Impact of Emergency Physician–Provided Patient Education About Alternative Care Venues

Pankaj B. Patel, MD; David R. Vinson, MD; Marla N. Gardner, BA; David A. Wulf, BS; Patricia Kipnis, PhD; Vincent Liu, MD, MS; and Gabriel J. Escobar, MD

ABSTRACT

OBJECTIVES: Interventions that focus on educating patients appear to be the most effective in directing healthcare utilization to more appropriate venues. We sought to evaluate the effects of mailed information and a brief scripted educational phone call from an emergency physician (EP) on subsequent emergency department (ED) utilization by low-risk adults with a recent treat-and-release ED visit.

STUDY DESIGN: Patients were randomized into 3 groups for post-ED follow-up: EP phone call with mailed information, mailed information only, and no educational intervention. Each intervention group was compared with a set of matched controls.

METHODS: We undertook this study in 6 EDs within an integrated healthcare delivery system. Overall, 9093 patients were identified; the final groups were the phone group (n = 609), mail group (n = 771), and matched control groups for each (n = 1827 and n = 1542, respectively). Analysis was stratified by age (<65 and ≥65 years). Patients were educated about available venues of care delivery for their future medical needs. The primary outcome was the rate of 6-month ED utilization after the intervention compared with the 6-month utilization rate preceding the intervention.

RESULTS: Compared with matched controls, subsequent ED utilization decreased by 22% for patients 65 years or older in the phone group (P = .04) and by 27% for patients younger than 65 years in the mail group (P = .03).

CONCLUSIONS: ED utilization subsequent to a low-acuity ED visit decreased after a brief post-ED education intervention by an EP explaining alternative venues of care for future medical needs. Response to the method of communication (phone vs mail) varied significantly by patient age.

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Emergency department (ED) crowding is a public health problem that compromises patient care and adversely affects clinical outcomes.[1-3] Low-acuity ED visits place a strain on already crowded EDs and are an expensive source of healthcare utilization and patient cost sharing, especially for conditions that can be managed appropriately in an ambulatory setting.[4,5] Attempts to reduce ED utilization have had variable success,[6-15] although most successful programs emphasize patient education delivered through care coordination and management.[10,12,13,15-17] Simply providing generic nonmedical information about alternative venues of care other than the ED appears to be effective.[4,6,10,14,18-20] Most studies have utilized nonphysicians, such as nurses, case managers, discharge planners, and pharmacists, to provide this information to patients.[6,8,10,12,13,15-17,19,21,22]

We hypothesized that providing patients with a simple educational intervention on available resources and venues of care within our organization could lead to reductions in future ED utilization for low-acuity problems. Our primary goal was to evaluate the impact of a brief educational phone call by an emergency physician (EP) and/or mailed information following a treat-and-release ED visit on subsequent 6-month ED utilization in a randomized population of low-risk, low-acuity adult patients.[23] We also sought to assess the impact of these interventions on utilization of the organization's Advice and Appointment Call Center (AACC) and outpatient visits. We made an a priori hypothesis that the effects of these interventions might differ by age group (<65 vs ≥65 years).

METHODS

Setting

This study was approved by the Kaiser Permanente Northern California (KPNC) Institutional Review Board for the Protection of Human Subjects, which has jurisdiction over all facilities included in this report.

We conducted this multicenter, randomized, controlled trial from October 2014 through July 2015 within KPNC, an integrated healthcare

TAKEAWAY POINTS

Emergency department (ED) crowding, especially for low-acuity visits, is a significant public health issue. We studied the impact of providing patients with simple nonmedical education about alternative venues of care following a recent ED visit.

- Patients 65 years or older had a 22% reduction in future ED utilization after phone follow-up by an emergency physician (EP).
- Patients younger than 65 years had a 27% reduction in future ED utilization after receiving mailed educational information.
- Phone follow-up by EPs may be a valuable tool to affect future ED utilization.
- Targeting interventions based upon age-specific responses warrants further study.

delivery system. Under KPNC's mutual exclusivity agreement, approximately 9500 physicians in The Permanente Medical Group, Inc, care for 4.1 million Kaiser Foundation Health Plan (KFHP), Inc, members at 21 hospitals and more than 200 outpatient clinics.[24-26] The Epic (Epic Systems; Verona, Wisconsin) electronic health record, known internally as Kaiser Permanente HealthConnect, was fully deployed in all KPNC facilities in 2010. Members account for approximately 33% of the insured population in Northern California and are representative of the geographic areas served.[24] KPNC's secure online services allow patients to access their medical information, refill prescriptions, make appointments, and communicate with their providers via email.[25-27] The KPNC AACC, which includes staffing by EPs, handles approximately 12 million calls per year.[28] The AACC provides healthcare advice, appointment scheduling, and messaging with primary care providers. Patients who need additional medical evaluation are directed to the most appropriate venue of care, including the ED. KPNC has 21 EDs that receive more than 1 million visits per year. We included patients with treat-and-release visits to 6 EDs with a range of annual censuses: 2 higher-census EDs (63,000 and 81,000 visits/year), 2 medium-census EDs (46,000 and 49,000 visits/year), and 2 lower-census EDs (26,000 and 27,000 visits/year).

Physician Selection

Two EPs from each of 6 KPNC EDs volunteered to participate in the study. Study EPs received standardized training from the principal investigator (PBP) about the study, its goals, and their roles in contacting patients by phone. Training included reviews of a standardized phone script (**eAppendix A** [eAppendices available at **ajmc.com**]), a phone log (**eAppendix B**), and postcontact letters (**eAppendices C** and **D**) and an information pamphlet that were mailed to each intervention group. The principal investigator fielded queries from the EPs and oversaw the entire enrollment process with the project manager (MNG).

Patient Identification and Selection

We identified patients who met the following inclusion criteria: (1) 18 years or older, (2) KFHP membership, and (3) a low-acuity treat-and-release ED visit during October-November 2014 but without AACC contact in the 24 hours prior to their ED visit in 1 of the 6 KPNC EDs (**eAppendix E**). We defined low-acuity as 1) having a Laboratory-based Acute Physiology Score, version 2 (LAPS2) score—an acute physiology score based on 16 laboratory tests, vital signs, pulse oximetry, and neurological status in the preceding 72 hours—less than 50 at the time of the ED index visit, a score associated with a 30-day mortality risk less than 1.5%[29]; and 2) being discharged directly home from the ED. Patients who left against medical advice, were discharged to a skilled nursing facility or long-term acute care facility, or were transferred to a non–health plan facility were excluded. We also excluded non–English-speaking patients, those who could not respond on their own or through a family member or guardian, and those who died during the 6-month postintervention period (eAppendix E). We conducted separate analyses for patients younger than 65 years and those 65 years or older. Lastly, in our capitated prepaid healthcare system, patients are not obligated to follow recommended care paths and there are no sanctions (economic or otherwise) for patients who choose different venues of care.

Interventions

We identified 3 arms for this study: phone and mail intervention (phone group), mail intervention only (mail group), and no intervention (control group). Prior to the start of this study, our study statistician (PK) identified a target of 600 patients for each of the 2 intervention arms. From a previous pilot study,[23] we had learned that we were successful in reaching 50% of patients by phone in a short time frame (within 2 weeks). Additionally, we needed to sample enough patients so that study physicians would reach 50% of patients who were younger than 65 years and 50% of patients who were 65 years or older. To ensure we would be successful in reaching 600 patients, we needed to sample twice that number. For the first arm, each study EP received a weekly list of 25 eligible patients seen at their medical center ED who were randomly assigned to the phone group. EPs contacted patients by phone within 2 weeks of their index ED visit. EPs worked their way through the list of patients until they had enrolled half of these patients each week to a total of 50 patients contacted for the study period. If a patient did not consent to be interviewed, was unavailable to talk, or could not be reached by phone, the EP moved on to the next patient on the list, a method of patient selection previously described.[30] The target was for 50% of contacted patients to be younger than 65 years and 50% of contacted patients to be 65 years or older. This weighting of patients was part of the study design because we postulated that older patients (≥65 years) utilized the ED at a different rate than younger ones.

