INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI

A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor MI 48106-1346 USA
313/761-4700 800/521-0600

Downloaded from SHAREOK. Persistent Handle URL: https://hdl.handle.net/11244/5778

UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

HEALTHCARE DEMAND MANAGEMENT SYSTEM

COMMUNICATION AMONG THE PRIMARY CARE PROVIDER, THE BENEFICIARY, AND THE NURSE CALL CENTER

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

In partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

Gerald R. Ledlow
Norman, Oklahoma
1999

UMI Number: 9925591

Copyright 1999 by
Ledlow, Gerald Ronald

All rights reserved.

UMI Microform 9925591
Copyright 1999, by UMI Company. All rights reserved.

This microform edition is protected against unauthorized
copying under Title 17, United States Code.

UMI
300 North Zeeb Road
Ann Arbor, MI 48103

© Copyright by GERALD R. LEDLOW 1999
All Rights Reserved.

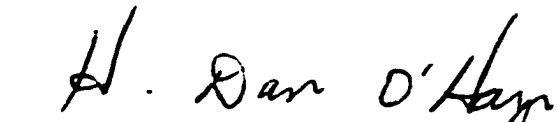
HEALTHCARE DEMAND MANAGEMENT SYSTEM

COMMUNICATION AMONG THE PRIMARY CARE PROVIDER,

THE BENEFICIARY, AND THE NURSE CALL CENTER

A Dissertation APPROVED FOR THE
GRADUATE COLLEGE

BY



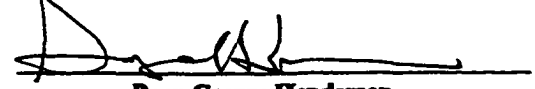
Dr. H. Dan O'Hair, Committee Chair



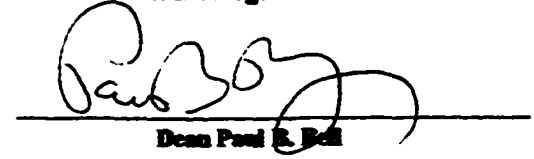
Dean Eddie C. Smith



Dr. Joseph L. Rodgers



Dean George Henderson



Dean Paul B. Bell

Acknowledgements

Without the support, love, and understanding of my best friend, partner, and wife, this dissertation could not have been finished. Silke Ledlow, I appreciate and love you very much. My baby daughter, Sarah Ledlow, allowed me to finish this project although she wanted her papa's attention. I love you very much Sarah. I greatly appreciated the guidance, support, and encouragement received from Dan O'Hair, Ph.D. I sincerely and wholeheartedly thank my committee members, Dean Eddie C. Smith, Dean Paul Bell, Dean George Henderson, and Joseph Rodgers, Ph.D. for their wisdom and support throughout the project. Lastly, I applaud all the healthcare professionals who strive to make the world a healthier and more compassionate place to live.

Table of Contents

page

Copyright Page iii

Acknowledgements iv

List of Tables vii

List of Illustrations ix

Terminology x

Abstract xi

Chapter 1: Purpose and Introduction 1

Chapter 2: Review of the Literature, Rational, and Hypotheses 5
- Healthcare Demand Management: The Nurse Call Center 5
  - Types of Nurse Call Center Systems 7
  - Reducing Healthcare Costs Appropriately 9
  - Nurse Call Centers: Facilitators of the Provider - Beneficiary Relationship 11
- Communication 13
  - Communication to Reduce Uncertainty and Equivocality 14
  - Choosing Communication Channels and Media 16
  - Health Self-Efficacy and Communication 18
  - Communication Quality 18
- Distance Learning Research Implications 20
- Rationale and Hypotheses 21

Chapter 3: Methodology 27
- Overview 27
- System Under Study and Participants 27
- Demand Management System Under Study: Background 30
- Internal Validity 33
- External Validity 34
- Design and Variables 35
- Dependent Variables 35
- Quantitative or Regression Variables 36
- Independent Variables 36
- Survey Construction 39
- Pilot Survey and Findings 42
- Data Analysis 44

Chapter 4: Results..... 52
Hypothesis 1..... 52
Hypothesis 2..... 55
Hypothesis 3..... 64

Chapter 5: Discussion..... 76
Hypothesis 1..... 76
Hypothesis 2..... 80
Hypothesis 3..... 82
Conclusion..... 88
Limitations..... 93
Research Implications..... 94

References..... 98

Appendix 1: Call Center Communication Survey Instrument 106
Communication Survey Instrument: Health Care Provider Edition..... 106
Communication Survey Instrument: Beneficiary Edition..... 110
Communication Survey Instrument Interpretation..... 112
Study Survey Cronbach's Coefficient Alpha: Provider Survey Instrument.... 113
Study Survey Cronbach's Coefficient Alpha: Beneficiary Survey Instrument .121
Pilot Survey Cronbach's Coefficient Alpha: Provider Survey Instrument..... 125
Pilot Survey Cronbach's Coefficient Alpha: Beneficiary Survey Instrument...129
Pilot Survey Development Instrument..... 133
Pilot Survey Development Results: Timeliness Dimension..... 135
Pilot Survey Development Results: Accuracy Dimension..... 136
Pilot Survey Development Results: Usefulness Dimension..... 137
Pilot Survey Development Results: Excessiveness Dimension..... 138
Pilot Survey Development Results: Demographics..... 139

Appendix 2: Healthcare System Demographics and Area of Responsibility.....140

Appendix 3: Demand Management System Communication and Information.....141
Sample One: Beneficiary Assessment..... 141
Sample Two: Beneficiary Assessment..... 142
Sample Three: Beneficiary Assessment..... 143
Sample Four: Beneficiary Assessment..... 144

Appendix 4: Inferential Statistical Tests and Models..... 145
Provider Survey Results for Hypothesis 2..... 145
Beneficiary Survey Results for Hypothesis 3..... 159

List of Tables

page

Table 1. Provider Group Distribution..... 28

Table 2. Data Collection Summary..... 29

Table 3. Independent Variable Data for Respondent Groups..... 29

Table 4. Regression and Manipulated Independent Variables for Hypothesis 1 & 2.... 38

Table 5. Regression and Manipulated Independent Variables for Hypothesis 3..... 39

Table 6. Data Collection Timeframes for Study..... 44

Table 7. Ideal and Actual Communication Quality Descriptive Statistics Per Question. 52

Table 8. Timeliness Dimension Comparisons: Ideal & Actual Communication Quality. 53

Table 9. Accuracy Dimension Comparisons: Ideal & Actual Communication Quality. 54

Table 10. Usefulness Dimension Comparison: Ideal & Actual Communication Quality.54

Table 11. Quantity Dimension Comparisons: Ideal & Actual Communication Quality.. 55

