

A Negative Trial of Inpatient Geriatric Consultation

Lessons Learned and Recommendations for Future Research

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Purpose: To determine the effectiveness of inpatient interdisciplinary geriatric consultation provided during hospitalization to frail, elderly subjects.

Subjects and Site: Admission cohort of 197 men admitted from 1985 through 1989, aged 65 years or more, meeting proxy criteria for frailty, living within follow-up area without terminal illness, and without prolonged nursing home residence.

Methods and Measures: Randomized controlled trial of inpatient geriatric consultation at a tertiary care Veterans Affairs hospital. Differences were determined between groups in the Physical Self-Maintenance Scale, Instrumental Activities of Daily Living, Mini-Mental

State Examination, Morale Scale, and nursing home and health care utilization.

Results: No differences were seen between groups in any measure after the intervention or during 1 year of follow-up. Intervention implementation may have been incomplete due to compliance and resource availability.

Conclusions: This trial is not definitive in determining whether geriatric consultation is effective or ineffective. Lessons learned from this research indicate that future studies should target frail subjects, include intervention-specific measures, and be conducted with direct control of comprehensive resources.

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THE RAPIDLY growing population of adults older than 65 years creates increased demand on an overburdened health care system. To attempt to reduce this burden, many strategies have been developed to improve the health and functioning of the frail elderly and thereby decrease health care utilization.¹ An inpatient interdisciplinary geriatric consultation cannot only offer geriatric expertise to larger numbers of hospitalized elderly than a dedicated inpatient unit, but may also serve to enrich the geriatric knowledge base of health professionals from many disciplines.²

To examine the impact of inpatient geriatric consultation, we conducted a randomized controlled trial of an interdisciplinary consultation team at the Veterans Affairs Medical Center, Palo Alto, Calif. We chose to evaluate health outcomes rather than educational impact. Hypotheses were that interdisciplinary inpatient geriatric consultation would (1) improve the physical and mental function of subjects at the time of hospital discharge and over

a 1-year follow-up period, and (2) reduce nursing home and health care utilization of subjects compared with controls.

RESULTS

Over the period of the trial, 2728 admissions of persons aged 65 years or more were screened for eligibility (Figure). Sixty-three percent of admissions were ineligible because of administrative exclusions, eg, short hospital stays, geographic distance from the Palo Alto Veterans Affairs Medical Center, or enrollment in an ongoing geriatric or rehabilitation program. The remaining 37% of admissions were eligible for clinical screening. Of these 1009 subjects, 25% were eligible after the clin-

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METHODS

All male patients 65 years of age and older admitted to the acute Medical and Surgical Services at the Palo Alto Veterans Affairs Medical Center, a tertiary care teaching hospital affiliated with Stanford (Calif) University Medical School, between October 1985 and January 1989, were screened within 96 hours of hospital admission (**Figure**).

Subjects with the following characteristics were screened for inclusion in the trial: (1) anticipated length of stay 96 hours or more, (2) residence within 2 hours' drive from the Palo Alto Veterans Affairs Medical Center, and (3) not enrolled in a geriatric or rehabilitation program. Patients were considered eligible for the trial if they were functionally impaired and aged 65 years with one of the following previously published and validated proxy criteria for frailty: confusion, dependence in activities of daily living, polypharmacy (more than six medications), disabling chronic illness(es), or a stressed caregiving system.¹⁴ Patients were excluded if they were independent in all activities of daily living prior to hospital admission ("too independent"); were a permanent nursing home resident; and had a terminal illness with life expectancy of less than 6 months by report of primary physicians ("too impaired"). Patients admitted directly to intensive care units were screened after transfer to the general wards.

During a 6-month pilot period, inclusion and exclusion criteria were standardized and operationally defined. For the first 3 months of the trial, interrater reliability of the inclusion and exclusion criteria were assessed for screened subjects between two investigators enrolling subjects. This revealed 92.5% simple agreement regarding clinical categorization of patients. Differences in eligibility determination were adjudicated by one of us prior to randomization. Entry into the study and randomization were performed according to the following procedures developed by Lincoln Moses, PhD,

the statistician for the project. Prospective patients were entered into a log consecutively. When found eligible for the study, and after giving consent, patients were registered as entered into the study. Baseline data were collected prior to randomization. The number of the next envelope was entered into the log and then opened. Opaque, sealed envelopes serially numbered had been prepared. Each envelope contained a slip of paper marked either treatment or control. The treatment or control condition was assigned using a table of random numbers, with the balance in alternating blocks of six or eight envelopes prepared by the statistician.