For arm 1 (phone group), we developed a detailed phone script that described services available through the organization's AACC

TABLE 1. Study Patient Variables for Phone Intervention Group, Mail Intervention Group, and Their Respective Matched Controls

	Phone Intervention	Matched Control for Phone Intervention (no contact)	Mail Intervention	Matched Control for Mail Intervention (no contact)
Patients, n	609	1827	771	1542
Age, years, median (mean ± SD)	64 (58.9 ± 21.5)	63 (58.7 ± 21.1)	71 (66.7 ± 19.8)	71 (66.4 ± 19.4)
Male, %	45	45	45	45
COPS2, median (mean ± SD)	10 (27.2 ± 32.6)	10 (27.5 ± 31.2)	17 (32.6 ± 34.7)	17 (33.0 ± 34.9)
CCI score, median (IQR)	1 (0-2)	1 (0-2)	1 (0-3)	1 (0-3)
LAPS2, median (mean ± SD)	16 (19.2 ± 13.1)	19 (19.6 ± 12.6)	19 (20.0 ± 13.1)	19 (20.4 ± 12.5)
Utilization Per Person for 6-Month Interval Before Index ED Visit, Median (mean ± SD)				
Days with calls to AACC	2 (3.3 ± 5.2)	2 (3.3 ± 5.0)	2 (3.4 ± 4.6)	2 (3.7 ± 5.3)
ED visits	0 (0.8 ± 2.3)	0 (0.7 ± 1.8)	0 (0.8 ± 1.7)	0 (0.8 ± 1.9)
Outpatient encounters	4 (7.3 ± 9.0)	4 (7.3 ± 10.4)	5 (7.7 ± 9.5)	5 (7.9 ± 10.3)
For 6-Month Interval After Index ED Visit				
Mortality, %	3	4	5	5

AACC indicates Appointment and Advice Call Center; CCI, Charlson Comorbidity Index; COPS2, COmorbidity Point Score, version 2; ED, emergency department; IQR, interquartile range; LAPS2, Laboratory-based Acute Physiology Score, version 2.

and online services.[27,28] The conversation opened with patient consent and closed with an opportunity for feedback and questions. Each EP maintained a phone log of their calls to document basic information about their encounter. We mailed information about the organization's AACC and online services to this phone group. We mailed information to arm 2 patients (mail group) who had no phone contact with a study EP. The third arm (no-intervention group) was not called or sent mailed information.

Data Collection

During the 6 months following the index ED visit, we captured data on 3 dependent variables: ED visits, outpatient visits, and AACC contacts (multiple calls on the same day were grouped together and counted as 1 contact). We extracted the following independent variables from KPNC clinical and research databases using previously described methods[31]: age, sex, LAPS2, Charlson Comorbidity Index score[32], and COmorbidity Point Score, version 2 (COPS2), a longitudinal score based on all patient diagnoses incurred in the preceding 12 months[29] (**Table 1**). We ascertained mortality in the 6 months following the index ED visit (primary source of mortality data was the California Department of Health Services, which maintains a registry of deaths and their causes).[29]

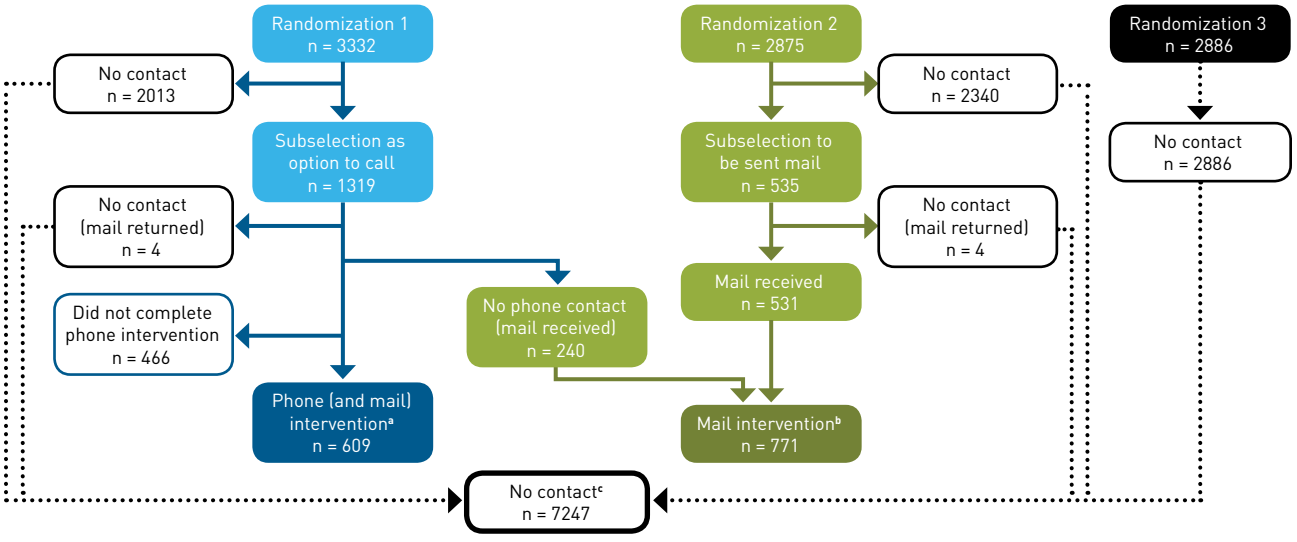
Before study interventions began, unknown to the EPs making calls or to the research assistants sending out mailings, 2 clerical errors occurred: (1) 300 patients not slated to receive a phone call were placed into the phone intervention group, and (2) the selection process from a spreadsheet led to an excess of patients 65 years or older in the mail group. To mitigate this difference, patients in each of the 2 intervention groups were separately matched to patients who did not receive any intervention. These 2 groups of matched control patients were obtained using the designmatch package in R, which utilizes the Gurobi optimization solver to construct optimally matched samples.[33] For our matching algorithm, we specified that matched patients should not differ by more than 0.1 SD in any of the following variables: age, LAPS2, COPS2, and the numbers of preintervention ED visits, AACC contacts, and outpatient visits. We also required that the matched groups had the same proportions of male patients and patients 65 years or older. Once we specified these criteria, we employed the designmatch algorithm to provide as many matched controls as possible for each case. The algorithm identified 3 matched controls for every phone intervention patient and 2 matched controls for every mail intervention patient.

Analysis

Patients who died before reaching the end of the study period were removed from analysis. The overall mortality rate for the cohort during the 6-month interval after the index ED visit was 5% or lower (Table 1), and sensitivity analyses showed no connection between intervention group placement and likelihood of early death.

For each of the 3 dependent variables, we modeled the outcome frequency in the 6 months after the index ED visit as a function of LAPS2, COPS2, age at admission, age category (<65 and ≥65 years), sex, outcome frequency in the 6 months prior to the intervention, and intervention group. We analyzed the data using generalized linear models and evaluated the fit of Poisson, negative binomial, and normal (log linked) distribution assumptions for all 3 variables. We selected the model predictors using backward selection with *P* values >.05 as removal criteria. Because of the skewness of the data, we first determined model fit and only then applied the model to the age group–separated cohorts. We employed a combination

FIGURE 1. Randomization of 9093 Patients to Identify the Study Groups

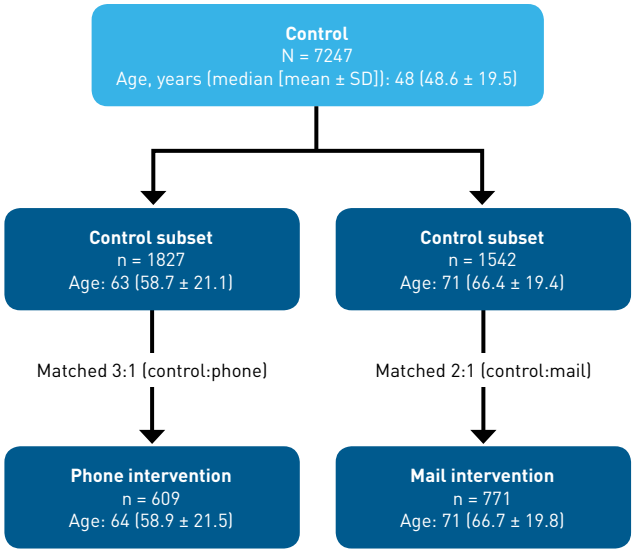


[a]The phone intervention group (n = 609) was identified from randomization group 1. From the subselection of patients from this randomized group, 466 patients were not contacted by phone and did not receive mailed information.

[b]Patients in the mail intervention group (n = 771) were included from randomization group 2 (n = 535) and from randomization group 1 (n = 240, patients who did not receive phone contact).

[c]Patients in the no-contact group (n = 7247) were pulled from all patients who had no contact/intervention, which included patients from randomization group 3 (n = 2886), randomization group 2 (n = 2340 and n = 4), and randomization group 1 (n = 2013 and n = 4).

FIGURE 2. Matched Control Patients Identified for Phone Intervention and Mail Intervention Groups Through Randomization[a]



[a]Control subsets of patients were identified to match the patient characteristics for each of the 2 intervention groups (phone intervention and mail intervention). A total of 1827 control patients were identified to match the 609 patients in the phone intervention group. A total of 1542 control patients were identified to match the 771 patients in the mail intervention group.

of mean average error, root mean squared error, deviance, and the Akaike information criterion[34] to compare and identify the model that best fit the data.

RESULTS

We identified 9093 low-acuity treat-and-release adult ED patients who were eligible for the study (**Figure 1**). After randomization and matching, our final study cohort consisted of the following groups: phone intervention (n = 609) with their matched controls (n = 1827) and mail intervention (n = 771) with their matched controls (n = 1542) (**Figure 2**). The control groups were well matched with each of the 2 comparison intervention groups (Table 1).

The Poisson distribution assumption was the best fit for ED visit frequency and the normal distribution best fit the AACC contact and outpatient visit count. We found that age group interaction was significant for all outcomes, so we fit separate models by age group for each outcome using the same predictors. As a result, we generated an estimate of the effect of each intervention for each metric by age group.

We directly compared the phone intervention with mailed information group with their matched controls. Likewise, we directly compared the mail-only intervention group with their matched controls. We did not compare the 2 intervention groups with each other, as those 2 groups were not matched for demographics.