Table 12. Timeliness Composite Dimension Full Model ANCOVA Results..... 56

Table 13. Timeliness Composite Dimension Reduced Model Results..... 57

Table 14. Group Means for the Reduced Model Timeliness Dimension..... 57

Table 15. Accuracy Composite Dimension Full Model ANCOVA Results..... 59

Table 16. Usefulness Composite Dimension Full Model ANCOVA Results..... 59

Table 17. Quantity Composite Dimension Full Model ANCOVA Results..... 60

Table 18. Quantity Composite Dimension Reduced Model Results..... 61

Table 19. Group Means for the Reduced Model Quantity Dimension..... 61

Table 20. Individual Question Statistics for the Beneficiary Survey Instrument..... 64

Table 21. Timeliness Dimension Full Model ANCOVA Results..... 65

Table 22. Timeliness Dimension Reduced Model Results..... 65

Table 23. Group Means for the Reduced Model Timeliness Dimension..... 66

Table 24. Accuracy Dimension Full Model ANCOVA Results..... 67

Table 25. Accuracy Dimension Reduced Model Results..... 67

Table 26. Group Means: Reduced Model Accuracy Dimension..... 68

Table 27. Usefulness Dimension Full Model ANCOVA Results..... 70

Table 28. Usefulness Dimension Reduced Model Results..... 71

Table 29. Group Means: Reduced Model Usefulness Dimension..... 71

Table 30. Quantity Dimension Full Model ANCOVA Results..... 74

Table 31. Significant Variables for Beneficiary Communication Quality Dimensions For Hypothesis 3..... 75

List of Illustrations

page

Figure 1. Communication Quality Component Composite Score Derivation..... 33

Figure 2. Research Design: ANCOVA Design Concept..... 48

Figure 3. Research Design Concept: Hypothesis 1..... 48

Figure 4. Research Design Concept: Hypothesis 2 49

Figure 5. Research Design Concept: Hypothesis 3..... 51

Figure 6. Timeliness Dimension: Mean Scores of Local and Distant Providers..... 57

Figure 7. Timeliness Dimension: Score by Provider Age..... 58

Figure 8. Quantity Dimension: Means for Local and Distant Providers..... 61

Figure 9. Quantity Dimension: Provider Specialty Group Means..... 62

Figure 10. Quantity Composite Mean Score by Communication Episode Quantity... 62

Figure 11. Quantity Composite Mean by Provider Age Group..... 63

Figure 12. Timeliness and Gender Mean Scores..... 66

Figure 13. Timeliness and Health Self-Efficacy Mean Scores..... 66

Figure 14. Accuracy and Beneficiary Category Mean Scores..... 69

Figure 15. Accuracy Composite Means by Location..... 69

Figure 16. Accuracy and Mean by Gender..... 70

Figure 17. Usefulness Composite Scores by Age Grouping..... 72

Figure 18. Usefulness Composite Scores by Beneficiary Category and Age Trend. 72

Figure 19. Usefulness Composite Score and Beneficiary Category 73

Figure 20. Usefulness Composite and Socio-Economic Class Mean Scores..... 73

Terminology

Capitation: A method of reimbursement, a set amount of money either received or paid based on membership rather than services rendered. A per capita rate per year (PMPY) or month (PMPM) for each beneficiary that is a member or insured in an organization. It may vary based on demographic variables such as age and gender.

Closed Panel: A managed care plan that contracts or employs providers on an exclusive basis and does not allow providers to provide care/services to patients/beneficiaries not enrolled in the managed care plan. Examples are staff (employed by organization) and group models (contracted by organization).

Financial Risk: A provider of healthcare paid under a capitation arrangement is obligated to pay for medical expenses for beneficiaries they receive prepayment for (PMPM or PMPY) in monthly or yearly increments (per capita). Risk implies medical expenses may be greater than revenues for a beneficiary or group of beneficiaries.

Gatekeeper: All care for a beneficiary must be preauthorized by a primary care provider (except emergencies); a predominant feature of most HMOs.

Health Maintenance Organization (HMO): An organization that provides healthcare to enrolled members based on a standard benefits package for a set period of time. Members prepay on a yearly (PMPY) or monthly (PMPM) basis. The definition also requires one of the two conditions be met: 1) places some of the providers at risk (financial and service risk), and/or 2) utilizes primary care providers as gatekeepers.

Managed Health Care: A system that manages healthcare cost, quality, and beneficiary access by utilizing authorization systems and a defined assortment of healthcare providers and services. Types of arrangements include managed indemnity, Preferred Provider Organizations, and Health Maintenance Organizations.

Moral Hazard: The propensity to use healthcare services indiscriminately; usually refers to beneficiaries that have little disincentive to use healthcare services and thus, utilize greater amounts of service than actually required.

Service Risk: Similar to financial risk, a provider is at risk for healthcare services needed by a beneficiary or group of beneficiaries they receive a prepayment (PMPM or PMPY) for in monthly or yearly increments (per capita). Risk implies that a provider of care may need to provide more services than normal or average and thus either work more (producing more services) or pay (financial risk) for services from another provider.

Triage: A French word meaning 'to sort out.' In healthcare, combining administrative and clinical decision mechanisms to place a beneficiary/patient at the correct level and place of service based on urgency and need as signs and symptoms are presented by the patient.

Abstract

The purpose of this study was to examine characteristics of communication in a managed care context. Nurse call centers were the focus of the study and several objectives were pursued. The study sought to determine the level of communication quality between patients (customers) and nurses in the call center. Secondly, the study was interested in examining the quality of communication between physicians and non-physician providers and the nurse call center from the provider's perspective. Measuring the timeliness, accuracy, usefulness, and quantity of communication, by survey instrument, provides a comprehensive picture of communication quality. As it was hypothesized, patients differ, these measures served as the independent variables for the study, in socioeconomic status, needs, experience, age, and various other factors, and their assessment and perception of nurse call center communication quality should differ. Likewise, providers who differ in training, specialty, and experience, should have different perceptions and expectations of communication. Also, location of the beneficiary and provider of care in relation to the nurse call center should have an impact on perceptions of communication quality.

Providers' communication quality needs were not met in this study. All dimensions of communication quality showed significant differences for provider perceptions of actual communication when compared to the provider ideal quality. Older providers and those who were distant to the nurse call center had higher timeliness dimension scores. Providers who were local, had internal medicine or ob/gyn specialties, and were 40 to 50 years old had lower quantity (excessive flow of

information) scores. Dimensions of accuracy and usefulness revealed no significant predictors.

Female beneficiaries scored higher in the timeliness, accuracy, and usefulness communication quality dimensions. Beneficiaries with high health self-efficacy scored higher for the timeliness dimension than low self-efficacy subjects, although females with low health self-efficacy scored higher than males with high or low health self-efficacy. For the accuracy dimension, civilians and local beneficiaries scored higher than other groups. The low socio-economic group, civilian beneficiaries, and age groups 19 to 25 and 36 to 40 scored higher in the usefulness dimension than other groups. The quality communication dimension revealed no significant findings. Implications of the results and limitations of the study were discussed.