Baseline and follow-up assessments with the following measures were performed by a trained research assistant blinded to treatment assignment. Mini-Mental State Examination (MMSE, possible scores 0 through 30; higher score, better function), Physical Self-Maintenance Scale (PSMs, possible scores 0 through 6; lower score, better function), Instrumental Activities of Daily Living (IADL, possible scores 0 through 8; lower score, better function), and the Philadelphia Geriatric Center Morale Scale (Morale, possible scores 0 through 18; lower score, better function).¹⁵ Subjects were assessed at admission, discharge, 3 months, 6 months, and 1 year. All evaluations were performed face-to-face with subjects, except the 6-month assessment, which was performed by telephone and did not include the MMSE.

Length of stay of the index hospitalization, discharge level of care, level of care over the year of follow-up, number of hospitalizations, total hospital days, number of nursing home admissions, total nursing home days, outpatient and home health care services, and mortality were also evaluated. Levels of care were assigned a score and used as categorical data as follows: community dwelling, 1; congregate or sheltered living, 2; and skilled nursing, 3. Health care utilization data were obtained by patient and/or caregiver interview and from the Patient Treatment File, the centralized inpatient database for the Veterans Affairs Medical Center. Nursing home utilization data were obtained from the

ical screening process. Of those ineligible, 566 did not meet any proxy criterion for frailty ("too independent") (75%), and 194 met the exclusion criteria for terminal illness or nursing home residence ("too impaired") (25%).

The most common inclusion criterion was disabling chronic illness (eg, arthritis, chronic obstructive pulmonary disease, congestive heart failure, diabetes mellitus), present in 147 subjects (75%). The caregiving system was stressed in 101 patients (51%), and impaired mobility was present in 90 patients (46%). Other common clinical conditions in the sample included polypharmacy in 83 patients (42%), malnutrition in 58 (29%), falls in 50 (25%), confusion in 47 (24%), cerebrovascular accident in 45 (23%), and incontinence in 38 (19%).

Fifty-two eligible subjects either refused to participate ($n=49$) or were transferred to other hospitals ($n=3$) prior to randomization. One hundred ninety-seven elderly male patients (99 experimental and 98 control) aged 65 years or more were enrolled in the trial. No significant

differences in age, function, cognition, morale, number of diagnoses, or level of care existed between the control and experimental groups at baseline (**Table 1**).

Table 2 shows health care utilization and survival. No differences existed in length of stay for the index hospital admission between the experimental and control groups by *t* test using a square root transformation ($P=.9$). Discharge disposition from the initial hospitalization was not different for the two groups ($P=.34$). No significant differences were found between the experimental and control groups with respect to number of rehospitalizations or nursing home admissions ($P=.46$ and $P=.47$, respectively), nor did the number of days spent in hospital or in a nursing home differ. Level of care at discharge ($P=.34$) or in the year following the index admission was not different between the two groups ($P=.35$). No differences were found in the utilization of outpatient care, home health care, or respite care.

Patient Treatment File and records of the community nursing home program at the Palo Alto Veterans Affairs Medical Center. Level of care was obtained by patient and/or caregiver interview. Mortality data were obtained by caregiver interview and from the California Automated Mortality Listing, which searches California death data and the National Death Index.²

The consultation intervention consisted of a comprehensive functional, mental, medical, and social evaluation and recommendations by an interdisciplinary team consisting of an attending faculty geriatrician, a geriatric fellow, an internal medicine house officer, a social worker, and a clinical nurse specialist. Members of other disciplines (eg, psychology, nutrition) were available to the consult team as needed. After initial evaluation, the team met as a group to discuss the patient and formulate recommendations. Recommendations were directed primarily at five areas: (1) medical issues including diagnostic testing and medications, (2) referral for rehabilitation, (3) evaluation and management of geriatric syndromes, (4) discharge planning, and (5) psychosocial issues. Care was taken to limit recommendations to as few as possible to enhance the likelihood of implementation. A formal consultation note outlining recommendations was placed in patients' charts and discussed with the primary care team. Patients were seen by physician members of the team a minimum of three times per week throughout the hospital stay and follow-up notes were written on at least a weekly basis. When necessary, members of the team provided limited direct patient care. Direct patient care was provided only when regular ward staff were unable to provide services because of inadequate staffing, primarily social services. When staff knowledge was identified as inadequate to carry out specific treatment of geriatric syndromes, such as incontinence, decubitus ulcers, and malnutrition, the consult team provided in-service edu-