TABLE 2. Relative Number of Postintervention Outcomes for Intervention Groups Versus Their Matched Control Groups[a]

Phone Intervention vs Matched Control			
Outcome (model)	**All Ages**	**<65 Years**	**≥65 Years**
ED visits (Poisson, all variables[b])	0.92 (0.77-1.10) *P* = .36	1.13 (0.87-1.46) *P* = .37	**0.78 (0.62-0.99)[c]** ***P* = .04**
Days with AACC calls (normal, without age and LAPS2)	0.93 (0.68-1.27) *P* = .63	0.98 (0.66-1.46) *P* = .92	0.86 (0.52-1.41) *P* = .54
Outpatient visits (normal, without age and LAPS2)	1.61 (0.67-3.89) *P* = .29	1.89 (0.53-6.78) *P* = .33	1.34 (0.41-4.31) *P* = .63
Mail Intervention vs Matched Control			
Outcome (model)	**All ages**	**<65 Years**	**≥65 Years**
ED visits (Poisson, all variables[b])	1.07 (0.92-1.23) *P* = .40	**0.73 (0.55-0.98)[c]** ***P* = .03**	1.12 (0.95-1.33) *P* = .18
Days with AACC calls (normal, without age and LAPS2)	0.83 (0.60-1.13) *P* = .23	0.77 (0.49-1.20) *P* = .25	0.85 (0.57-1.27) *P* = .42
Outpatient visits (normal, without age, LAPS2, and COPS2)	1.13 (0.49-2.62) *P* = .77	1.59 (0.25-9.74) *P* = .62	0.93 (0.38-2.29) *P* = .88

AACC indicates Appointment and Advice Call Center; COPS2, COmorbidity Point Score, version 2; ED, emergency department; LAPS2, Laboratory-based Acute Physiology Score, version 2.
[a]Relative visit/utilization rates with 95% CIs and *P* values are presented.
[b]All variables include age, sex, COPS2 score, Charlson Comorbidity Index score, LAPS2 score, and intervention type.
[c]Values that were found to be significant in each of the 2 intervention groups compared with their matched controls are in **bold**.

We found no significant differences in the combined age groups for phone or mailed information interventions compared with their matched controls. Also, no postintervention changes were found in the following: phone group ED utilization compared with matched controls for all patients and those younger than 65 years, mail group ED utilization compared with matched controls for all patients and those 65 years or older, AACC use or outpatient visit frequency for either intervention in both age groups, and overall ED visits, AACC contacts, and outpatient visits during the 6 months prior to and the 6 months following the index ED visits for the 9093 patients (**Table 2**). The vast majority of study patients had 2 or fewer ED visits before and after the intervention month, a highly skewed utilization distribution (**eAppendix F**).

We saw significant decreases in ED revisits that varied by age group and intervention type. For patients 65 years or older, phone intervention was associated with 0.78 times the number of ED revisits for control patients (95% CI, 0.62-0.99; *P* = .04), a 22% relative decrease (Table 2). For patients younger than 65 years, mail intervention was associated with 0.73 times the number of ED revisits for control patients (95% CI, 0.55-0.98; *P* = .03), a 27% relative reduction.

DISCUSSION

We found that future ED utilization was reduced by 22% for low-risk patients 65 years or older after a brief phone call from EPs followed by mailed information about AACC and online KPNC services for future medical care needs. ED utilization was reduced by 27% for low-risk patients younger than 65 years who were only sent mailed information.

Educating patients about how best to access their healthcare system can affect demand and the choices that patients make to access future care.[10,18] Focusing on ED-based care interventions that interface with outpatient care appears to be most effective in reducing ED utilization.[17] Our postvisit phone and mail education interventions provided simple but specific patient education about access points for patients' future healthcare needs. Education, case coordination and management, and linkage with primary care have been shown to be effective strategies to reduce ED utilization.[4,9,10,12-17] Similarly, discharge interventions are most effective when combined across the hospital–home interface,[13,18] with phone follow-up specifically being highly correlated with success.[6,10,16] Further, the recent concept of patient-centered medical homes has been associated with reductions in ED utilization.[11,15,35] Our simple educational interventions linked patients to their medical homes after ED discharge, favorably impacting future ED utilization.

EPs served as educational advocates via phone follow-up, a practice that has received little research attention. Similar research to reduce healthcare utilization has been undertaken with outreach by nonphysician personnel (eg, nurses, case managers, healthcare advocates, discharge planners, pharmacists, social workers).[6,10,13,22] In a preliminary pilot study within our organization, we found that future ED utilization was significantly reduced when EPs made postvisit phone calls, but no change occurred when emergency nurses made similar contact, suggesting that patients were perhaps more receptive to receiving information from EPs. Physician costs to provide phone education would be higher when compared with nonphysician staff costs, although specific cost and complexity details of many nonphysician staff intervention programs have not

been well described. Following brief training, physicians functioned independently, alleviating the need to create complex, expensive mechanisms for nonphysician staffing to provide postvisit education. Based on the knowledge that the use of telemedicine can get patients to the "right place" before they even step foot into the ED,[23,36] perhaps higher physician costs can be offset by utilizing such telemedicine capabilities as we did in our study. Future studies to identify the differences in follow-up that involve physicians compared with nonphysician staff would be of great interest.

Although phone response rates have been shown to be high for all ages,[37,38] a generational divide in technology use has been described.[39-41] Internet usage is increasing among the elderly,[42-44] even though they may prefer more traditional paper-based services over Web-based services compared with the younger population.[42] In our study, patients of different ages responded differently to our 2 methods of communication in terms of future ED utilization: Older patients more often answered phone calls, whereas younger patients were more difficult to reach by phone. Younger patients appeared to respond more to mailed information. These were interesting findings that are not well described in the literature. Studies have shown that older patients are readily contacted by phone (46%-69% with a single call and 79%-86% after 3 or 4 attempts),[21,45] perhaps indicating that they may be more receptive to phone education; in our study, older patients were more easily contacted than younger patients. The age-specific responses we found are intriguing with regard to the effects of different interventions. Future research to investigate this disparity in follow-up communication modalities would be helpful to delineate more specific strategies that can better target patient education for ED utilization.

Identifying the optimal population of ED patients for study on the effects of interventions on future ED utilization is fraught with challenges. Although many studies on reducing ED utilization have focused on high-utilizing ED patients,[7,8,15,20] frequent ED usage may be short-lived, often due to an intense but temporary need for recurrent ED services, with almost 75% of high utilizers returning to a general baseline of extremely low ED utilization within 1 year.[46] Additionally, although it may have limited our effect size, the decision not to limit our study to high utilizers makes our findings more generalizable to the overall population in which the vast majority of patients have few, if any, ED visits each year, something our study identified. Finally, we uniquely employed a validated acute physiology score to select treat-and-release ED patients with a low predicted 30-day mortality risk.[29] Using such tools to more objectively identify low-acuity patients most likely to benefit from future outpatient management options may be a worthwhile strategy for future studies.

Limitations

Our study has several limitations. The study was conducted in an integrated healthcare organization with an AACC and online healthcare services, which may not be generalizable to organizations that lack these resources. However, given that integrated systems are becoming more common, the strategies we describe may be useful.[26,27]

Only patients who completed the full intervention were included in the phone group. Phone group patients with partial interventions were not included in that group (ie, if a call was not made [n = 466] or information was not mailed [n = 4]). From the phone group, patients who were not contacted by an EP but who were mailed information were placed into the mail intervention group (n = 240).

Although it would have been interesting to compare the 2 intervention groups directly with each other, this was not possible because the demographics of these 2 groups were not matched. Consequently, each intervention group was compared only with its matched control group. Future studies that directly compare the effects of phone follow-up and mailed information follow-up on subsequent ED utilization would be useful.

The clerical errors described earlier resulted in imbalanced groups. Therefore, we employed a process in which patients in each of the 2 intervention groups were separately matched to patients who did not receive any intervention. We believe that we alleviated bias from these early sampling errors by our matching and risk-adjusted modeling practices, which resulted in similar populations of patients in the subsequent matched groups (Table 1).

Our study has identified very interesting results. However, given the limitations of the study design, its power, and the differences between the 2 age group cohorts, our conclusions will need further replication.

CONCLUSIONS

We found that ED utilization for low-acuity treat-and-release adult patients with average preintervention ED use patterns was reduced by 22% to 27% when EPs provided simple educational information by phone and/or when information was mailed to patients about non-ED options for managing their future medical care needs. We found that responses to phone and mail interventions varied by patient age, suggesting a role for targeting specific interventions based on age. Identifying the optimal ED patient population for interventions targeting ED utilization for low-risk situations is an area that deserves further study. ■

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Author Affiliations: Department of Emergency Medicine, The Permanente Medical Group, Kaiser Permanente Medical Centers (PBP, DRV), Sacramento and Roseville, CA; Kaiser Permanente Division of Research (DRV, MNG, DAW, PK, VL, GJE), Oakland, CA.

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Address Correspondence to: Pankaj B. Patel, MD, Department of Emergency Medicine, Kaiser Permanente Roseville Medical Center, 1600 Eureka Rd, Roseville, CA 95661. Email: pankaj.patel@kp.org.

