The Role of Patients and Providers in the Timing of Follow-up Visits

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OBJECTIVE: Although the decision about how frequently to see outpatients has a direct impact on a provider's workload and may impact health care costs, revisit intervals have rarely been a topic of investigation. To begin to understand what factors are correlated with this decision, we examined baseline data from a Department of Veterans Affairs (VA) Cooperative Study designed to evaluate telephone care.

DESIGN: Observational study based on extensive patient data collected during enrollment into the randomized trial. Providers were required to recommend a revisit interval (e.g., "return visit in 3 months") for each patient before randomization, under the assumption that the patient would be receiving clinic visits as usual.

POPULATION/SETTING: Five hundred seventy-one patients over age 55 cared for by one of the 30 providers working in three VA general medical clinics. Patients for whom immediate follow-up (≤ 2 weeks) was recommended were excluded.

MEASUREMENTS: Mean revisit interval was adjusted for patient factors using a regression model that accounted for patients being nested within providers and providers being nested within sites. Four patient-level variable blocks (illness burden-patient, travel time, illness burden-physician, and prior utilization) were sequentially entered into a linear model to determine their role in explaining the variance in revisit intervals. Physician identity was also entered after four blocks.

MAIN RESULTS: Recommended revisit intervals ranged from 1 month to over 1 year with the most common recommended intervals being 2, 3, or 6 months. About 10% of the variance in revisit interval was explained by illness measures independent of provider (e.g., general health perception) and travel time. Adding other illness measures (e.g., diagnoses, medications) and prior utilization (e.g., clinic visits) doubled the variance explained ($R^2 = .21$). Finally, the identification of in-

dividual provider doubled the explained variance again ($R^2 = .45$). After adjusting for patient factors, the average revisit interval for individual providers ranged from 8 to 26 weeks (8 to 19 weeks when restricted to the 16 staff physicians). There were also substantial differences across the three sites (adjusted means: 14, 17, and 11 weeks).

CONCLUSIONS: Even after adjusting for a detailed array of patient-level data, primary care providers have different practice styles regarding the timing of return visits. These may, in turn, reflect the local "culture" in which they practice. How many patients providers are able to care for may be determined by the providers' inclinations toward the timing of follow-up visits.

KEY WORDS: outpatients; follow-up visits; revisit interval.
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One decision is common to all outpatient encounters involving longitudinal care. It has a direct impact on a provider's workload and a potentially powerful impact on both health care costs and outcomes. Yet, it is a decision about which providers receive little training and the effect of which is unknown. The decision is deceptively simple—when to see this patient again.

The determination of the revisit interval (e.g., "return to clinic in 3 months") is a remarkably unexplored area in medicine. Much of the literature is either reported in abstracts,¹⁻⁴ or comes from the dental profession.⁵⁻⁸ Although complex mathematical models have been developed to help standardize revisit intervals for two discrete clinical settings (patients with bladder cancer⁹ or receiving warfarin¹⁰) we know of no efforts to standardize revisit intervals for more common conditions, and there are good reasons to believe that completing such a task will be difficult. Despite some evidence that providers base the revisit interval on a patient's blood pressure,^{11,12} there was little agreement among providers asked about the length of the revisit interval they would recommend for various levels of hypertension.¹³ This lack of consensus was even more evident when providers were given clinical vignettes of patients with common ambulatory care conditions.¹⁴

To begin to explore the sources of variability in revisit intervals, we examined the patient intake data from the Department of Veterans Affairs (VA) Cooperative Study of Telephone Care. The study subjects were established patients (aged 55 years or older, predominately male) who were appearing for a previously scheduled general medical clinic visit. In addition to extensive intake data, all providers recorded the one piece of information that was central to the intervention—their recommendation about the timing for the subsequent visit.

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METHODS

Design

Overview of the VA Cooperative Study of Telephone Care. The data analyzed here are from the ongoing VA Cooperative Study of Telephone Care. This is a randomized trial comparing routine clinical care with telephone care, in which provider-initiated telephone calls are scheduled to replace selected face-to-face visits. Figure 1 depicts the protocol for the study, which was modeled after the seminal investigation by Wasson et al.¹⁵ Briefly, providers recommend a revisit interval (e.g., 3 months) prior to randomization. Patients randomized to clinic care were scheduled to return using the recommended revisit interval. For patients randomized to telephone care, the recommended revisit interval was doubled (e.g., 6 months). In the interim, three “telephone appointments” were scheduled. At subsequent visits, providers are encouraged to lengthen the revisit interval given that three additional telephone appointments will be scheduled. The primary outcomes of the study are cost and self-assessed health status at 2 years. In this article, we report on the study’s intake data at the three sites and investigate the factors explaining the recommended revisit interval.