cation. After hospital discharge, no further care was provided. Control subjects received usual care and were not evaluated by the consultation team.

Compliance with recommendations by the primary ward team was assessed for a 1-year period midway through the intervention trial. The medical records of 60 subjects (62% of experimental subjects) were evaluated with respect to each recommendation. Compliance was defined as an order or note in the chart that indicated that the recommendation was ordered or planned. Determination of full implementation of recommendations such as patient repositioning, feeding, assisted ambulation, and activity orders would have required 24-hour observation of patients by research staff. Such observation was beyond the resources of the research team.

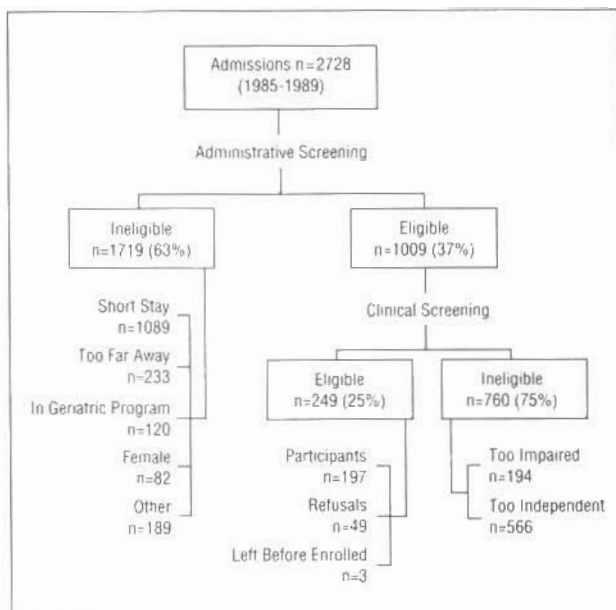
Baseline characteristics of the control and experimental subjects were compared using *t* tests for continuous variables and χ^2 tests for categorical data. Repeated measures of analysis of variance controlling α for multiple comparisons was used to ascertain differences between groups in activities of daily living, IADL, Morale, and cognition. To determine if death had an influence on functional results, analyses were performed first with survivors (who had complete data for the entire follow-up period) and then using all available data for all subjects with maximum likelihood estimation techniques. Length of index hospital stay and postdischarge hospital and nursing home utilization were compared between groups using *t* tests after square root transformation for positively skewed distributions. Differences between groups in level of care required over the follow-up year were compared using repeated-measures categorical analysis. Survival differences between groups were compared using Kaplan-Meier techniques, and adjustment for significant covariates was performed using a Cox proportional hazards model.

At the 1-year follow-up, 41 (41% mortality) persons were dead in the experimental group and 35 (36% mortality) were dead in the control group. Twenty-two percent of both experimental and control subjects had died within the first 100 days after admission. Using Kaplan-Meier techniques, no differences in survival existed between the groups during the follow-up period ($P=.43$). During the follow-up year all participants survived a mean of 274 ± 27 days. The Cox proportional hazards model, adjusting for age, PSMS, IADL, MMSE, and Morale showed no differences in survival between groups.

Analysis of variance with all subjects, using maximum likelihood estimation techniques, showed no significant differences between groups in PSMS ($P=.91$), IADL ($P=.69$), or Morale ($P=.23$) scores over the year of follow-up (Table 3). Analysis of covariance using age, initial PSMS, IADL, Morale, and MMSE scores as covariates showed no significant differences between

groups with respect to PSMS ($P=.7$), IADL ($P=.32$), and Morale ($P=.7$). With respect to the MMSE scores, the experimental and control groups did differ from each other over the year of follow-up ($P=.02$). Results did not differ when only survivors were used in the analyses.