REFERENCES

1. Institute of Medicine. *Hospital-Based Emergency Care: At the Breaking Point*. Washington, DC: The National Academies Press; 2006.
2. Bernstein SL, Aronsky D, Duseja R, et al; Society for Academic Emergency Medicine, Emergency Department Crowding Task Force. The effect of emergency department crowding on clinically oriented outcomes. *Acad Emerg Med*. 2009;16(1):1-10. doi: 10.1111/j.1553-2712.2008.00295.x.
3. Sun BC, Hsia RY, Weiss RE, et al. Effect of emergency department crowding on outcomes of admitted patients. *Ann Emerg Med*. 2013;61(6):605-611.e6. doi: 10.1016/j.annemergmed.2012.10.026.
4. Morgan SR, Chang AM, Alqatari M, Pines JM. Non-emergency department interventions to reduce ED utilization: a systematic review. *Acad Emerg Med*. 2013;20(10):969-985. doi: 10.1111/acem.12219.
5. Weinick RM, Burns RM, Mehrotra A. Many emergency department visits could be managed at urgent care centers and retail clinics. *Health Aff (Millwood)*. 2010;29(9):1630-1636. doi: 10.1377/hlthaff.2009.0748.
6. Crocker JB, Crocker JT, Greenwald JL. Telephone follow-up as a primary care intervention for postdischarge outcomes improvement: a systematic review. *Am J Med*. 2012;125(9):915-921. doi: 10.1016/j.amjmed.2012.01.035.
7. Althaus F, Paroz S, Hugli O, et al. Effectiveness of interventions targeting frequent users of emergency departments: a systematic review. *Ann Emerg Med*. 2011;58(1):41-52.e42. doi: 10.1016/j.annemergmed.2011.03.007.
8. Kumar GS, Klein R. Effectiveness of case management strategies in reducing emergency department visits in frequent user patient populations: a systematic review. *J Emerg Med*. 2013;44(3):717-729. doi: 10.1016/j.jemermed.2012.08.035.
9. Flores-Mateo G, Violan-Fors C, Carrillo-Santisteve P, Peiró S, Argimon JM. Effectiveness of organizational interventions to reduce emergency department utilization: a systematic review. *PLoS One*. 2012;7(5):e35903. doi: 10.1371/journal.pone.0035903.
10. Racine AD, Alderman EM, Avner JR. Effect of telephone calls from primary care practices on follow-up visits after pediatric emergency department visits: evidence from the Pediatric Emergency Department Links to Primary Care (PEDLPC) randomized controlled trial. *Arch Pediatr Adolesc Med*. 2009;163(6):505-511. doi: 10.1001/archpediatrics.2009.45.
11. Reid RJ, Johnson EA, Hsu C, et al. Spreading a medical home redesign: effects on emergency department use and hospital admissions. *Ann Fam Med*. 2013;11(suppl 1):S19-S26. doi: 10.1370/afm.1476.
12. Bristow DP, Herrick CA. Emergency department case management: the dyad team of nurse care manager and social worker improve discharge planning and patient and staff satisfaction while decreasing inappropriate admissions and costs: a literature review. *Lippincotts Case Manag*. 2002;7(3):121-128.
13. Mistiaen P, Francke AL, Poot E. Interventions aimed at reducing problems in adult patients discharged from hospital to home: a systematic meta-review. *BMC Health Serv Res*. 2007;7:47. doi: 10.1186/1472-6963-7-47.
14. DeVries A, Li CH, Oza M. Strategies to reduce nonurgent emergency department use: experience of a northern Virginia employer group. *Med Care*. 2013;51(3):224-230. doi: 10.1097/MLR.0b013e3182726b83.
15. Raven MC, Kushel M, Ko MJ, Penko J, Bindman AB. The effectiveness of emergency department visit reduction programs: a systematic review. *Ann Emerg Med*. 2016;68(4):467-483.e15. doi: 10.1016/j.annemergmed.2016.04.015.
16. Reinius P, Johansson M, Fjellner A, Werr J, Ohlén G, Edgren G. A telephone-based case-management intervention reduces healthcare utilization for frequent emergency department visitors. *Eur J Emerg Med*. 2013;20(5):327-334. doi: 10.1097/MEJ.0b013e328358bf5a.
17. Katz EB, Carrier ER, Umscheid CA, Pines JM. Comparative effectiveness of care coordination interventions in the emergency department: a systematic review. *Ann Emerg Med*. 2012;60(1):12-23.e1. doi: 10.1016/j.annemergmed.2012.02.025.
18. Pines JM, Lotrecchiano GR, Zocchi MS, et al. A conceptual model for episodes of acute, unscheduled care. *Ann Emerg Med*. 2016;68(4):484-491.e3. doi: 10.1016/j.annemergmed.2016.05.029.
19. Goodman RM. ED use associated with primary care office management. *Am J Manag Care*. 2013;19(5):e185-e196.
20. Emergency Severity Index (ESI): a triage tool for emergency department. Agency for Healthcare Research and Quality website. ahrq.gov/professionals/systems/hospital/esi/esi1.html. Published November 2012. Updated November 2014. Accessed April 5, 2018.
21. Jones JS, Young MS, LaFleur RA, Brown MD. Effectiveness of an organized follow-up system for elder patients released from the emergency department. *Acad Emerg Med*. 1997;4(12):1147-1152. doi: 10.1111/j.1553-2712.1997.tb03698.x.
22. Dudas V, Bookwalter T, Kerr KM, Pantilat SZ. The impact of follow-up telephone calls to patients after hospitalization. *Am J Med*. 2001;111(9B):26S-30S. doi: 10.1016/S0002-9343(01)00966-4.
23. Patel PB, Vinson DR. Emergency physicians seek...and are finding their place. *Ann Emerg Med*. 2016;68(3):397-398. doi: 10.1016/j.annemergmed.2016.05.005.
24. Gordon NP. Similarity of the adult Kaiser Permanente membership in Northern California to the insured and general population in Northern California: statistics from the 2011 California health interview survey. Kaiser Permanente website. divisionofresearch.kaiserpermanente.org/projects/memberhealthsurvey/SiteCollectionDocuments/chis_non_kp_2011.pdf. Published June 19, 2015. Accessed April 5, 2018.
25. Selevan J, Kindermann D, Pines JM, Fields WW. What accountable care organizations can learn from Kaiser Permanente California's acute care strategy. *Popul Health Manag*. 2015;18(4):233-236. doi: 10.1089/pop.2014.0157.
26. Pines J, Selevan J, McStay F, George M, McClellan M. Kaiser Permanente – California: a model for integrated care for the ill and injured. The Brookings Institution website. brookings.edu/wp-content/uploads/2016/07/KaiserFormatted_150504RH-with-image.pdf. Published May 4, 2015. Accessed April 5, 2018.
27. Silvestre AL, Sue VM, Allen JY. If you build it, will they come? the Kaiser Permanente model of online health care. *Health Aff (Millwood)*. 2009;28(2):334-344. doi: 10.1377/hlthaff.28.2.334.
28. Conolly P, Levine L, Amaral DJ, Fireman BH, Driscoll T. TPMG Northern California appointments and advice call center. *J Med Syst*. 2005;29(4):325-333.
29. Escobar GJ, Gardner MN, Greene JG, Draper D, Kipnis P. Risk-adjusting hospital mortality using a comprehensive electronic record in an integrated health care delivery system. *Med Care*. 2013;51(5):446-453. doi: 10.1097/MLR.0b013e3182881c8e.
30. Auerbach AD, Kripalani S, Vasilevskis EE, et al. Preventability and causes of readmissions in a national cohort of general medicine patients. *JAMA Intern Med*. 2016;176(4):484-493. doi: 10.1001/jamainternmed.2015.7863.
31. Escobar GJ, Ragins A, Scheirer P, Liu V, Robles J, Kipnis P. Nonelective rehospitalizations and postdischarge mortality: predictive models suitable for use in real time. *Med Care*. 2015;53(11):916-923. doi: 10.1097/MLR.0000000000000435.
32. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with *ICD-9-CM* administrative databases. *J Clin Epidemiol*. 1992;45(6):613-619. doi: 10.1016/0895-4356(92)90133-8.
33. Package 'designmatch.' R Project website. cran.r-project.org/web/packages/designmatch/designmatch.pdf. Updated May 1, 2017. Accessed April 5, 2018.
34. Hardin JW, Hilbe JM. *Generalized Linear Models and Extensions*. 3rd ed. College Station, TX: Stata Press; 2012.
35. Pines JM, Keyes V, van Hasselt M, McCall N. Emergency department and inpatient hospital use by Medicare beneficiaries in patient-centered medical homes. *Ann Emerg Med*. 2015;65(6):652-660. doi: 10.1016/j.annemergmed.2015.01.002.
36. Telehealth: helping hospitals deliver cost-effective care. American Hospital Association website. aha.org/content/16/16telehealthissuebrief.pdf. Published April 22, 2016. Accessed April 5, 2018.
37. Nota SP, Strooker JA, Ring D. Differences in response rates between mail, e-mail, and telephone follow-up in hand surgery research. *Hand (N Y)*. 2014;9(4):504-510. doi: 10.1007/s11552-014-9618-x.
38. Garcia I, Portugal C, Chu L-H, Kawatkar AA. Response rates of three modes of survey administration and survey preferences of rheumatoid arthritis patients. *Arthritis Care Res (Hoboken)*. 2014;66(3):364-370. doi: 10.1002/acr.22125.
39. Newitz E. Email is the new generation gap. Gizmodo website. gizmodo.com/email-is-the-new-generation-gap-1743697716. Published November 27, 2015. Accessed April 5, 2018.
40. Weiss S. Generation gap: how technology has changed how we talk about work. *Forbes*. May 16, 2012. forbes.com/sites/ciocentral/2012/05/16/generation-gap-how-technology-has-changed-how-we-talk-about-work. Accessed April 5, 2018.
41. Anderson M. For vast majority of seniors who own one, a smartphone equals "freedom." Pew Research Center website. www.pewresearch.org/fact-tank/2015/04/29/seniors-smartphones. Published April 29, 2015. Accessed April 5, 2018.
42. Horevoorts NJE, Vissers PAJ, Mols F, Thong MSY, van de Poll-Franse LV. Response rates for patient-reported outcomes using web-based versus paper questionnaires: comparison of two invitational methods in older colorectal cancer patients. *J Med Internet Res*. 2015;17(5):e111. doi: 10.2196/jmir.3741.
43. Rainie L. Senior citizens and digital technology. Pew Research Center website. pewinternet.org/2012/09/15/senior-citizens-and-digital-technology. Published September 15, 2012. Accessed April 5, 2018.
44. Narasimha S, Madathil KC, Agnisarman S, et al. Designing telemedicine systems for geriatric patients: a review of the usability studies. *Telemed J E Health*. 2017;23(6):459-472. doi: 10.1089/tmj.2016.0178.
45. Poncia HD, Ryan J, Carver M. Next day telephone follow up of the elderly: a needs assessment and critical incident monitoring tool for the accident and emergency department. *J Accid Emerg Med*. 2000;17(5):337-340. doi: 10.1136/emj.17.5.337.
46. Johnson TL, Rinehart DJ, Durfee J, et al. For many patients who use large amounts of health care services, the need is intense yet temporary. *Health Aff (Millwood)*. 2015;34(8):1312-1319. doi: 10.1377/hlthaff.2014.1186.