CHAPTER 1

Purpose and Introduction

Purpose

Demand management systems in healthcare provide a quality improvement to the continuum of health care services. Nurse call centers are increasingly becoming the first point of access for managed beneficiaries. To improve the healthcare system and patient health outcomes, the telephonic nurse call center, the health care provider responsible for patient care, and the beneficiary must communicate effectively. Demand management systems' performance, physician agreement (concordance), and patient satisfaction rates have been studied by various groups. The key link, communication between the major system stakeholders, remains as a research topic to further refine and find possible improvements to telephonic nurse call centers. Determining communication quality from the demand management system to providers of primary care, depending on the location, specialty, training background, and patient panel size of the provider, and the beneficiary, considering location, reason for call, socioeconomic status, and caller to patient relationship, is an important aspect of healthcare demand management improvement.

Introduction

The evolution of managed health care within the health care industry has required physicians, nurses, administrators, and beneficiaries to change how care is delivered. Changes to the system impact on health care cost, quality, and patient access into the health system. As managed care characteristics become more prevalent, physicians and health plans have more financial and service risk (Kongstvedt, 1995). This creates a paradox for physicians, managed care plans, and other capitated arrangements. Many providers of health care are paid a capitated rate (a prearranged payment for each beneficiary that they care for) by the managed care plan for each beneficiary in their patient panel. The more beneficiaries in a physician's panel enables the physician to

increase revenue with accompanying increases in financial and service risk. Also, patients that are directed to inappropriate lower levels of care or who have chronic diseases can cause significant financial strain (risk) to the physician (Spalding, 1996). If patients are directed to lower levels of care and subsequently have increased acuity, the cost of treatment can dramatically increase (financial risk). To decrease service risk (volume of patient visits) and not increase financial risk (cost of care), physicians and health plans have looked for ways to effectively manage beneficiaries without compromising quality or customer satisfaction. Healthcare industry research and exploration in demand management has exploded due to the financial risk to healthcare providers under capitation (Wolcott, 1996).

One type of demand management approach changes the health care delivery process by appropriately managing service risk without increasing financial risk. This particular system maintains quality of care and effectively allows physicians some degree of freedom. It involves integration of telephone triage, advice, and appointments systems as a means of demand management. Telephone systems employ nurses who direct patients/beneficiaries to appropriate levels of care based on the current episode of presenting complaints.

In the United States, Sweden, and Canada, telephone contact between patients and the health care system constitute between 2% and 28% of primary care, and in 1990, over one million monthly calls were made by households to telephone-based health care information services (Barton, et al. 1992; Williams, Crouch, & Dale, 1995; Robinson, Anderson, & Erpenbeck, 1997). Telephone triage, advice, and appointments systems are usually centrally located and are accessed by beneficiaries both locally and from a distance. Understanding the interaction of telephonic triage, advice and appointments between the nurse, physician, and patient is critical to the long term success and improvement of the telephonic triage system (Bell, 1996). Continuous evaluation of communication between the stakeholders of the system and telephonic triage and advice

processes are important to improve the system and maintain satisfaction (Barton, et al. 1992). Measuring hospital-physician communication quality has seldom been accomplished; hospitals haven't systematically measured communication effectiveness between themselves and physicians to near the extent they have for customer/beneficiary communications (Jaklevic, 1996). In an isolated group practice study, physicians gave fair to poor ratings to communication efforts between hospitals [health care systems] and themselves (Jaklevic, 1996). Vital to telephonic triage, advice, and appointments system success is the communication link between physicians and the nurses who communicate with patients assigned to physician panels. The information timeliness, accuracy, usefulness, quantity, and the communication channel used to relay information between the patient/beneficiary and their physician via the nurse telephonic system must be explored to ensure that all stakeholders are satisfied with the exchange of information and that the patient receives appropriate care. Since most nurse call centers are centrally located to realize economies of scope and scale, the quality of communication with primary care providers that are local, as well as distant, from the nurse telephone system must be analyzed to evaluate the system and identify potential improvements.

Systematically improving communication quality for healthcare access mechanisms is an organizational leadership concern. Internal, providers of care, and external, beneficiaries, system stakeholders are constrained or freed to increase individual and group health status partly from the knowledge gained through quality nurse call center communication. Communication improvement is a paramount issue for leadership teams for all healthcare systems. The problems associated with communication improvement are made more complex as health systems integrate vertically and horizontally along the continuum of care and add access control operations. Nurse call center communication quality impacts satisfaction measures throughout the health system and has significant legal implications. Healthcare system leaders have the responsibility

to improve their systems. As the first point of beneficiary/customer contact, the nurse call center is a logical choice to begin communication quality improvement programs.

CHAPTER 2

Review of the Literature, Rational, and Hypotheses

Healthcare Demand Management: The Nurse Call Center

Many health care reform measures and strategic plans focus on the supply side of the health care delivery equation by implementing barriers to access such as precertification and limiting provider selection by the beneficiary (Fries, 1996). Finding ways to demarket healthcare, or discourage demand by raising prices, reducing access, service, and promotion are not wise solutions to the demand problem (MacStravic, 1995). The health care formula, determining what, where, and how much care is required, is based on community needs. Although this approach, the supply side, has been used for many years, the demand for health services has been neglected. Ignoring the demand for health care services by a community's population leads to skyrocketing health care costs. In the US, emergency rooms are visited over ninety million times per year but over half of these visits are for minor conditions and problems; unnecessary emergency room visits are estimated to total over $5 billion a year (Anders, 1997) and is not considered desireable since the care is usually discontinuous and uncoordinated (Franco, Mitchell, & Buzon 1997). HMOs and managed care organizations are struggling with inappropriate emergency department use by beneficiaries (some organizations will not pay for inappropriate ER use) so, to counter this, telephone advice is an expectation in most healthcare settings (Robinson et al., 1997). Analysis, planning, and program implementation to only the supply side of services increases beneficiary dissatisfaction since the limits placed on the health care customer are usually not patient focussed or friendly and, at times, clinically inappropriate. Equal concern must focus on the demand side of the healthcare equation. Educating and empowering beneficiaries, coupled with the development of intelligent access systems, is the key to demand side management. "Current knowledge makes possible health policies which can improve population health and at the same time reduce overall medical care costs by 20% or more. The strategy is

based upon reduction in need for medical services and reduction in demand for medical services" (Fries, 1996, p. 2).

Telephone care creates a barrier-free environment, is timely for the patient, is accepted by the patient, and can serve as the basis for many quality health services in the community (Guy, 1995). Telephone triage not only is an important component of the health system that promotes cost effective care but also educates beneficiaries on self-care, medical advice, and the appropriate use of the healthcare system (Brayden, Kempe, & Thomasson, 1997). In fact, nurse call centers are a competitive requirement for the healthcare system and essential to callers (Mohagen & Hoosier, 1996 and supported by Bartholow, 1997) in many areas.