Provider and Patient Selection. Ten primary care providers were recruited at each of three sites. We stipulated the number of providers to be recruited within each provider type (e.g., staff physician, physician assistant) to match their relative contribution to overall outpatient workload at the site (i.e., if 50% of the visits were performed by staff physicians in a site, five staff physicians were recruited for the study). This allocation process resulted in the following distribution of provider types across the three sites: 16 staff physicians (all of whom were board-certified internists), 4 medical residents, 1 osteopathic resident, 6 nurse practitioners, and 3 physician assistants.

Only patients who were appearing for a previously scheduled general medical clinic appointment were recruited. A research assistant determined the patient’s eligibility immediately prior to the clinic visit, and the provider applied the exclusion criteria during the course of the routine visit. Patients who had a telephone, were aged 55 years or older, and had been seen in the clinic at least

once in the previous 8 months were eligible. Patients who had uncontrolled hypertension (systolic blood pressure above 170 or a diastolic blood pressure above 100), who had to come to clinic for routine injections or monitoring (e.g., for anticoagulation), or who were unable to complete data collection forms were excluded. In addition, any patient for whom the provider believed a subsequent visit was needed within 2 weeks was excluded. Finally, before randomization, providers were given the option to exclude any patient for whom they thought telephone care was inappropriate. Of eligible patients 95% consented to participate in the randomized trial.

Data

Recommended Revisit Interval. All data presented here were obtained during the intake visit of the VA Cooperative Study of Telephone Care. At the end of the visit, the provider stipulated his or her recommendation for follow-up (e.g., “return to clinic in 3 months”). Revisit intervals could be expressed in either weeks or months (each month was calculated as being 4 weeks). Because this recommendation was made before the randomization, the decision about the return interval was independent of the subsequent study group assignment.

Patient-Level Data. Baseline patient data came from three sources. The VA’s Decentralized Hospital Computer Program provided information about prior utilization (number of outpatient visits and number of hospitalizations). At the intake visit, providers were asked to record information about specific diagnoses and all medications for each patient. Finally, the patients completed an extensive survey at entry that included information about general demographic factors, their geographic access to clinic, and their self-assessed health status. The latter was accomplished using the Medical Outcomes Study’s 36-Item Short Form Health Summary, which was summarized using its two major component scales: the physical component score (PCS) and the mental health component score (MCS).¹⁶

Patient-level variables were assigned to one of four blocks. The rationale for each and the variables included were as follows:

FIGURE 1. Overview of the study design of the VA Cooperative Study of Telephone Care.

Block 1: Illness burden–patient. Demographic and illness measures that are independent of the provider were included in this block. These were age, gender, ethnic background, income, employment status, living situation, systolic and diastolic blood pressure, two general health perception questions (how is your health now, and how is it compared with a year ago), and the PCS and MCS.

Block 2: Travel time. Self-reported time spent traveling between home and VA clinic was included in this block (also included as a quadratic term).

Block 3: Illness burden–provider. Illness measures that are assessed by the provider (i.e., those that may, in part, reflect provider practice style) were included in this block. These were the number of current diagnoses, the number of current medications, and dichotomous variables for one of six disease categories that are common among veterans (angina or congestive heart failure, anxiety or depression, chronic obstructive pulmonary disease, degenerative arthritis, diabetes, and hypertension).

Block 4: Prior utilization. Measures of prior health care utilization, also partly a reflection of provider practice style, were included in a separate block. Two variables were included: the number of outpatient visits to any clinic during the previous 8 months (also included as a quadratic term) and the number of hospitalizations during the previous 2 years.

Analysis

Our analysis had two goals. First, we wanted to determine the role of patient factors in the determination of revisit intervals and to examine the effect of individual providers. Second, we wanted to calculate the mean revisit intervals for individual providers after adjusting for patient factors.

Variance Explained. In order to account for the grouping of patients within provider (revisit intervals may be more similar within providers than across providers), we developed linear regression models using the robust variance estimator (Stata Statistical Software release 5.0, Stata Corp., College Station, Tex, 1997). The unit of analysis was the patient; the recommended revisit interval was the dependent variable (using a log transformation because of skew). Variable selection was accomplished using forward stepwise regression ($p < .15$ to enter, $p > .30$ to exit).