eAppendix A. Phone Script

Template for calling patients who have visited ED without having called AACC first

- Do not call any patient who is currently in the hospital or in the ED at time of call.
- Do not call if the patient is known to you, i.e. friend, family, KP nurse, KP doctor, etc. (avoid HIPAA issues!).

"Hello, my name is _____. I am calling from Kaiser Permanente about _____[patient's name]. May I speak to _____ [patient's name]?"

- Patient reached (or person with Durable Power of Attorney for patient) – Continue to #1 below.

- If patient not available, ask when you can call back and document the date and time for next call _____. Do not leave specific information about the study with anyone but the participant.

- If answering machine or voicemail reached: "**I am calling from Kaiser Permanente for _____[patient's name]. Please call me back at _____. Thank you.**" (**Do not identify yourself as doctor**)

- **Note:** if the family member tells you that the patient died, please check below. Do not ask family member this question**;** they are likely to volunteer this information at the beginning**.** If the patient died, do not continue with the telephone call. Offer sympathies to the family member and then respectfully end the telephone call.

  ☐ Patient died: *** End Call ***

- If the family member or patient ask additional questions regarding the medical care of the patient in the ED, please inform them that this is only a telephone survey about available KP services and that you are unable to provide them with medical information. Medical questions should be managed by directing the patient to their own primary care physician, referral to the ED, or by calling the AACC (xxx-xxx-xxxx). If the family member requests additional information, then please provide the family/friend with the number to Patient Member Services: 1-800-xxx-xxxx. Also, inform Dr. Y, the PI, about this contact as soon as possible.

- Patient demented or hearing impaired – *** End Call ***

- See the contact code information on telephone log

UPON REACHING THE PATIENT:

1. "I am calling patients who were seen in the Emergency Room recently. I would like to tell you about a study we are conducting which will provide you with information about medical services that are available to you through KP for your future medical care. It is your choice to participate or not and there are no charges involved. Whether or not you agree to participate in this telephone study, it will not affect you or your

family's care in any way. If you do participate, you do not have to answer any questions that you don't want to answer. All of your answers will be kept confidential and will only be grouped with responses by 600 other members in the study. The information will not go to your doctor, to the health plan, or into your medical record. If you have any questions or concerns about participating in this phone study, I will be happy to answer them now or at any other time and I can give you a phone number to contact our IRB (Institutional Review Board) or Dr. Y, the study's principle investigator. At the end of this call, I will mail you information about the services I describe to you now. The call should take about five to ten minutes."

"Do you consent to participating?"

☐ No – "Thank you for your consideration." *** End Call ***

☐ Yes. Proceed with the next steps.

2. **"Do you know about our Appointment and Advice Call Center?"**

☐ No – go to #3 below and check reason: "Unaware of AACC services" (item #6 below**).

☐ Yes – You may choose to ask this question now, or after you have reviewed information about the call center and KP.org. **"Please tell me why you did not call the call center?"** (Choose all that apply, then go to #3 to give information about AACC services. In some cases, the patient was referred to the ED by their PCP or by EPRP or brought by ambulance – if so, note this.)

1. I did not have the phone number
2. I did not have access to a phone
3. I did not think they could help me with the type of medical concern that I had
4. My medical concern was so urgent that I did not have time to call (e.g. severely injured)
5. I prefer to get medical care directly from the emergency department
6. **Unaware of AACC services****
7. Other: _____
8. Referred to ED by another health provider

3. "Our Call Center offers many services that can help you in the future if you have a medical problem. Here are the services available to you through the call center:
   a. 24/7 nurses/physicians available: We have trained nurses and emergency physicians who work here 24/7 who can review your symptoms and provide you with medical advice and recommendations on how best to manage those symptoms.
   b. Urgent appointments: We can book an urgent appointment for you with your doctor, either as a regular clinic appointment, or as a telephone appointment, where a physician will call you to review your medical problem.
   c. Messages to your doctor: We can send messages to your regular doctor, who can then follow up with you to provide further advice and recommendations.
   d. Telephone treatments: We have over 30 conditions/medical problems for which we can treat you over the telephone, getting prescriptions to your pharmacy that you can pick up without having to make an appointment with your doctor. Examples of these medical conditions include:

- Urinary tract infections
- Conjunctivitis (pink eye)
- Vomiting
- Upper respiratory infections/sinusitis"

4. **"Are you enrolled on KP.ORG?"** (Check KPHC if enrolled on KP.ORG)

   ☐ Yes – **"Would you like me to review the benefits of this system?"**

   ☐ No – "If you register for this service, you can do many things to help you manage your health better. It is completely free and easy to sign up for – you just go to www.kp.org and follow the instructions, get a personal account, and create your own password. Here are some of the things you can do through KP.org:
   - Email your doctor directly through secure messaging, privately and confidentially.
   - Appointment booking – you may book your own appointment with your doctor.
   - Prescription refills – you may get refills on your prescriptions (except for controlled substances)
   - Medication list – you can review your own list of medications to make sure it is accurate.
   - Lab results – you can review your own lab results.
   - Medical information – you can review information about a wide variety of medical symptoms and diseases.
   - Podcasts – we have numerous podcasts about various medical topics that you may review."

5. **"Would you like us to send information to you about the various services I have described to your home address listed on your record?"**
   ☐ No.
   ☐ Yes.
   Send the file of patient names and home addresses to _____, highlighting those patients you have contacted and who have agreed to accept this mailed information.

6. **"Now that you know about the services that are available through our Call Center, do you think you will you call us the next time you have a medical problem?"**

   ☐ Yes – "Our Call Center telephone number is: xxx-xxx-xxxx. We will be here to help address your medical questions. Call us the next time you have a medical problem that you would like us to help you manage."