Most health plans employ some form of demand management (Bell, 1996). A total of fifty-eight percent of Health Maintenance Organizations provide some type of nurse call center services for their beneficiaries resulting in a substantial portion (42%) who are missing quality and cost saving opportunities (Medical Source, 1996). Approximately thirty-five million Americans have access to nurse call centers, compared to two million in 1990, and the demand management concept is growing as much as twenty-five percent per year (Anders, 1997). Demand management is not new since physician's receptionists and nurses have performed telephone triage and advice since the telephone was installed (Wolcott, 1996). Over the past ten years, measures have been developed to decrease moral hazard and increase appropriateness of care. Telephone triage is the process of directing patients to appropriate levels of care (Fifield, 1995). Demand management techniques, such as telephone triage, reduce unnecessary use of medical resources, such as emergency room visits, while maintaining user satisfaction and quality of care (Wolcott, 1996). Over ninety percent of parents were satisfied and over ninety-two percent of problems were resolved using a telephonic demand management system; these results indicate that telephone care can effectively triage and

give patient advice and thus increase provider's time for direct patient contact for those patients who really need professional care (Katz, Pozen, & Mushlin, 1978).

In the nursing discipline, the area of call center/telephone triage nursing has begun to establish it's niche within the field. Professional development, exchange of information, and standard setting within the telephone nursing field are preparing the healthcare industry to establish this avenue of patient/bneficiary access to care as a key component to health plan management and system integration to primary care. The American Academy of Ambulatory Nursing, in 1995, created a special interest group responsible to open a dialogue and increase professional contact between telephone triage and nurse call center nurses (Webster, 1996). Webster (1996) states that a nurse call center-oriented electronic magazine began publication in August 1996 and that the National Committee on Quality Assurance (NCQA) have begun to include nurse call centers, triage lines, advice lines, and combinations of these in the health plan accreditation certification process, thus establishing system standards of outcome measurement, training, and the like.

Types of nurse call center systems. Two ways of implementing demand management are nurse advice and patient risk assessment systems (Bell, 1996). Within the patient risk assessment niche, there are basically three ways to approach the delivery of health care: unstructured nurse protocols, computer-supported protocols, and automated clinical algorithms. Current automation technology makes computerized support systems critical to successful demand management (Bell, 1996). The future focus will be on automated systems.

The proliferation of computer-assisted medical decision support systems have enabled a transition from 'nurse advice' to a more appropriate system called 'telephone risk assessment' (Bell, 1996). New to demand management is the integration of open architecture automation systems and clinical knowledge that guide patients to appropriate levels of care but also provide health plans and providers of care timely information

(Wolcott, 1996). The sophistication of automated systems allows timely data collection and evaluation that leads to system improvements.

Protocol-based systems are automated checklists that nurses use during the patient call that provide a useful triage framework (Wolcott, 1996). Standing protocols or algorithms should be used to guide the nurse's assessment and create an uniform guideline for medical recommendations (Bosna, 1995). Protocols tend to be very conservative, have less potential for reducing unnecessary patient visits, and clinical safety and consistency have been questioned (Wolcott, 1996). A more aggressive approach to demand management utilizes clinical algorithms that are physician developed binary logic pathways (decision trees) that nurses use to triage and assess patients during the telephone call (Wolcott, 1996). Physician concordance studies show that protocol based triage achieved between 49 - 84% physician agreement while clinical algorithms achieved a 92.8% agreement rate (Wolcott, 1996). These systems are extensions of one's health system and a first access point for patients (Bell, 1996). A study in Sweden concluded that patients followed telephone advice, had high rates of satisfaction, and overall, telephone nurses handled the program adequately (Marklund et al., 1990).

While some plans require the beneficiary to call the telephone demand management system as a pre-certification step in the access process, other plans use the system as an option or a marketing tool (Bell, 1996). Beneficiary access to the nurse telephone triage, advice, and appointments (demand management) is available (usually) 24 hours a day, 7 days a week, and 365 days a year (O'Connor, 1996), enhancing beneficiary access to quality health care services. O'Connor (1996) is currently running a pilot study to understand how best to serve distant populations. Most beneficiary calls were placed after office hours of most physicians, usually between 5 p.m. and 11 p.m. (Poole et al, 1993) and further verified by Fifield (1995). Augmenting physician practices, telephone use in medicine is increasingly used to teach and advise patients and clarify information (Barnes, 1995). The family doctor is the best source of information

for the patient, yet physicians are not trained thoroughly in teaching and communication and have a considerable workload in patient visits without taking on additional telephone responsibilities (Glasper & McGrath, 1993). Considering the wide use of telephone-based health care, proper integration of information and careful scrutiny of the process must occur to eliminate adverse outcomes.

A system that does not have quality clinical integrity will not be utilized and will become a catalyst of conflict between plan management, providers (physicians and other care providers) and beneficiaries and will have potential negative legal implications (Bell, 1996). Physician, nurse, management, and beneficiary involvement in the development, testing, evaluation, and reevaluation are indicators of a quality telephone risk assessment [triage] and advice system (Bell, 1996).

Reducing healthcare costs appropriately. The most costly outpatient health care is in the emergency department, subspecialty, and specialty care. Less costly is a primary care physician appointment and the lowest cost is self care or advice. Trained telephone triage nurses evaluate each case and send patients to appropriate levels of care; redirecting patients from the emergency room to lower cost levels of care range from 25% (Thompson, 1996), to 87% (Informed Access Systems, 1995) and redirecting patients from higher levels of care to self care (advice) ranged from 51% (Informed Access Systems, 1995) to 61.5% (Wolcott, Johnson, Phillips, and White, 1995). Glasper and McGrath (1993) report that a quality review of a Toronto, Canada telephone triage and advice system suggests that beneficiaries would visit the emergency department and demand a physician visit if the telephone service were not available; the cost per call is under ten dollars while an emergency room visit costs one hundred dollars. The cost of an emergency room visit for non-urgent episodes is much greater than the benefit; this relates to the value of the healthcare dollar. Padgett and Brodsky (1992) report that since 1955, US emergency room utilization has increased three hundred and twelve percent with a fifty percent increase in outpatient clinic visits and that eighty-five percent of

emergency room visits were for non-life threatening reasons. Kelly (1994) found that thirty percent of ER visits across the nation were for nonemergency conditions.