Our modeling strategy was to determine the relative importance of purely patient factors before we considered factors over which the provider has some influence. We were interested in learning, for example, about the contribution of a patient's self-assessed health status before considering the role of how many medications he was prescribed or whether he had been given a specific diagnosis. Thus, stepwise regression was first performed using variables in block 1. Variables selected from block 1 were then locked into the model before variables in block 2 were made available for selection, and so on. We consid-

ered explanatory power of the block using the coefficient of determination (R^2). Although the interpretation of the R^2 in this form of regression is the subject of some debate, we continue to use the conventional interpretation as the models are essentially the same as those obtained using ordinary regression. This strategy allowed the total explanatory power of measures that are independent of the provider (blocks 1 and 2) to be determined before considering measures that may in part reflect the provider's practice style (blocks 3 and 4). As a final step, we entered dummy variables to represent the 30 providers (10 at each site). Given the heterogeneity in provider type, we repeated the entire modeling process restricted to the 252 patients cared for by the 16 staff physicians.

Adjusted Provider Means. In order to account for the hierarchical effects (i.e., patients are nested within providers, and providers are nested within sites), we then developed a mixed effect model to calculate adjusted provider means (SAS Procedures Guide, version 6.12, SAS Institute Inc., Cary, NC, 1996). The patient-level variables selected in the stepwise regression process described above were modeled as fixed effects. The individual providers were modeled as random effects. A provider's adjusted mean was calculated by solving the regression equation using the means for the patient-level variables and the provider-specific (and site-specific) coefficient. The adjusted means (see Fig. 3) can be interpreted as what the individual providers' means would have been were they each caring for the same panel of "average" patients.

RESULTS

Table 1 details the characteristics of 571 patients enrolled in the study. As expected, the study patients were overwhelmingly elderly men, reflecting both the study entry criteria (aged 55 years or older) and the gender distribution of older veterans. Their mean PCS was slightly lower (implying worse physical function) than the mean score for American men over age 65 (39.8 vs. 42.0) while their mean MCS was slightly higher (57.1 vs. 52.5).¹⁶ Figure 2 depicts the distribution of recommended revisit intervals, which ranged from 1 month (patients for whom the provider felt a return visit was needed within 2 weeks were ineligible) to 1 year. The most common intervals recommended were 2, 3, and 6 months. Figure 2, however, also highlights that each site had a different distribution.

The univariate relations between the categorical variables and recommended revisit interval are shown in Table 2. Gender, ethnic background, and income are not shown; relations were not statistically significant. General health perception, hospitalization, and the diagnoses of diabetes and hypertension were significantly related to recommended revisit interval. The correlations between various continuous measures and recommended revisit interval are shown in Table 3. The significant correlations

Table 1. Characteristics of the Study Population (n = 571)

Characteristic	Proportion, %
Age, years	
55–65	29
65–74	50
75+	21
Gender	
Male	97
Female	3
Employment status	
Employed (full- or part-time)	24
Not employed	76
Living situation	
Lives with spouse	66
Lives alone	24
Other living situation	10
Self-assessed health status (In general, you'd say your health is . . .)	
Excellent	5
Very good	19
Good	48
Fair	24
Poor	4
Physical health status score*	39.8
Mental health status score*	57.1

*Mean values.

each demonstrate the expected relation with revisit intervals. As patient travel time to the clinic increased, the revisit interval lengthened. As patients carried more diagnoses (or were receiving more medications), the revisit interval shortened. Finally, more clinic visits in the past were associated with shorter visit intervals.

Table 4 shows the ability of various variable blocks to explain the variance in recommended revisit interval for all providers. The illness measures independent of the

provider that entered the model (four demographic variables of gender, ethnicity, living situation, and education, and the two variables of general health perception and general health perception compared with a year ago) explained about 10% of the variance. The addition of travel time, other illness measures that entered the model (diabetes, hypertension, and number of medications), and prior utilization (clinic visits, hospitalization) combined to roughly double the amount of variance explained. The sequential addition of each of these three blocks significantly improved the model fit (test of additional significance: $p = .002$ for travel time, $p < .001$ for the other two blocks). Despite using the best explanatory variables selected from all four blocks, the identification of the individual providers again doubled the explained variance (test of additional significance, $p < .0001$). Restricting this analysis to patients cared for by staff physicians (all of whom were board-certified internists) did not meaningfully change these relations.