   ☐ No – **"Please tell me why not?"**

7. **Do you have any questions for comments for me?**

Appendix B - Phone Log

				Question 1: Will patient participate? If not, is there a better time to call back?				CONTACT CODE		CONTACT CODE		CONTACT CODE							Question 2: Why did you not call the call center before your visit to the ED?	Question 3: See template for info about the services that the call center provides	Question 4. Are you enrolled on KP.org? We want to know if patient is on KP.org per HealthConnect AND if the patient knows himself/herself that they are on KP.org "Per KPHC" - Check KPHC to see if the patient is on KP.org "Per Patient" - ask patient if he/she is on KP.org Review benefits of KP.org			Question 5. Would you like us to send information to you about the various services we described to the home address listed on your record. Send MRI# for patients who would like to receive letter in mail to Pankaj Patel, PI	Question 6. Now that you know about the services that are available through our call center, do you think you will call us the next time you have a medical problem and are considering going to the emergency room?		Question 7. Do you have any questions for me that I can answer?	
								RR	Reached Respondent	RR	Reached Respondent	RR	Reached Respondent																	
								CB	Call Back	CB	Call Back	CB	Call Back																	
								NH	Respondent Not Home	NH	Respondent Not Home	NH	Respondent Not Home																	
								NA	No Answer	NA	No Answer	NA	No Answer																	
								BZ	Busy Tone	BZ	Busy Tone	BZ	Busy Tone																	
								AM	Answering Machine	AM	Answering Machine	AM	Answering Machine																	
								DC	Disconnected	DC	Disconnected	DC	Disconnected																	
								WN	Wrong Number	WN	Wrong Number	WN	Wrong Number																	
								BC	Blocked Call	BC	Blocked Call	BC	Blocked Call																	
								DP	Durable Power of Attorney	DP	Durable Power of Attorney	DP	Durable Power of Attorney																	
								CG	Care giver	CG	Care giver	CG	Care giver																	
																		INTERVIEW CODE												
																		CI	Completed Interview											
																		PI	Partial Interview											
	MRN	Patient Name	call done or don't call	Better time to call? Yes/No	Date and Time to call back	MD/RN comments	FAILED ATTEMPT 1			FAILED ATTEMPT 2			FAILED ATTEMPT 3			SUCCESSFUL ATTEMPT					List #'s from above	other - enter reasons		Is patient on KP.org? Per KPHC Yes/No	Per Patient Yes/No	review KP.org? Yes/No	Mail information Yes/No	Will you call next time? Yes/No	If no, why not?	Patient questions? Yes/No	Details
							Date	Time Called	Contact Code	Date	Time Called	Contact Code	Date	Time Called	Contact Code	Date	Time Called	Time Ended	Length of call	Interview Code											
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			call done or don't call	Better time to call? Yes/No	Date and Time to call back	MD/RN comments	FAILED ATTEMPT 1			FAILED ATTEMPT 2			FAILED ATTEMPT 3			SUCCESSFUL ATTEMPT					List #'s from above	other - enter reasons	Call center services	Is patient on KP.org? Per KPHC Yes/No	Per Patient Yes/No	review KP.org? Yes/No	Mail info to you? Yes/No	Will you call next time? Yes/No	If no, why not?	Patient questions? Yes/No	Details
							Date	Time Called	Contact Code	Date	Time Called	Contact Code	Date	Time Called	Contact Code	Date	Time Called	Time Ended	Length of call	Interview Code											

eAppendix C. Information Letter Phone Group

KAISER PERMANENTE®

Date

I appreciate the recent opportunity to speak with you on the telephone about the Kaiser Permanente appointment and advice line and about the KP.org website. As we discussed, I am sending to you further information that I hope will help with any future medical problems you may have.

Appointments and advice

When you or a loved one has an illness or injury, you probably want to get it taken care of right away. We can help – whether it's day or night. For care in your area, including in-person appointments, telephone appointments, and advice, please call our appointment and advice line for your medical care needs* 24 hours a day, seven days a week: **xxx-xxx-xxxx**. We'll discuss your situation and help you decide what type of care may be right for you with these helpful services:

- An advice nurse (and/or an emergency physician) to help answer your questions.
- A telephone visit with a doctor.
- A convenient same-day office appointment.
- An after-hours or weekend appointment.
- An emergency department visit if needed.

Save time. Get your answers from home with KP.org

I have enclosed information about **KP.org** ("***Anytime.Anywhere***") that will allow you to take advantage of numerous services that are available to you through the online "My Health Manager" program. Registering for this program is safe and secure, as only **YOU** may access it with your own personalized password. I highly encourage you to register for this program, if you are not on KP.org already, so that you may start using My Health Manager right away.

Thank you again for talking with me. I hope that this information will enhance your care experience when you have future medical needs.

Healthfully yours,

Marcus Welby, MD

Emergency Room Physician
Kaiser Permanente Appointment and Advice Call Center

*Note: If you have an emergency medical condition, call 911 or go to the nearest hospital. An emergency medical condition is any of the following: (1) a medical condition that manifests itself by acute symptoms of sufficient severity (including severe pain) such that you could reasonably expect the absence of immediate medical attention to result in serious jeopardy to your health or body functions or organs, (2) active labor when there isn't enough time for safe transfer to a Plan hospital (or designated hospital) before delivery, or if transfer poses a threat to your (or your unborn child's) health and safety, or (3) a mental disorder that manifests itself by acute symptoms of sufficient severity such that either you are an immediate danger to yourself or others, or you are not immediately able to provide for, or use, food, shelter, or clothing, due to the mental disorder.

eAppendix D. Information Letter Mail Group

KAISER PERMANENTE®

Date

Appointments and advice

When you or a loved one has an illness or injury, you probably want to get it taken care of right away. We can help – whether it's day or night. For care in your area, including in-person appointments, telephone appointments, and advice, please call our appointment and advice line for your medical care needs* 24 hours a day, seven days a week: **xxx-xxx-xxxx**. We'll discuss your situation and help you decide what type of care may be right for you with these helpful services:

- An advice nurse (and/or an emergency physician) to help answer your questions.
- A telephone visit with a doctor.
- A convenient same-day office appointment.
- An after-hours or weekend appointment.
- An emergency department visit if needed.

Save time. Get your answers from home with KP.org

We have enclosed information about **KP.org** ("***Anytime.Anywhere***") that will allow you to take advantage of numerous services that are available to you through the online "My Health Manager" program. Registering for this program is safe and secure, as only **YOU** may access it with your own personalized password. We highly encourage you to register for this program, if you are not on KP.org already, so that you may start using My Health Manager right away.

We hope that this information will enhance your care experience when you have future medical needs.

Healthfully yours,

Marcus Welby, MD

Emergency Physician
Kaiser Permanente Appointment and Advice Call Center

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eAppendix E. Inclusion and Exclusion Criteria for Study Patients

Inclusion Criteria

- Adult patients ≥18 years
- Members of KFHP
- Low-acuity treat-and-release from 1 of 6 study EDs
- Between October-November 2014
- No contact with Call Center within 24 hours of ED visit
- LAPS2 score less than 50 at time of ED visit
- Discharge from ED to home

Exclusion Criteria

- Patients who left ED against medical advice
- Discharged to skilled nursing facility or other long-term acute care facility
- Transferred out to a non-health plan facility
- Non-English-speaking
- Unable to respond to questions, or no family member or guardian
- Deceased
- Pediatric patients (<18 years)

eAppendix F. Pre- and Post-Intervention Data Figures 3a, 3b, 4a, 4b, 5a, 5b

Figure 3a. Pre-intervention ED visit utilization. ED visit utilization of 9093 patients in the 6 months prior to study interventions. The y-axis represents number of patients. The x-axis represents the number of ED visits. The vast majority of patients (almost 6500) had zero ED visits, with 1500 patients having just 1 ED visit, and just over 500 patients having 2 ED visits, in the 6-month period before study interventions. The dots above the x-axis represent the presence of at least one patient for that value (ie, one patient had 43 ED visits, one patient had 39 ED visits, one patient had 35 ED visits, etc). Where there is no dot, no patients had visits in that range.