Analysis of the compliance data showed that, using our limited definition of compliance, 67% of all recommendations were ordered. Recommendations for which there was greatest compliance (>80%) were those regarding diagnostic testing (laboratory and roentgenogram) and referral for physical therapy or inpatient rehabilitation. Compliance with recommendations for changes in medication regimen were complied with the least frequently (22%). Recommendations for treatment of geriatric syndromes were followed 30% of the time. These included nutritional recommendations, skin care, and decubitus prevention, and diagnostic and therapeutic interventions for urinary incontinence.



Screening process.

COMMENT

Our study found that the interdisciplinary geriatric consultation did not have an effect on improving discharge disposition, functional status, level of care in the year of follow-up, utilization of hospitals, nursing homes, or other health care services. The single positive outcome was an improvement in mental status of the experimental group. Although this is an important positive finding, it was not accompanied by any functional improvement. Thus, its significance is uncertain. Since none of the major hypotheses were fulfilled, we conclude that the trial was negative.

The possibility exists that our treatment may have been effective, but our sample size was inadequate to detect change, a type II error.⁵ This is unlikely, however, due to our sample size. Original power calculations (power of 80% with an α of .05) showed that a sample size of 200 would detect a difference of 25% in nursing home placement. Calculations were based on effects observed on planned discharge location during the authors' uncontrolled trial in 1984. Post hoc power calculations also suggest that adequate power was present. Using an analysis of variance design, the observed means, SDs, correlations of change, specifying a 20% improvement, setting α at .05 and power at 80%, a sample size of 12 (Morale), 138 (IADL), 46 (discharge location), 47 (MMSE), 201 (PSMS), and of more than 500 (nursing home days) would be required, respectively, in each group.⁹ With the exception of PSMS and nursing home days, an ample sample size was achieved in our study to detect even smaller, yet clinically significant changes.

Results of randomized controlled trials of geriatric consultation have been mixed.^{10,16} Two trials by Hogan and colleagues¹⁵ and Hogan and Fox¹⁴ have demon-

strated improvements in survival, use of medications, mental status, and function.^{13,14} One study suggested that the patients' emotional function and general health of the caregiver may be positively affected by geriatric consultation.^{15,16} The remainder, including the present trial, however, have been negative.^{10,11,17,18}

A variety of explanations have been offered for the negative results in the past.^{10,12,15} The Duke study attributed their negative results to lack of direct clinical control over patient care.^{10,17,19} In addition, their intervention was not targeted to a frail patient population, but rather to all persons older than 75 years. Several investigators have suggested that the efficacy of consultation may be limited when applied to an unselected group of older patients.^{15,17,19,20} Our targeting criteria have been shown to identify a group at high risk for prolonged hospital stay, nursing home placement, and death.^{3,4}

However, criteria that identify patients at risk for poor outcomes may not identify potential for benefit. Our study population is similar to the successful trial of Rubenstein

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and coworkers²¹ of an inpatient geriatric evaluation unit, making it unlikely that this patient population could not benefit from an intervention. While the similarities of our sample and that of the successful trial of an inpatient geriatric evaluation unit make it unlikely that we targeted a low-benefit population, we recommend that future studies continue to target high-risk individuals. Indeed, the multicenter geriatric evaluation and management trials planned by the Veterans Affairs Health Services Research and Development Service will employ an almost identical targeting strategy.

Outcome measures were chosen to measure global rather than intervention-specific effects, as changes in global function were our aim. Although these global measures may not be sensitive enough to detect intervention-specific change (such as change in physical performance produced by physical therapy), they have been successful in detecting change in other interdisciplinary intervention trials.^{21,22} We suggest, however, that future studies incorporate measures specific to their most common recommendations along with global measures of function. One strategy that may be useful for multifactorial interventions is goal attainment scaling, used in other studies of geriatric rehabilitation.²³

Another important limitation of this study is the lack of primary data regarding implementation of consultation recommendations. Compliance-enhancing strategies were employed, and compliance with recommendations appears to be similar in magnitude to that reported in other trials.¹⁰ Compliance was poorest, however, for recommendations that required staff time, effort, or understanding of geriatric syndromes. We recognize, however, that the measure of compliance used in this study could not assess actual implementation of recommendations. Future studies should plan direct data collection regarding implementation of recommendations.

