by the university's Institutional Review Board. It involved all individuals who called in to the after-hours Telephone Operating Service for the Family Medicine Clinic between November 12, 2004, and February 7, 2005, not including December 12–30, 2004.

The Telephone Operating Service assumes all calls from the medical center from 5 pm to 8 am on weekdays and all day on weekends. Second- or third-year residents on backup call are paged to answer the phone calls. The answering service uses a computerized registry to keep track of who calls in for what service.

Patients were not eligible for the telephone interview if they spoke neither English nor Spanish (n=3), were under 18 years of age (n=1), were prisoners (n=0), or were without capacity to consent (n=0). Attempts were made to contact a sample of 140 of 218 total callers. Of those 140, four did not meet the eligibility criteria, 42 could not be reached, three were in the hospital, six had disconnected phones or wrong numbers, one was "too sick to answer questions," and 17 refused to participate. Four calls had technical problems. In the end, 61 patients were interviewed about 63 calls (two patients called twice).

*Interviews*

The English- and Spanish-speaking registered nurse research assistant (RN RA) interviewed all patients. Consent was obtained by telephone. The RN RA used an interview guide. The interview guide was field tested for comprehension and timing. Responses were entered into a computer database at the time of the interview, and interviews were audiotaped as a backup measure.

To answer the first research question, "What are the threats to patient safety associated with after-hours telephone medicine?" patients were asked (1) about the medical care given in the telephone encounter and (2) about any problems after the phone call, including whether the patient was or could have been harmed. An affirmative response to the second part of the interview was categorized by the researchers either as a "patient-identified adverse event" or as a "patient-identified potential adverse event." Table 1 provides definitions of adverse events and potential adverse events.

To answer the second research question, "What kinds of errors are made during after-hours telephone medicine?" all the patient interview data were reviewed by three researchers with medical knowledge (one physician and two registered nurses). To differentiate their medical opinions from the lay opinions of the patients, they are henceforth termed "medical personnel." The three medical personnel used the definitions in Table 1 to characterize threats to patient safety. Threats to patient safety identified by the medical personnel were

categorized either as a "medical personnel-identified adverse event" or as a "medical personnel-identified potential adverse event." Final categories were decided by consensus.

Initially, the plan was to review all charts as well for telephone messages, but this turned out to be impossible. Instead, all notes within 1 month after a patient's call were reviewed by the principal investigator to look for unreported or unrecognized adverse events.

*Data Analysis*

During the analysis, it became clear that a new category was needed: threats to patient safety caused by the patients themselves. We had multiple instances when a patient failed to follow the advice they were given, and there are numerous situations in which this has happened.<sup>13</sup> This concept has also been broached by Elder and Dovey.<sup>14</sup>

Thus the main categories of data became (1) patient-identified threats to patient safety, (2) medical personnel-identified threats to patient safety from medical errors (Table 1), and (3) medical personnel-identified threats to patient safety from patient errors (Table 1). Individual incidents could be in more than one category simultaneously. Each individual incident was then

Error	"An error is defined as the failure of a planned action to be completed as intended (ie, error of execution) or the use of a wrong plan to achieve an aim (ie, error of planning)." <sup>15</sup> Can be made by patients (patient error) or anyone involved in providing health services to patients, ie, pharmacists, telephone operators, receptionists, nurses, doctors, etc (medical error).
Potential adverse event (PAE)	A potential adverse event (PAE) is an error that could have, but did not, result in harm. <sup>16</sup> This term is frequently used in adverse drug event literature. <sup>17,18</sup>
Error= PAE	The study authors consider that whenever an error is made, the potential for harm to the patient exists, and thus all errors are PAEs, unless the error results in injury, in which case it is an adverse event. The converse is not necessarily true. In this text, the term "error" should be understood to mean "potential adverse event", as is shown in Figure 1.
Adverse event (AE)	"An adverse event is an injury caused by medical management rather than the underlying condition of the patient." <sup>15</sup>
Near miss	A potential adverse event prevented from causing harm by an intervention.
"Save"	The intervention that prevents the potential adverse event from causing harm

characterized as a potential adverse event and/or near miss or an adverse event.