To better illustrate the variability across individual providers, Figure 3 shows the mean revisit interval for the 30 providers adjusted for all four blocks of patient variables. Figure 3 highlights both the site effects and the considerable range of mean revisit intervals across providers. The mean revisit intervals for three sites were 14, 17, and 11 weeks. The mean revisit interval across all providers ranged from 8 to 26 weeks (unadjusted range 7 to 31 weeks). When restricted to staff physicians, the mean revisit interval ranged from 8 to 19 weeks (unadjusted range 7 to 18 weeks).

DISCUSSION

It might seem reasonable to expect that the most important determinant of the length of time until the next clinic would be some piece of information about the patient. In our data, however, the single most important predictor of the recommended revisit interval is not information about who the patient is, but information about who the provider is.

For those familiar with the realities of clinical practice, this finding is not surprising. Providers receive no formal training on how to determine revisit intervals, and what little informal guidance they receive undoubtedly varies with the clinicians to whom they are exposed. Not surprisingly, providers develop different practice styles. At the same time, a provider's practice style may also be influenced by the local culture—as exemplified by the 6-week difference in mean revisit intervals across the three sites.

Our study is, of course, only a preliminary look into the subject. The observations reflect only three clinical sites and only 30 providers (all of whom work for the Department of Veterans Affairs). The data were obtained as part of a clinical trial, which itself may have influenced provider behavior and was not designed to address the questions raised here. Finally, it is important to emphasize that

FIGURE 2. Distribution of recommended revisit intervals for 571 patients randomized into the VA Cooperative Study of Telephone Care.

Table 2. Relation Between Various Categorical Variables and Recommended Revisit Intervals

Variable	n	Mean Recommended Revisit Interval,* Weeks $\pm$ SD
Employment status		
Employed (full- or part-time)	137	16.1 $\pm$ 10.1
Not employed	434	15.1 $\pm$ 8.2
Living situation		
Lives with spouse	373	15.8 $\pm$ 8.5
Lives alone	139	14.3 $\pm$ 8.3
Other living situation	59	14.6 $\pm$ 10.8
General health perception†		
Excellent	29	18.0 $\pm$ 11.3
Very good	109	15.4 $\pm$ 9.6
Good	274	15.9 $\pm$ 8.4
Fair	139	14.2 $\pm$ 8.0
Poor	20	11.8 $\pm$ 6.0
Hospitalizations in the prior 2 years‡		
None	428	15.8 $\pm$ 8.6
One	90	15.0 $\pm$ 9.7
More than one	53	12.3 $\pm$ 7.4
Specific diagnostic categories (patients can appear in multiple categories)		
Angina or congestive heart failure		
Yes	119	14.4 $\pm$ 8.2
No	452	15.5 $\pm$ 8.8
Anxiety or depression		
Yes	78	14.8 $\pm$ 7.4
No	493	15.4 $\pm$ 8.9
Chronic obstructive pulmonary disease		
Yes	152	15.1 $\pm$ 7.2
No	419	15.4 $\pm$ 9.2
Degenerative arthritis		
Yes	230	15.4 $\pm$ 9.1
No	341	15.2 $\pm$ 8.5
Diabetes‡		
Yes	113	12.3 $\pm$ 8.4
No	458	16.2 $\pm$ 9.1
Hypertension†		
Yes	365	14.8 $\pm$ 8.4
No	206	16.3 $\pm$ 9.2

*Expressed as geometric means.

†p < .05.

‡p < .001.

variables available to us explained only approximately half of the observed variance in revisit intervals.

Some of the unexplained variance could be due to unmeasured characteristics of the patient. For these to influence our assessment of the provider's role, however, they would have to be independent predictors of the revisit interval and to vary substantially across providers (variation not observed among those patient-level predictors we did measure). Alternatively, unexplained variance could reflect something about the patient-provider relationship (such as how well the provider knows or likes the patient). Unexplained variance is likely, however, also to reflect unmeasured characteristics of the visit. Information about interventions initiated during the visit (e.g., scheduling of diagnostic tests, medication changes, and

other changes in management), and patient preferences regarding the timing of future visits, would most likely help explain the observed variance.