The dramatic increase in ER utilization greatly raises the cost of health care. Substantial cost savings and greater continuity of care could be achieved if beneficiaries had a reliable and quality telephonic access to triage and advice and accessed care at the appropriate level of care (usually at a lower cost for care) or initiated self care at home (an even lower cost). "It was costing us [in Yuba, California], in round numbers, $170 to see patients in an emergency department when it would have cost $70 if they were seen at the Clinic" (Kelly, Cost containment in the emergency department, 1994, page 454). Another study of an HMO enrolled population concluded that a nurse call center reduced total physician visits by 17%, a 35% decrease in HMO visits for minor illnesses, a 15% reduction in medical visits for a Medicare risk plan, and that each $1 invested in the demand management system returned $3.40 for the HMO (*Capitation Management Report*, March 1995). A large nurse call center in Broomfield, Colorado, handling over five hundred thousand calls a year, direct forty percent of patient callers to self or home care, two percent are directed to the emergency room, fifteen percent to urgent care, and forty percent to some type of healthcare provider consultation (Anders, 1997).

The *Physician's Managed Care Report*, published in December 1995, found that a 100,000 beneficiary population that accessed health care via a nurse telephone demand management system could realize cost savings of $5.5 million for pediatric care, $5.4 million in adult care and $2.7 million in geriatric care by decreasing unnecessary patient visits versus a system that lacked nurse telephone systems. In a two-year long Wisconsin study of 24,000 beneficiaries, the Education Association Insurance Group found that a self care program with access to a telephone based nurse call center saved $4.75 per $1 invested as compared to a $2.40 savings per $1 investment in a program that only offered beneficiaries a printed manual and newsletter [documents that reinforce self care in the home] (Medical Source, 1996).

Decreasing the number of unnecessary office visits allows physicians to see the patients who truly need care (Osterhaus, 1995) and thus, reduces cost. In an example used by Lippman (1995), Denver pediatricians complained that the most stressful component of their jobs were late night calls from parents. A telephonic demand management system allowed the pediatricians more personal freedom by removing most late night patient care stressors and decreasing unnecessary office visits while maintaining control of their practices (Lippman, 1995). Telephone nurses promote access to primary care services and improve the quality of a general practice [primary care practice] (Andersson, Hallberg, & Norstrom, 1995). Physicians' organizations [and other provider groups] that manage and care for tens of thousands of covered lives in a capitated environment could save millions of dollars if they implement nurse call centers that not only receive calls, triage, provide advice, and if appropriate, direct patients to the correct level of care, but also *intitiate* calls for providers to patients for reminders of preventive clinical services, disease state management issues, and the like (Medical Source, 1996).

Nurse call centers: Facilitators of the provider - beneficiary relationship. Physician agreement with nurse recommendations and patient satisfaction with the telephone-based demand management system are high, especially with the clinical algorithm approach, and adverse outcomes are minimal or absent (Brayden et al. 1997; Informed Access Systems, 1995; Wolcott, Johnson, Phillips, and White, 1995; O'Connor, 1996; Poole et al., 1993). In Toronto, niney-four percent of beneficiaries were satisfied with the service (Glasper & McGrath, 1993). The importance of provider/physician agreement with nurse recommendations cannot be understated. Providers direct the clinical system; without provider support of nurse recommendations to beneficiaries the nurse call system would not succeed in the long run.

Beneficiary self care in the home is another demand management program that is greatly reinforced by nurse telephone triage and advice systems. Self care algorithms,

such as in the books Taking Care of Yourself and Taking Care of Your Child provide the beneficiary layman's explanations and procedures for home care and in many ways mirror the nurse telephone triage and advice systems (Fries, 1996). Working in tandem, these programs, nurse telephone triage and advice, and a beneficiary self care program, reinforce each other and provide a quality health care mechanism to reduce the cost of health care while promoting positive outcomes and improvements in quality of life. Fries (1996) suggests a four line defense for health care: 1) programs that promote healthy lifestyles; 2) self care in the home; 3) nurse call center for triage and advice; and finally, 4) the health care provider.

Key to the demand management process is documentation and communication. The system should be real time; documentation of each call should be done during the call not after the fact (Bell, 1996). Advanced systems allow rich documentation ranging from individual call data to system's measurable impact on patient/beneficiary utilization (Wolcott, 1996). Documentation is essential and cannot be overlooked and should be incorporated into the patient's permanent medical record (Brayden et al 1997; Osterhaus, 1995). "Accurate and concise documentation of all interactions with clients [beneficiaries] should be retained as per normal practice in the documentation of any nursing procedure" (Glasper & McGrath, 1993, page 36). In fact, in the Denver pediatric telephonic demand management system, documentation of each call is forwarded to the patient's physician (Lippman, 1995). Any triage/advice system must include a method for accurate documentation that assists in protecting the organization against liability (Bosna, 1995). Telephone-based systems allow a close link to patients and their physicians; supplying up-to-the-minute data that enables providers and plans to better meet the needs of staff and beneficiaries. (Wolcott, 1996). "Communication with the patient's regular physician is critical for integrated and appropriate care as well as the physician's and patient's comfort" (O'Connor, 1996, page 59). Periodic evaluation in communication abilities allows you to check for potential problems (Barton et al, 1992).

Keeping patients more informed (18%) and having more complete records (45%) were among changes physicians made to protect against future lawsuits (Barton et al, 1992). "Giving telephone advice creates a legal duty, and such careful, complete charting should provide protection if a lawsuit arises" (Lippman, 1995, page 53). Isaacman, Verdile, Kohen, and Verdile (1992) found that many emergency departments are filling the telephonic nurse advice and triage roles in an inadequate and variable manner, due to inadequate training, lack of clinical supervision, and inadequate systems, that leads to significant risk to the patient and organization.

Coleman (1997) suggests three approaches to limit legal liability: 1) using standard protocols, 2) documenting calls systematically and thoroughly, and 3) establishing and maintaining a quality assurance program to audit and improve the system. A quality demand management system should take over these roles to decrease liability, increase patient satisfaction, and improve the potential for quality health outcomes.

Demand management systems also serve as a source of patient autonomy and empowerment. Professional nursing advice serves as reinforcement for self care in the home, as well as, assisting in health care decisions such as when a clinic visit is needed and what questions to ask the health care provider. Successful and useful telephone interaction between the nurse and the patient is a shared responsibility that relies on effective communication (Glasper & McGrath, 1993).

Communication

Communication is critical for successful health outcomes; communication is the vital process that links consumers of care and providers of care (Kreps, O'Hair, & Clowers, 1994). The accurate gathering, documenting, and passing of information that allow high quality decisions to be made, or for instructions to be followed, is at the crux of what is required to communicate effectively within the health system and with beneficiaries. Nurse call centers operate with electronic and telephonic 'conduits' that

pass information and allow communication. The value of communication in an organization equates directly to how much communication assists the organization in reaching its goals; goals must be clear, measureable, and set within a reasonable time frame (Lindeborg, 1994). The quality of the information transfer, the communication, is the issue. "Communication becomes the major vehicle for the entire nursing process, so it would seem obvious that this [communication and advice] has to be the best that can be offered to the client. These functions [communication and documentation] also apply to telephone triage" (Coleman, 1997, page 229). Media richness theory (Daft & Lengel, 1986) and distance learning offer research and application potential for nurse call center operations. Reasonably, communication research can, and should, be used as the vehicle to improve the nurse call center operation.