Extremely frail, high-risk patients may require geriatric posthospital care either in a more controlled inpatient setting such as a geriatric evaluation unit, or by a geriatrician in an outpatient clinic.^{13,14,21,22} We expected that the treatment plan recommended by the geriatric consultation team might not achieve maximum benefit at the time of hospital discharge. The benefits of drug reduction may not become apparent for weeks. Other services, such as rehabilitation, might produce benefits during hospitalization but require a maintenance phase after hospital discharge. In both examples, a physician with geriatric expertise would be necessary after discharge to continue the treatment regimen initiated in hospital. Future trials should consider incorporating posthospital care (either outpatient geriatric care or in a dedicated geriatric unit) into the intervention

strategy. Cost-effectiveness analyses are needed to document the impact of such models of care.

Gayton and associates¹² suggested that their trial may have been negative because of diffusion of the experimental intervention by rotating house staff and the strong rehabilitation orientation of their hospital. Our compliance data, which reflect that recommendations for "geriatric syndromes" were unlikely to be implemented, make diffusion an unlikely explanation for our negative results. To avoid contamination, this trial was performed shortly after the service was created. In choosing to avoid contamination, we may have sacrificed efficacy. Ideally, the consult team would have been mature, smoothly oper-

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ating, and well accepted by the hospital staff prior to evaluation. We recommend that future trials evaluate only well-established services.

Studies of geriatric consultation to date have been carried out in different health care systems. For example, negative trials have been largely performed in the United States at university-affiliated Veterans Affairs Medical Center and community hospitals, while the positive studies were carried out in Canadian teaching hospitals.^{10,13,18} Hospitals in the United States and Canada may have differing patient populations, differential access to services, and links with community-based health care that affect outcomes.²⁴ Freedom from reimbursement constraints theoretically allows Veterans Affairs hospitals to configure resources in such a way as to allow longer lengths of stay, inpatient rehabilitation, and a spectrum of care that is more comprehensive and flexible than in the private sector. How-

Table 1. Baseline Characteristics of Patients*

	Experimental (N=99)	Control (N=98)	P
Age, y (range, 65-106)	75.7±9.0	76.6±9.7	
Age distribution, No. (%)			
65-74, y	55 (56)	54 (55)	.96
75-84, y	23 (22)	22 (22)	
85+ y	21 (21)	22 (22)	
PSMS (0-6)	2.5±2.1	2.6±1.9	.68
IADL (0-8)	4.2±2.7	4.5±2.5	.53
MMSE (0-30)	20.3±7.5	21.7±6.8	.17
Morale (0-18)	13.5±2.3	14.0±2.6	.19
Admitting service			
Medicine	57 (58)	57 (58)	.93
Surgery	42 (42)	41 (42)	
No. of diagnoses	4.4±2.0	4.3±1.7	.8
Residence at admission†			
Community	88 (88)	85 (86)	.62
Sheltered care	8 (8)	12 (13)	
Nursing home	2 (2)	0 (0)	

*PSMS indicates Physical Self-Maintenance Scale; IADL, Instrumental Activities of Daily Living; MMSE, Mini-Mental State Examination; and Morale, Philadelphia Geriatric Center Morale Scale. Numbers in parentheses after these four items represent the range of possible scores. See "Methods" for details.

†Residence at admission not available for one experimental and one control subject.

Table 2. Health Care Utilization and Survival Over 1 Year of Follow-up*

	Experimental (N=99)	Control (N=98)	P
Index length of stay	24.8±22	26.7±33	.91
Discharge location, No. (%)†			
Community	59 (60)	65 (66)	.34
Sheltered	9 (9)	9 (10)	
SNF	17 (16)	18 (18)	
Died in-hospital	14 (14)	6 (6)	
Hospital readmissions, No.	1.0±1.3	1.2±1.7	.46
Hospital days	15.0±27.0	20.0±39.0	.44
SNF admissions, No.	0.3±0.6	0.3±0.5	.47
SNF days	35.9±74.5	25.8±63.1	.33
One-year survival, No. (%)	58 (59)	63 (64)	.43

*SNF indicates skilled nursing facility.