It is not clear that better information about the visit would change our findings regarding the average revisit intervals of individual providers. Although our study population (e.g. male veterans) might reasonably raise questions about generalizability, the VA setting also provides some special strengths: all providers were working for the same health care organization and under the same financial incentives. Furthermore, we are able to examine variation within a site: a setting in which the providers' patient population and patient volumes are most homogeneous and providers are exposed to the same cultural norms. Nevertheless, there was tremendous variation in the

Table 3. Simple Correlations (Spearman) Between Continuous Measures and Recommended Revisit Intervals

Measure	Correlation with Recommended Revisit Interval*
Illness burden–patient (illness measures independent of provider)	
Age	+.02
Diastolic blood pressure	–.03
Systolic blood pressure	–.02
Self-assessed physical health status†	+.05
Self-assessed mental health status†	+.08
Travel time (self-reported time spent traveling between home and VA clinic)	+.25‡
Illness burden–provider (illness measures not independent of provider)	
Number of diagnoses reported by provider	–.11§
Number of medications reported by provider	–.19‡
Prior utilization (number of clinic visits in prior 8 months)	–.39§

*A positive correlation implies that higher levels of the variable are associated with longer revisit intervals.

†Higher values reflect better functioning.

‡p < .001.

§p < .01; all others are not significant.

average interval recommended even within sites. Different providers most likely have different set points that anchor their recommendation about the timing of future visits. Although providers might agree qualitatively about revisit intervals (i.e., a patient whose insulin dose was just adjusted should be seen earlier than a patient with stable hypertension), it is unlikely they would agree quantitatively (i.e., the former should be seen in 1 month, the latter in 1 year).

The cost implications of the varying visit times are far from trivial. Practice style regarding revisit intervals may determine how many patients a provider is able to care for. Consider two providers, each with the same number of clinic slots per week. If the mean revisit interval is 10 weeks for one and 20 weeks for the other (a range less than that observed in our study), the former will be allocating twice as much time per patient and be able to care for half as many patients. In addition, patients who are seen more frequently are likely to receive more resource-intensive care—as clinic visits tend to beget other forms of

utilization (e.g., referrals, medications, and laboratory and radiologic tests).

The implications of revisit intervals for health outcomes are not clear. It is tempting to posit that patients who are seen more frequently (e.g., at shorter intervals) will also do better. What little data exist, however, bring this assumption into question. Threefold variations in mean revisit intervals (after adjusting for comorbidity and disease severity) was observed across providers at one institution,³ with no apparent differences in outcome.⁴ Revisit intervals were indirectly examined in the first study of telephone care, in which intervention patients were associated with longer revisit intervals, yet reported similar health status and were hospitalized less frequently.¹⁵ Because

Table 4. Proportion of Variance Explained in Multiple Regression Models Predicting the Recommended Revisit Interval of Study Patients*

Variable	All Providers, %	Staff Physicians (All Internists), %
Illness burden–patient	9.19	12.93
Travel time	2.49	1.76
Illness burden–provider	3.98	4.78
Prior utilization	5.80	6.68
Identification of provider	22.91	27.62
Total	44.37	53.77

*Variable blocks were entered sequentially beginning with illness burden variables obtained from the patient and ending with the identification of the individual provider. The analysis considered all 30 study providers (571 patients) and then was restricted to the 16 staff physicians (252 patients).

FIGURE 3. Mean revisit intervals for the 30 providers enrolling patients in the VA Cooperative Study of Telephone Care. The means (geometric) for individual providers are adjusted for all four blocks of patient-level data in the mixed effects model.

these patients also received telephone calls, however, it is impossible to determine whether the telephone contact facilitated early detection of problems or whether the longer visit intervals made the patients less prone to "overmanagement," in which they receive diagnostic tests that detect minor abnormalities and then receive unnecessary (and possibly harmful) therapeutic interventions. A VA Cooperative Study designed to reduce hospitalization in patients with diabetes, chronic obstructive pulmonary disease, and congestive heart failure also suggests harm is possible. Despite being seen sooner after discharge (twice as quickly in follow-up) and more often (70% more general medical visits), intervention patients were readmitted to the hospital significantly more often.¹⁷

Questionable benefit and potent cost implications make revisit intervals an important area for future research. As a first step, researchers might consider ways to encourage more consistency across providers. One avenue might be to develop and test appropriate follow-up intervals for patients with specific disease (e.g., diabetes). But because the decision of when to see a patient again is influenced by so many factors other than diagnosis, a more productive avenue may be to work to make the choice of revisit intervals more discrete. Currently, providers face an infinite number of choices to deal with what is qualitatively a reasonably discrete decision: Do I want to see this patient immediately, in the near term, in the intermediate term, or in the long term? Attaching a length of time to these categories (perhaps within 2 weeks, 2 months, 6 months, and 1 year) could serve as a foundation on which to evaluate the effect of lengthening or shortening the time between clinic visits. Although such questions will never be easily answered, they begin to address a fundamental issue of primary care—How often should we see patients?

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