Communication to reduce uncertainty and equivocality. Daft and Lengel (1986) state that organizations process information to reduce uncertainty (the absence of information) and equivocality (ambiguity). Information is processed and communication occurs to accomplish internal tasks of the organization, to coordinate activities, and evaluate external environments (Daft & Lengel, 1986). "Uncertainty is a measure of the organization's ignorance of a value for a variable in the [information] space; equivocality is a measure of the organization's ignorance of whether a variable exists in the [information] space" (Daft & Lengel, 1986, page 557). More information reduces uncertainty (Daft, Lengel, & Trevino, 1987). Basically, low uncertainty about an issue or problem means an organization has data or information in sufficient quantity to make decisions about the problem, whereas low equivocality means an organization has defined what questions or what data is needed to attempt to solve the problem. Equivocality means that multiple and contradictory interpretations exist about an organizational issue or problem (Daft et al., 1987). Managers differ in information processing response when confronted with uncertainty as opposed to equivocality. Uncertainty causes managers to acquire data, whereas, equivocality prompts the

exchange of subjective views among managers to define problems and resolve conflicts (Daft et al., 1987).

Information richness is defined by Daft and Lengel (1986) as the ability of information to change understanding within a time interval. The longer the time interval to change understanding, the less rich the information. Consequently, the less time required, the more rich the information is to the organization. The media that carries information to intended audiences also has a richness associated with it. A continuum of media richness has been established based on the medium's capacity for immediate feedback, the number of cues and channels utilized, personalization, and language variety (Daft & Wiginton, 1979; Daft, Lengel, & Trevino, 1987). Daft and Lengel (1986) state that, in decreasing media richness, that the continuum of richness consists of: "1) face-to-face, 2) telephone, 3) personal documents such as letters or memos, 4) impersonal written documents, and 5) numeric documents" (page 560). The richer the media, the better equivocality can be reduced; media low in richness are best used when communicating messages that are understood well and possess standard information (Daft & Lengel, 1986).

Uncertainty increases as sections of an organization become more dependent on each other (interdependence) (Daft & Lengel, 1986). Also, as differentiation between organizational sections increases, equivocality decreases (Daft & Lengel, 1986). Regarding nurse call centers, the nurse center and primary care providers become increasingly interdependent but are somewhat differentiated; this state of affairs suggests that potentially high levels of uncertainty and some equivocality can exist during communication between the parties. This is complicated by the myriad of patient issues and problems; the focal point of communication between the providers and nurses. In order to decrease uncertainty and equivocality, when focusing on a patient issue, the nurse call center must communicate in a timely, accurate, useful, and concise manner.

High quality communication from the nurse call center links the patient, and the specific issues at hand (acute episodic care as most urgent and preventive/advice issues as less urgent), with the primary care provider that is ultimately responsible for their patient's care.

Choosing communication channels and media. Media choice is important. Different channels of information flow can influence the receiver's message processing ability and ultimately, the satisfaction with the communication. Ambiguity, or equivocality, influences media choice. When ambiguity is high, richer media such as face-to-face communication will increase, whereas, unambiguous situations allow greater use of memos, letters, and electronic channels (e-mail) (Trevino, Lengel, & Daft, 1987). Equivocality is the major barrier confronting new media (Daft et al., 1987). Distance and job pressure do increase the use of e-mail [and telephonic media] without as much regard to media richness implications (Trevino et al., 1987). Electronic mail messages are sent and received conveniently; time, distance, and physical space are less constrictive so this media creates an environment that shares neither space or time (Barnes & Greller, 1994). In urgent situations, however, lack of shared sense of time can be a problem. Since the Trevino et al. (1987) article was published, where the author's stated that new media (such as e-mail and video-teleconferencing) should be used in unambiguous situations, more recent research suggests otherwise. Walther, Anderson, and Park (1994) and Schmitz and Fulk (1991) state that early theories of computer mediated communication (CMC) were not very favorable toward the new media but this is no longer true. Schmitz and Fulk (1991) comment on work by Markus (1987) that electronic mail is used in highly ambiguous situations and used more by senior managers.

As computer assisted media becomes more prevalent, new media are more accepted and used by organizations. Webster and Trevino (1995) place new media (e-mail and voice mail) before written documents and after telephonic communications in

the media richness continuum. D'Ambra and Rice (1994), in their work, have constructed a revised continuum of media richness as follows (more to less rich): 1) face-to-face, 2) telephone, 3) voice mail, 4) email, and 5) business memo. This stance is more accepted in light of new media in the recent literature. For example, managers are using e-mail to send equivocal messages today, where ten years ago they would have not used e-mail for such communication. Although, electronic communication (email, voice mail) associated with task performance only outperformed richer media in low ambiguous situations (Valacich, Paranka, George, & Nunamaker, 1993).

Media richness theory may not be as straight-forward when considering new media (CMC). Current social factors, situational contraints (distance for example), and communication infrastructure greatly influence media richness today (D'Ambra & Rice, 1994). Reinforcing the social factors concept, Webster and Trevino (1995) found that social influence contribute to new media use. Communicators using electronic media, or new media, are more focused on the issue at hand than face to face groups who are more focused on their 'public' selves (Valacich et al., 1993). More structured communication tends to be more timely, accurate, and complete than less structured communication mechanisms (Mohr & Sohi, 1995). Social information exchange in CMC is just as potent and effective, over time, as face to face exchanges; the key element, time, [repeated measures] influences positive rather than negative dimensions of communication (Walther et al., 1994). Face to face communication allows the weaker position, in an argument or stance, to make a greater argument than CMC (Spears & Lea 1994). Also, Valacich, Paranka, George, & Nunamaker (1993) found that communicators using new media (e-mail) were not less satisfied with the information exchange experience than communicators in face to face exchanges. Basically, timeliness, accuracy, usefulness, and being concise directly relate to communication quality in traditional and new media channels.

As beneficiaries use the nurse call center to access the healthcare system and providers of care depend on nurse call center communication to evaluate specific beneficiary needs, the nurse call center becomes a focal point of the healthcare system; all parties are interdependent. Additionally, each beneficiary, depending on the severity of their health issue, whether they are calling for their child, and their specific situational related factors (socioeconomic status, distance from health care facilities, and age as examples), determine the level of uncertainty related to the episode that prompted the contact of the nurse call center. Providers of care, likewise, have different levels of uncertainty with each patient encounter. Since nurse call centers are becoming more prevalent in the health care industry, effective communication between the beneficiary, nurse call center, and provider of care should reduce uncertainty and equivocality. Centralization of nurse call centers, to achieve economies of scope and scale, requires various automated approaches to documentation and communication; media rich face-to-face communication between the nurse, patient, and provider is impractical. The situational reality implies that media richness theory has foundational implications for the nurse call center. Nurse call center activities and interactions with beneficiaries and providers span the continuum of uncertainty and equivocality; how this impacts communication quality is an important research question.