†Information on discharge disposition was not available for two subjects in the experimental group and four subjects in the control group.

Table 3. Comparison of Outcome Measures Between Experimental and Control Groups Over Time*

	Admission	Discharge	3 mo	6 mo	1 y	P
MMSE						
Exp	20.3±7.5	22.6±6.6	24.1±5.8	N/A	24.3±7.1	.02
Con	21.7±6.8	22.5±6.8	23.3±7.0	N/A	21.4±9.2	
PSMS						
Exp	2.5±2.1	3.2±1.9	3.4±2.0	3.4±2.0	3.6±2.0	.91
Con	2.6±1.9	3.1±2.2	3.6±2.1	3.5±2.2	4.0±2.1	
IADL						
Exp	4.2±2.7	N/A	5.0±2.7	4.2±2.6	4.6±2.8	.69
Con	4.5±2.5	N/A	5.2±2.6	4.6±2.8	5.2±3.1	
Morale						
Exp	13.5±2.3	13.7±2.4	14.2±2.7	N/A	14.1±2.8	.23
Con	14.0±2.6	13.6±2.2	14.3±2.8	N/A	14.2±2.7	
Level of care						
Exp	1.1±0.4	1.4±0.7	1.4±0.7	1.5±0.8	1.4±0.8	.43
Con	1.1±0.3	1.3±0.6	1.3±0.7	1.3±0.7	1.4±0.7	

*Mean±SD. MMSE indicates Mini-Mental State Examination; PSMS, Physical Self-Maintenance Scale; IADL, Instrumental Activities of Daily Living; Morale, Philadelphia Geriatrics Center Morale Scale; Exp, experimental; Con, control; and N/A, not applicable.

ever, in our experience, available resources were often unpredictable. Services ordered were often not provided. Labor-intensive recommendations, eg, supplemental oral feeding, incontinence programs, frequent position changes, and bedside physical therapy, were frequently foiled by staffing shortages. At the time of the study, a nationwide nursing shortage and the noncompetitive Veterans Affairs salary structure had stretched nursing and rehabilitation resources to the limit.

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In a scarce resource environment, frail, quiet, older patients who require low-tech, time-consuming interventions to preserve limited function may not compete well for nursing time with acutely ill, unstable younger patients who urgently require constant monitoring, intravenous medications, or other more invasive procedures. Older patients must also compete with younger, "more salvageable" patients for bedside rehabilitation and inpatient rehabilitation services. At the time of our trial, only two physical therapists were available at the Veterans Affairs Medical Center for the 177 acute care beds (medicine, surgery, and neurology) and none for Veterans Affairs Medical Center outpatient clinics. In contrast, Stanford University Hospital had 18 physical therapists to serve 286 similar beds and outpatient clinics. The Veterans Affairs rehabilitation services were often delayed for 5 through 7 days after requests were made, and available only for patients who could be easily transported to the Palo Alto Veterans Affairs Rehabilitation Department. Readily available rehabilitation is a relatively constant feature of positive multidisciplinary geriatric intervention tri-

als.^{11,13,14,21,22,25} We suggest that future studies ensure access to comprehensive rehabilitation services for all subjects.

Anecdotal evidence indicates that organizational structure supportive of geriatric consultation may be an additional necessary element that facilitates access to resources and implementation of recommendations.²⁶ If future studies of geriatric consultation are to be performed, careful attention must be paid to resources and structure for a definitive trial to be possible. If hospital resources are inadequate to implement recommendations, the geriatric team must be configured so that required personnel are members of the team, eg, physical therapists.

In conclusion, we cannot say whether geriatric consultation is effective or ineffective. We believe that our trial was an inadequate test of the intervention and strongly believe that an adequate test of geriatric consultation has not yet been carried out. We have identified logistic and methodological issues that future trials should confront in the developmental phase. We have also identified elements that may need systematic improvement in many hospital systems before truly comprehensive, continuous, and high-quality geriatric care can be provided. If, in fact, geriatric care by consultation can be effective, it may be the least costly of the alternatives for geriatric hospital care. Geriatric consultation deserves study with a mature service, and in an environment with comprehensive resources readily available to implement the consultants' recommendations.

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