**Results**

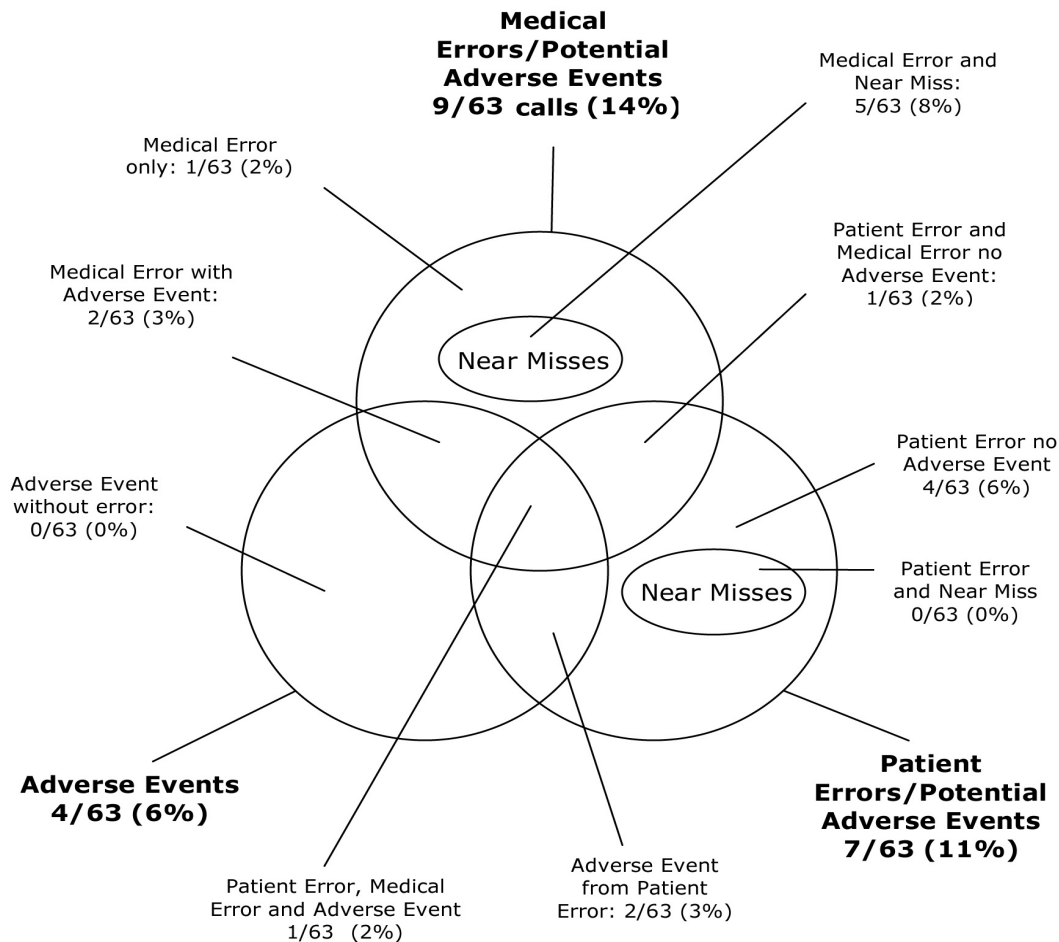
There were 11 medical errors in nine after-hours calls (14%) and seven patient errors in seven after-hours calls (11%). A total of 14 after-hours calls (22%) involved any errors. Two phone calls had both patient and medical errors. Figure 1 and Table 2 summarize these results. The most common type of medical error was the doctor not returning the phone call, which happened in six cases (9.5%) of after-hours calls. In five cases, the patient “saved” the situation (prevented

the error from causing harm) and turned the error into a near miss. Only one of the six patients did not try again to get care.

There were five (8%) errors of medical practice (errors of planning). Three occurred during the same phone call (errors 5a, 5b, and 5c). These included (1) a 10-fold overdose of acetaminophen and (2) a 10-fold overdose of antihistamine for a 3-month-old child with viral symptoms but no fever, and (3) an inappropriate prescription for an antihistamine. The fourth was an incomplete history in a complicated patient who could have been sicker than realized (error #6), and the fifth was an MD refusing a call.

Figure 1

Threat to Patient Safety Investigation Results



This Venn diagram, in conjunction with Table 1, describes threats to patient safety within telephone medicine and reports our results. All errors for the purposes of this study are potential adverse events (PAEs). Errors may be made by patients (ie, not coming in for care as advised by the physician), as well as medical staff and personnel (ie, a wrong dose of Tylenol for a baby, a wrong number recorded from a caller). Adverse events (AE) may occur without error on anyone’s part but may also be associated with patient or medical error. PAEs may be prevented from causing harm by the action of someone or something and are then termed near misses (NM).