Health self - efficacy and communication. A person's perception of their ability to successfully improve their health is the essence of health self-efficacy. Moore (1998) found that a patient's self-efficacy is positively related to communication satisfaction with their health care provider and compliance with treatment regimens. Beneficiaries with a high degree of health self-efficacy under a managed care healthcare system had the highest degree of communication satisfaction (Moore, 1998).

Communication quality. What defines communication quality? Mohr and Sohi (1995) state that the quality of communication is a function of completeness, credibility,

accuracy, timeliness, and adequacy of information flows. Much of the literature suggests that more information for decision making is better, but information that is not needed, wanted or important to the decision at hand lowers communication quality perceptions. Primary care providers need accurate and concise information that can be used in making patient care decisions. Furthermore, depending on the urgency of the patient care episode, providers need timely information pertaining to the triage and disposition of the patient.

New media, also refered to as CMC, is changing the communication landscape. Email is easy and efficient but can also overwhelm receivers of messages (Barnes & Greller, 1994). There are automated ways to make the quantity of messages manageable, but excessive message content is at the control of the sender. New media increases the speed of communication exchange within an organization. Spatial distance, especially remote work centers, are unencumbered when communicating by CMC (Wellman, Salaff, Dimitrova, Garton, Gulia, & Haythornthwaite, 1996). New media (CMC) is fast, efficient, and not effected by distance as long as the CMC infrastructure exists and is reliable.

Nurse call centers rely on CMC and the telephone as primary conduits for information exchange. CMC channels are less rich than the telephone channel that is less rich than direct interaction with patients or providers. How nurse information exchange using CMC and the telephone impacts communication quality perception is a salient issue regarding beneficiary and provider satisfaction with the nurse call center system. Coleman (1997) recommends that demand management systems, specifically nurse call centers, conduct quality audits, consumer and provider satisfaction surveys to continuously validate and improve the system. Using communication research to improve the nurse call center operations would be an effective way to advance healthcare demand management systems. Determining the communication quality between system

users, healthcare providers and beneficiaries, will allow nurse call center operations to evaluate improvement opportunities.

Distance Learning Research Implications

Distance learning research and operational experience can also be useful to nurse call center improvement. This is specifically true considering reinforcing self-care in the home and providing advice and medical information to patients over the telephone. Distance education can be as effective as traditional learning (University of Idaho, Engineering Outreach, College of Engineering, 1995). Distance education approaches provide access to customers that normally would not be accessing the system by traditional means (Sediak, & Cartwright, 1997). Voice, video, data transmission, and print are the primary methods of distance education delivery (University of Idaho, Engineering Outreach, College of Engineering, 1995). Telephone contact can be used to reinforce learning between the student and the teacher (Eddy, Burnett, Spaulding, & Murphy, 1997). This is analgous to beneficiaries that attend a self-care class and then access the nurse call center for additional advice or reinforcement; using the same information in the class and reinforcing the information via the nurse call center improves patient empowerment and continuity between the beneficiary and the health system. The opportunities that distance education provide are limitless. Creativity, not technology, is the only limiting factor (Sediak, & Cartwright, 1997).

Distance education research is in an infantile stage. However, nurse call centers provide learning opportunities, reinforcement of selfcare, and appointment preparation instruction to beneficiaries. How beneficiaries perceive interaction with nurse call centers as a learning opportunity may depend on beneficiary distance (location) away from healthcare facilities and their level of self-efficacy.

Rationale and Hypotheses

The purpose of the study is to determine the level of communication quality between patients (customers) and the nurse call center and providers of care and the nurse call center from the patient and provider perspective. The quality of communication is a function of completeness, credibility, accuracy, timeliness, and adequacy of information flows (Mohr & Sohi 1995). Measuring the timeliness, accuracy, usefulness, and quantity of communication provides a total picture of communication quality. As patients differ in education level, needs, experience, age, propensity for self/home care, health self-efficacy, and various other factors, their assessment and perception of nurse call center communication quality should differ.

Telephone triage, advice and appointments systems performing demand management functions in a structured protocol or algorithm system have high beneficiary satisfaction and compliance rates, as well as, high levels of physician agreement (concordance) with nurse recommendations (Brayden et al. 1997; Informed Access Systems, 1995; Wolcott, Johnson, Phillips, and White, 1995; O'Connor, 1996; Poole et al., 1993). Demand management systems support healthcare providers who are responsible for their patient panels. Since primary care management increases continuity of care, both the patient and the provider require timely information to make health related decisions; the provider of care and the patient must be able to make decisions about specific health needs based on information from the demand management system. Information from the nurse call center, perceived by providers and patients as useful and of high quality, is the catalyst for decision making that ultimately impacts patient care. The provider's perception of high quality communication, information that can be credibly and readily used as knowledge for patient decision making, can be measured as the difference between provider expectation and actual or perception of communication. The greater the ideal versus actual or perceived communication quality, the less likely providers will use and find value in the nurse call center's information.

Ha 1: Healthcare provider's ideal/required communication quality needs are of a higher quality level than actual/received communication quality regarding episodic patient call information from the nurse telephone triage, advice and appointments system.

The nurse call center is the point of access into the healthcare system; the center starts the flow of events. The providers of care provide clinical direction to the nurse call center. Although somewhat differentiated in the approach to care and responsibility in the healthcare system, there is a large degree of interdependence between the nurse call center and the providers. This creates a general environment of uncertainty and potential for equivocality. Quality communication between these entities should reduce uncertainty and equivocality. The greater quality the communication tends to be, the higher the measured scores of communication quality (timeliness, accuracy, and usefulness) and the lower the score for lack of quality (quantity); this depends on media richness theory (media channel used) and distance (between beneficiaries, providers, and the nurse call center). Several provider specialities, family practice, internal medicine, pediatrics, general practice, and non-physician providers (and to some degree obstetrics and gynecology), are responsible for primary care management. Also, each of these specialties receive medical training in different settings and with different approaches. As each provider manages a patient panel, the level and degree of communication from the demand management system and the provider must be measured to ensure that quality communication leads to effective and efficacious health care.

Determining the difference in communication needs of local and distant physicians are important to further refine telephone demand management systems as more beneficiaries access care through these types of mechanisms. Ensuring effective communication with the patient's regular physician is one significant way to improve the system (O'Connor, 1996). All healthcare system stakeholders must strive to improve

communication so that decision makers of the care process, the patient and responsible provider, are satisfied with information exchange.