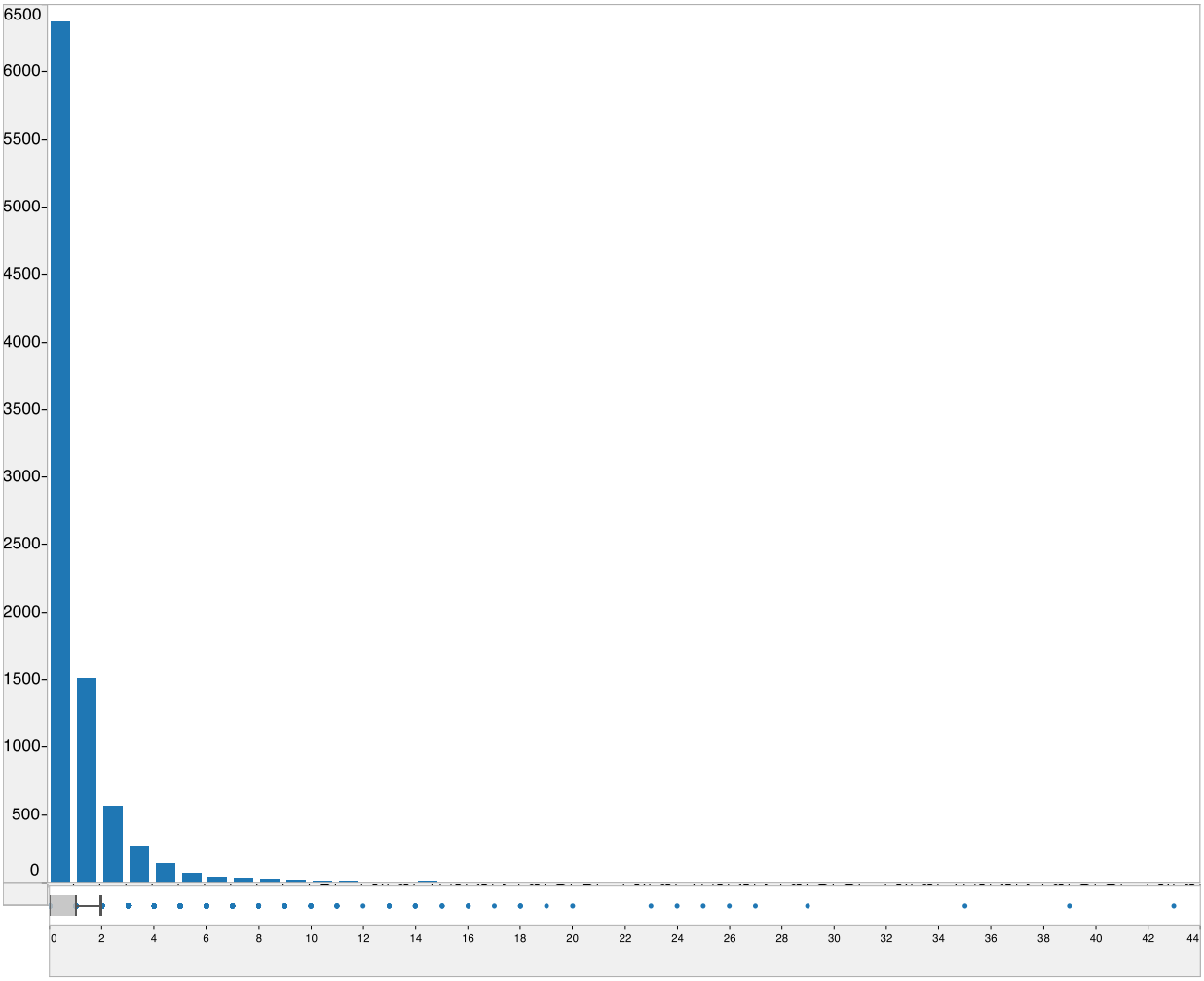
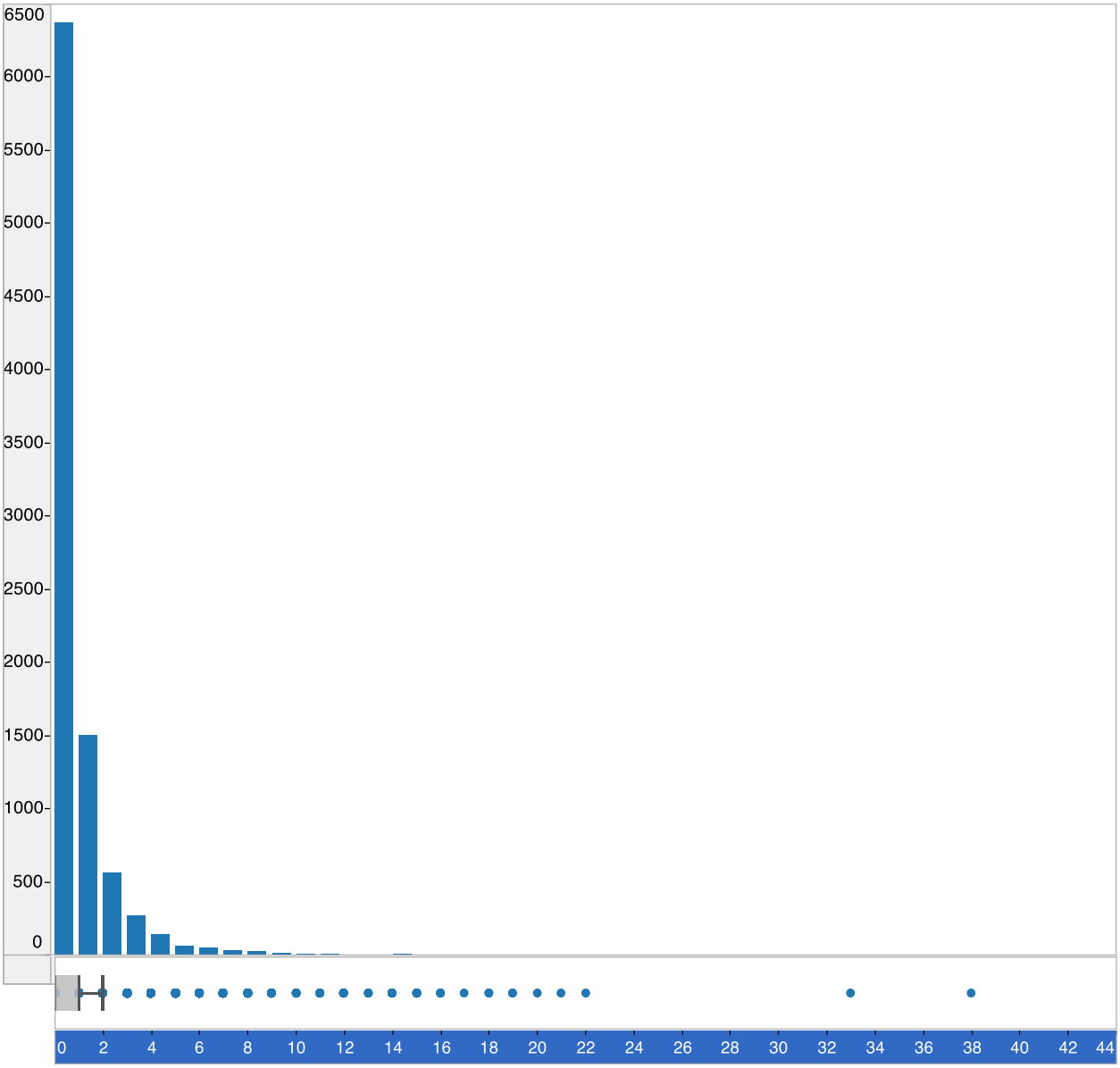


Figure 3b. Post-intervention ED visit utilization. ED utilization is shown for the 6 months after study interventions. Similar to the pre-study ED visit utilization pattern, the vast majority of the 9093 study patients had fewer than 2 ED visits following study interventions.



<u>Figure 4a. Pre-intervention AACC utilization</u>. The y-axis represents number of patients; the x-axis represents the number of days that a patient had contacted the Advice and Appointment Call Center. Almost 6000 of the 9093 study patients had ≤2 contact days with the AACC. As a patient may have called the AACC more than once on a given day, each day that a patient called the AACC was considered a single contact day, regardless of how many times a patient spoke with someone at the AACC on a given day.