Table 2

Errors, Adverse Events (AE), and Potential Adverse Events (PAE) in After-hours Telephone Medicine

Description of Error or Adverse Event	Patient ID'd PAE?	Medical Expert ID'd PAE From MD Actions?	Medical Expert Identified PAE From Patient Actions or Chart?	Situation "Saved"?
<b>Medical Errors</b>				
1. Call not returned	Yes	Yes—MD error of execution	No—mother sought care with pediatrician, child got antibiotic for ear infection. <b>Potential adverse event and near miss</b>	Yes, by mother
2. Call not returned	Yes	Yes—MD error of execution	No—patient called again, with nosebleed, persisted, wound up in ER packed, delay in care not shown to affect outcome. <b>Potential adverse event</b>	Yes, by patient
3. Call not returned	No	Yes—MD error of execution	No—patient called next day, led to minor delay in change of prescription. <b>Potential adverse event and near miss</b>	Yes, by patient but prescription still delayed
4. Call not returned	No	Yes—MD error of execution	No—patient called back but with serious pain, care was delayed and led to emergency room, not urgent treatment center visit. <b>Adverse event</b>	Failed save by patient as delay led to increase in care level
5a. 10x overdose for infant with Tylenol, and 5b. 10x infant overdose with antihistamine, and 5c. Inappropriate antihistamine suggestion for infant	Yes	Yes—MD error of planning	No. <b>Potential adverse event and near miss</b>	Yes, by mother
	Yes	Yes—MD error of planning	No. <b>Potential adverse event and near miss</b>	Yes, by mother
	Yes	Yes—MD error of planning	No. <b>Potential adverse event and near miss</b>	Yes, by mother
6. Needed medical history not obtained in complicated patient	No	Yes—MD error of planning	No—patient was on Coumadin and had fallen, called and complained of sore ankle; could have had arrhythmia, subdural, etc. No harm noted at interview. Chart unobtainable. <b>Potential adverse event</b>	No
7. Telephone call refused by MD	Yes	Yes—MD error of planning	No—patient was able to obtain anti-vertigo medications over the counter. <b>Potential adverse event and near miss</b>	Yes, by patient
<b>Patient Errors</b>				
8. Diabetic patient advised to go to emergency room; did but left without being seen	No	No	Yes—patient error of planning—diabetic patient at high risk for serious illness; needed further evaluation. Chart unavailable. <b>Potential adverse event</b>	No
9. Diabetic patient advised to seek care in clinic; refused, still sick at time of survey	No	No	Yes—patient error of planning—diabetic patient at high risk for serious illness; needed further evaluation. Not seen within 1 month of call at FM office. <b>Potential adverse event</b>	No
10. Sick patient advised to go to Urgent Care waited until Monday to be seen in clinic	No	No	Yes—patient error of planning—patient deemed too sick for telephone medicine by resident, needed face-to-face assessment and did not get it. Got antibiotic 3 days after call. <b>Potential adverse event</b>	No
11. Patient desired antibiotics for "sinusitis;" not prescribed but advised to go to emergency room; patient did not.	Yes—from no antibiotic over phone	No—antibiotic prescription over phone not appropriate unless patient recently seen and personally known to physician	Yes—patient error of planning—from failure to come for appropriate care. Patient reported harm from pain and progression of illness due to lack of treatment. Chart unavailable. <b>Adverse event</b>	No, patient never came in
12. Patient desired narcotic pain medication for headaches; advised to go to emergency room, did not.	Yes—from no pain medications over phone	No—narcotic prescription over the phone not appropriate unless patient recently seen and personally known to physician	Yes—patient error of planning—from failure to come for appropriate care. Patient reported harm from pain due to lack of treatment. Chart review: patient dismissed from practice for narcotic seeking at next visit (multiple MDs writing narcotic prescriptions) <b>Adverse event</b>	No, patient never came in
<b>Medical and Patient Errors</b>				
13a. Call not returned, and 13b. Patient did not pursue care	No	Yes—MD error of execution	Yes—patient error of planning—patient sought care, did not call back, never got it. Still sick at follow-up visit 4 weeks later. <b>Adverse event</b>	No and No
14a. Call not returned and 14b. Patient advised to seek further care, did not	No	Yes—TOS error of execution (wrong number recorded)	Yes—patient error of planning—called again (wrong number first time) postpartum patient with back pain, did not go to emergency room as advised, followed up in clinic. Diagnosed minor strain, prescribed ice and ibuprofen. <b>Potential adverse event</b>	Yes and No



All seven patient errors fell into the same category: patients not following through on obtaining medical care. No patients reported harm from any of these errors. The two patients who did report harm (errors #11 and #12) referred only to the doctor's inability to prescribe over the phone and did not relate any consequences they suffered to their own actions or inactions.

Only four adverse events were detected, none of which caused patients more than temporary harm. These four adverse events occurred in four after-hours calls (6%); all were identified by both patients and medical personnel. These resulted from errors #4, #11, #12, and #13 in Table 2. Error #4 was a medical error of a phone call not returned, which resulted in a delay of care and a worsening of the patient's condition. Error #11 was considered a patient error and not a medical error by the medical personnel, as the patient requested a treatment not usually given over the phone, in this case antibiotics for "sinusitis." The patient error was in initially seeking care and then declining to follow through on the doctor's recommendation to come in and be properly evaluated. Error #12 was also considered a patient error, for essentially the same reason, except this patient called requesting narcotics. This patient also declined to come in for an evaluation. Error #13 was found on chart review. The patient had not been called back, did not seek further care, and was still ill 4 weeks later at a follow-up visit to the office.

A chart review was attempted in order to obtain the doctor's view of the interaction, but 6 weeks after the completion of interviews, only four telephone messages were found in the charts. Charts were pulled and notes from visits within 1 month after the telephone call were analyzed. This review revealed patient #12 to have drug-seeking behaviors in the clinic and patient #13's adverse event (not recognized from the interview alone).

## Discussion

This is the first study to examine threats to patient safety in the practice of telephone medicine, as opposed to triage. In this study, the investigators deliberately used wide-ranging inclusive criteria in defining threats to patient safety to be as comprehensive as possible in a pilot study. The study was designed to be exploratory and descriptive. Our findings show there are many, sometimes potentially serious, threats to patient safety in telephone medicine. Overall, 14 calls (22%) of the 63 studied involved threats to patient safety of some kind. In this study, all threats to patient safety resulted from errors on the part of doctors or patients, and three calls (5%) involved multiple errors. Systems issues with phone calls were also discovered.

Only 5% of charts with calls had telephone notes on them at the time of the chart review. These missing

notes are unquestionably medical errors, with potential downstream consequences from lack of communication. They also illustrate the difference between "systems errors" and "professionalism": the problem must be with the system when its failure is so pervasive. It is untenable to conclude that essentially all the attendings and residents in this program behave unprofessionally regarding telephone messages. These errors, the recognition of a failed system, and its consequent redesign will be addressed in another paper by the same authors on the process of an after-hours telephone system and will not be further analyzed here.

Of the four adverse events found, none caused more than temporary harm. The two adverse events reported by the patients (#11, #12) were difficult to analyze since the pain the patients experienced might have been a natural consequence of their conditions. In the end, these instances were categorized as adverse events. It is noteworthy that both patients felt strongly that they had been harmed by the doctor, while the medical personnel were not nearly so certain.

Six unreturned calls were system-type errors—errors caused because there was no check other than the on-call doctors themselves. While in the past these might have been regarded as personal or professionalism issues, the modern concept of safety in medicine is no longer to test the mettle of individual physicians and health care workers by seeing whether they are "good" enough to avoid errors. Rather, it is to protect the patient by setting up systems to ensure that every health care worker does it right every time. In our practice, we have set up a rudimentary system: we have asked the answering service to inform patients they should call back if they have not heard from the doctor in 20 minutes. We expect that this will reduce the number of dropped calls, which was our single largest group of medical errors.

Four of the five errors of medical practice (three overdoses and an inadequate history) were more traditional types of medical errors—the physicians clearly made a mistake in doing their job. All eight "saves" (13%) in this study were made by patients themselves, not medical practitioners. Unlike the hospital setting, where there are more checks and balances, in the outpatient setting the patients often are the only people able to prevent the consequences of errors.

On the other hand, almost half the errors were made by patients choosing not to seek care as directed. These were considered potential adverse events in this study because they could have caused harm. While we do not argue that patients should have no choice in whether to follow or not follow a physician's recommendation, we do feel that in general the doctor knows more about what could be dangerous medically than the patient. In that case, some risk of an adverse event always exists when a patient has a concern about which they feel

strongly enough to call a physician after hours, the physician has enough concern to recommend evaluation, and the patient declines to be evaluated.

### Limitations

This is a pilot study with small numbers of subjects. Thus, no definitive conclusions or recommendations can be made from our data. Although conducted in one family medicine residency program, it highlights potential concerns in both teaching and non-teaching settings.

Another limitation is that patient reports were the main source of data about the events. The interview method permitted consideration of patient perceptions of error and harm, but our methods did not allow us to seek further information from hospitalized or sick patients. Finally, the interviews did not ask patients to explicitly identify potential harm as well as actual harm, which would have made the analysis more complete.

### Conclusions

After-hours telephone medicine is not as safe as many of us have assumed. Our study demonstrated threats to patient safety. It showed that errors are common, and adverse events are possible. It is encouraging that no severe consequences of adverse events were found in this study; there are numerous situations in which this has happened.<sup>13</sup> This concept has also been broached by Elder and Dovey.<sup>14</sup>

Sixty-three subjects are a small sample of the 49 million after-hours telephone encounters in the United States per year. Given the numbers of errors we observed, it is likely there are adverse events in the practice of telephone medicine that cause harm every year. More study is needed to define the problem and ultimately ensure that our patients receive the safest care possible, even when seeking medical advice on the telephone after normal working hours.

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*Corresponding Author:* Address correspondence to Dr Killip, University of Kentucky, Department of Family and Community Medicine, K302 Kentucky Clinic 0284, 740 S. Limestone, Lexington, KY 40536-0284. 859-323-5917. Fax: 859-323-6661. skill2@email.uky.edu.

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