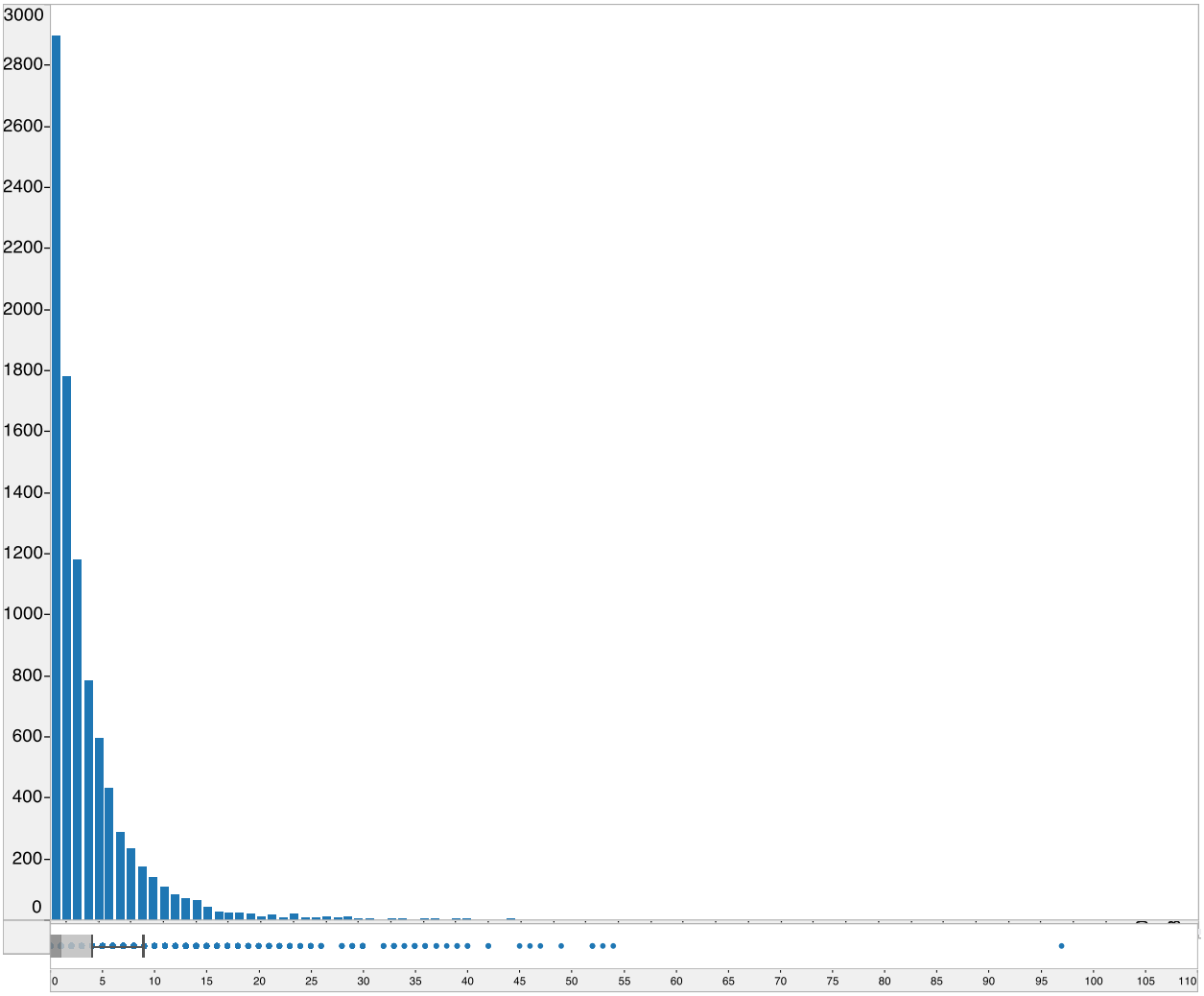
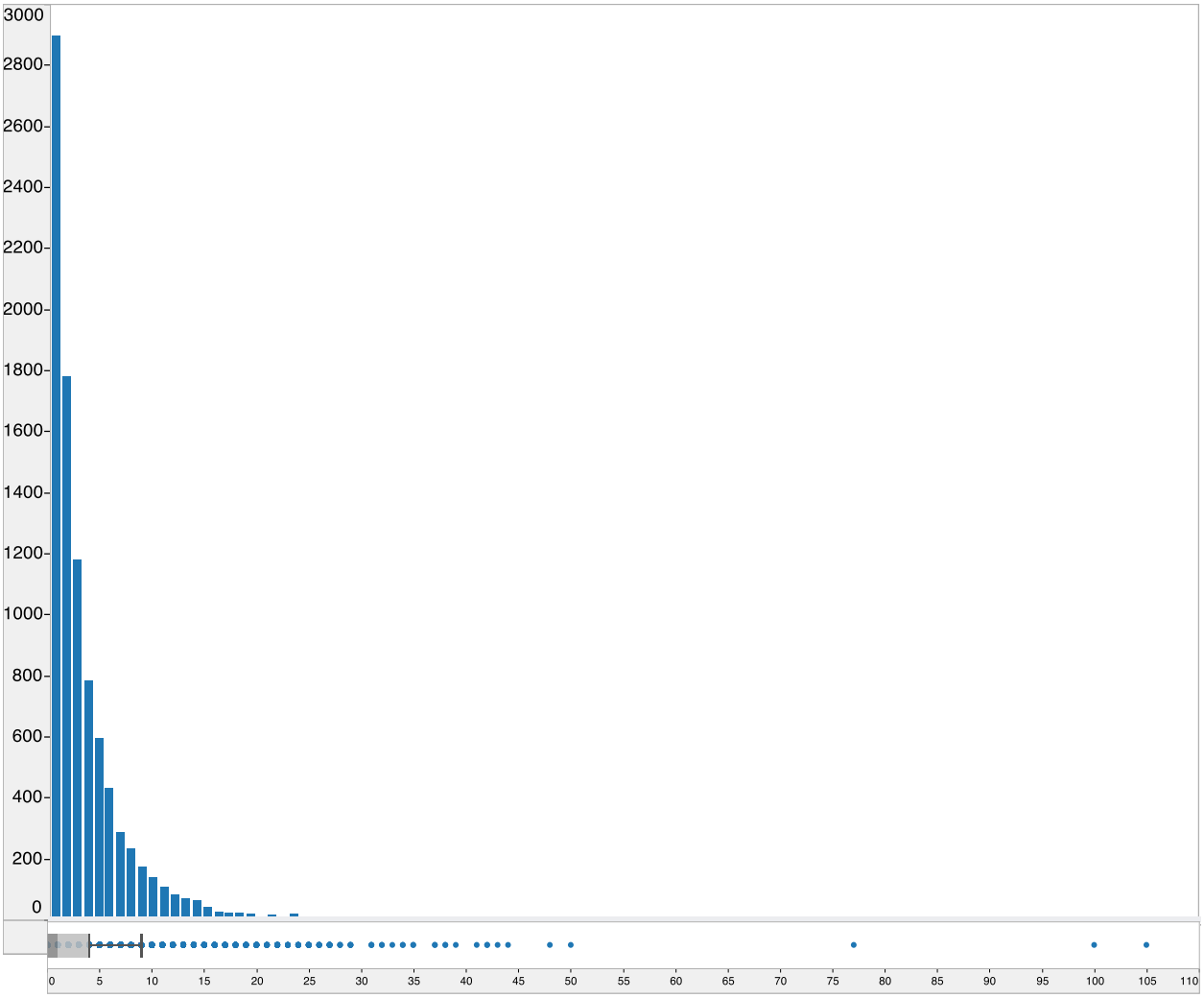
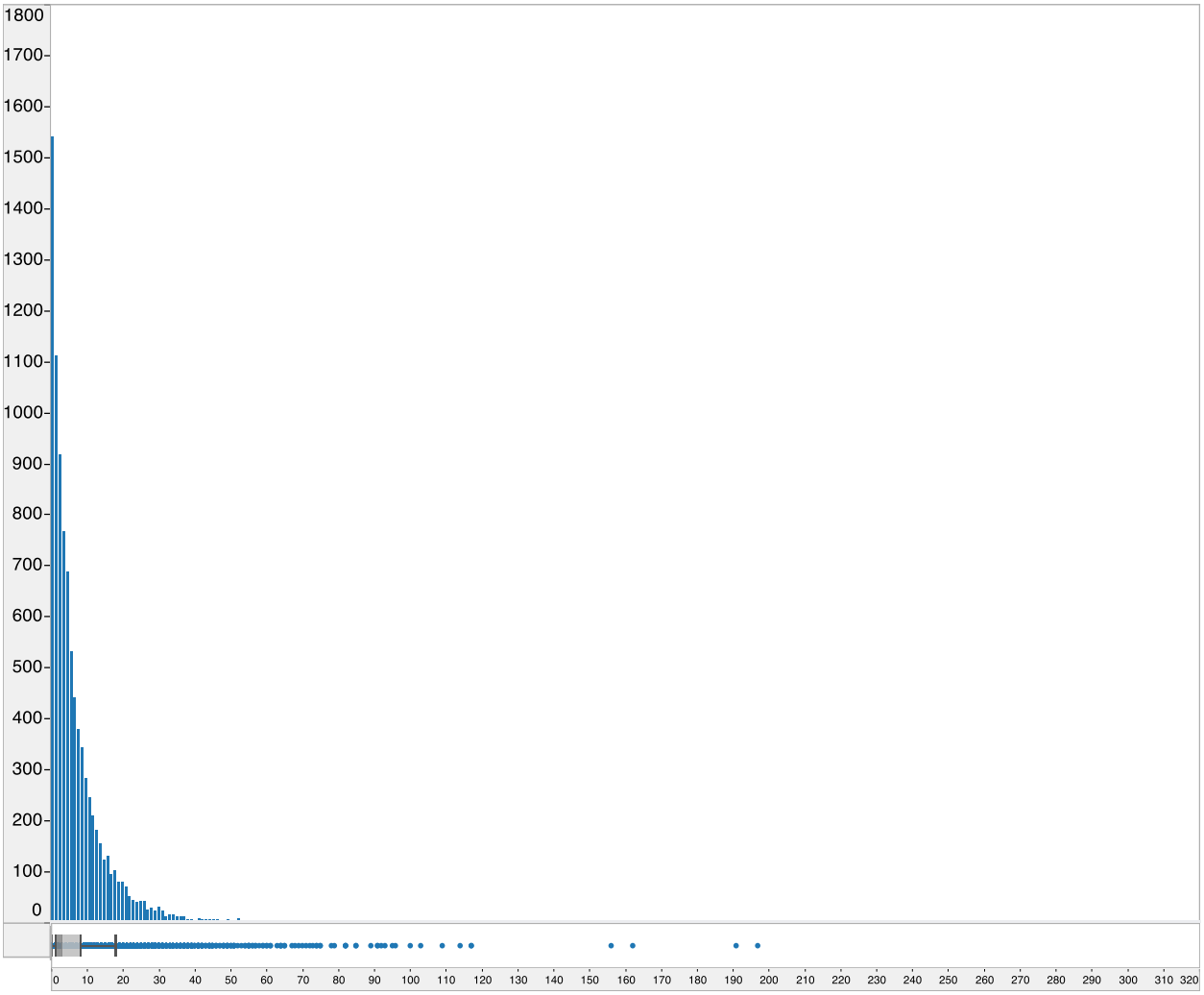


Figure 4b. Post-intervention AACC utilization. Almost 6000 of the 9093 study patients had ≤2 contact days with the Advice and Appointment Call Center after study interventions, similar to the pre-study pattern.



<u>Figure 5a. Pre-intervention outpatient utilization</u>. The y-axis represents number of patients; the x-axis represents the number of contacts a patient had with the outpatient department. As can be seen, almost 4000 patients had ≤2 contacts with the outpatient department in the 6-month period of time prior to the study. A patient may have had a telephone appointment, followed by an office visit on the same day. Consequently, each day the patient was in touch with the outpatient department was considered a single contact day, regardless of the number of actual "visits".



<u>Figure 5b. Post-intervention outpatient utilization</u>. A majority of patients (3500) had ≤2 outpatient contacts during the 6-month period of time after study interventions, similar to the pre-study period pattern.