Information is transfered to providers of care via several potential routes. Electronic mail, intranet printer (local area network [LAN] data transfer), fax, and telephone are the most often used. Provider specialty plays a major role in communication perception. For example, a pediatrician may have a higher general level of uncertainty due to the potential of quick adverse outcomes in their patient population. An infant does not have the ability to express illness or pain as an adult, nor does the child have the biological capacity to endure disease as an adult. This one example illustrates the importance of provider specialty and media channel (timeliness and accuracy specifically) in this study. The medical degree earned, either Doctor of Medicine (MD), Doctor of Osteopathy (DO), nurse practitioner (a masters trained provider), or a physician's assistant (PA), provides a general paradigm for the specific provider's practice style, method, and interaction in the healthcare system. The panel size, how many patients/beneficiaries a provider is responsible for, should vary the needs and perceptions of communication quality since more patients in a panel means less time for the provider in general and more potential communication episodes from the nurse call center. Gender and age should add more specific detail to communication quality needs and perceptions of providers. Lastly, how much the provider interacts with the nurse call center impacts provider communication quality perceptions. Satisfying the providers of care in the system by communicating well, the nurse call center becomes a value-added extension of the provider. For nurse call centers in their demand management role, communication improvement begins with the call center. Communication improvement will allow this high quality demand management system to increase presence as the standard for entry into the healthcare system.

Ha 2: Differences in provider satisfaction with the quality of communication can be attributed to the location of providers, provider specialty and medical degree, panel size, age of provider, gender of the provider, and the channel of information used with regard to information provided by the nurse staffed telephone triage, advice and appointments system.

Nurse call centers deal with a myriad of patient issues. As the urgency of the issue increases, so does the uncertainty and ambiguity [equivocality] of the situation (Leprohon & Patel, 1995). Patient care is serious business, especially when the need for care seems urgent. Reducing patient and provider uncertainty by providing high quality communication should increase usefulness measures regarding the flow of information. Also, equivocality reduction is a major goal of the nurse call center. Knowing what to ask the patient, evaluating the response, returning adequate feedback to the patient, and relaying the issues of the patient episode to the provider in a timely, accurate, and concise manner should result in high measures of timeliness and accuracy with low quantity measures. The information is relayed to the patient by telephone in most cases. This transfer of information using telephonic media is relatively high in media richness. But, nonverbal queues cannot be evaluated and thus cannot help the nurse form a more informed feedback response to the patient. This increases uncertainty and will result in changes to communication quality measurement scores from the patient's perception. As patients access the nurse call center for advice, information, or routine type appointments, situational urgency is decreased. These patients may perceive communication in a very different light than patients who are acutely ill or who have sick children in a more urgent situation. The caller's relationship with the patient should skew the perception of communication; calling for a child versus another adult would change the urgency, uncertainty, and equivocality of the situation. Beneficiary category captures the access to care priority that certain patient groups have within the healthcare system. Civilian and

retiree groups are lower on the priority scale. Civilians understand this issue and expect access problems. Retirees, however, feel disenfranchised from the healthcare system as they perceive decreasing healthcare benefits over the past ten years. Typical research variables, such as age, gender, and socio-economic class, may further define communication perception in the beneficiary population. This study used sponsor rank/grade of the military or federal employee as a measure of socio-economic class. The higher the rank or grade (enlisted rank E-1 through E-9, officer O-1 through O-6 or above, and civilian grade GS-1/2/3 through GS-15 or above) the higher the socio-economic class (more household income, usually higher levels of attained education, and more maturity) of the individual or family. The propensity to administer self or home care is important when measuring communication quality of a nurse call center. The intent (or actual attendance) to go to a self-care class that is directed and implemented by the health care system and the beneficiary's level of health self-efficacy (high or low) will have an impact on patient/beneficiary communication perception. Lack of beneficiary initiative to attend a free self-care class and low health self-efficacy should relate to lower perceptions of communication quality.

Ha 3: Differences in patient/beneficiary satisfaction with the quality of communication can be attributed to the location of the patient/beneficiary, reason for call, patient/beneficiary category, gender and age of the patient/beneficiary, sponsor socio-economic status, healthcare self-efficacy, and self-care class attendance with regard to information provided by the nurse staffed telephone triage, advice and appointments system.

Lastly, the nurse call center, using similar methods as that of distance education, must educate patients, reinforce home/self-care, and prepare patients for visits with their provider. This information must effectively flow to patients, as well as pass, to providers

that are in remote/distant locations. Both patients and providers that are not in the vacinity of the nurse call center may perceive communication quality differently than local stakeholders. Distance education is vastly becoming a popular method of instruction, but when uncertainty and ambiguity are high (as issues become more urgent), the comfort (and thus perception of communication) level may contribute to perceptions of decreased communication quality. This, if true, would decrease the timeliness, accuracy, and usefulness scores and increase quantity scores for this group. Therefore, telephonic communication (from the nurse call center and patient caller) may not be media rich enough to decrease uncertainty and ambiguity within the communication triangle (patient-nurse-provider) for the patient's episodic care concerns. This problem should amplify due to patient comfort level (patient comfort with nurse call center) as the distant patient accesses the nurse call center.

CHAPTER 3

Methodology

Overview

An ex post facto design (also called causal-comparative) was employed for this study. The population was located in the U.S. Army Medical Department Activity in Heidelberg, Germany (USAMH) and surrounding ten communities in the U.S. Department of Defense central Germany Healthcare System (the USAMH Area of Responsibility). The study included healthcare providers of primary care services and beneficiaries of that region. Random assignment was not reasonable with a limited number of primary care providers in the study. Also, further restricting randomization, beneficiaries were assigned to a specific community by the U.S. Army. A modified International Communication Association (ICA) survey instrument (a five-point bipolar Likert-type scale design) (Goldhaber & Rodgers, 1979) was used as the basis of a final instrument to determine provider ideal and actual (received) communication and patient received communication. Communication quality is defined as a composite of the timeliness, accuracy, usefulness, and quantity of information measures. The modified ICA survey instrument gathered observations for each communication quality component using several questions specific to each component under study. The scores from each question, specific to a component, were summed to give a composite component score. Each component, known as survey dimensions in the instrument, had the same number of questions in the survey. Survey data was gathered using a cross-sectional (Wiersma, 1995) design (one point in time). Figure 1 illustrates this concept, whereas, Figure 2 displays the analysis of covariance (ANCOVA) groupings or factors concept; Figures 3 through 5 illustrate the concepts of the hypotheses.

System Under Study and Participants

Hypothesis 1 and 2 participants. Sixty-three provider surveys were used in the study (n = 63). 81% of the surveys were returned (69 of 85), however six could not be

used. The ultimate response rate was 74% (63 out of 85). The provider's mean age was 38.873 years (standard deviation of 8.86 years) with a range of 27 to 65 years of age. The mean panel size was 722.423 beneficiaries (standard deviation of 385.327) and the mean number of nurse call center communication episodes was 108.222 (standard deviation of 215.672). Seven of the sixty-three providers participated in the pilot survey a year earlier. Table 1 shows the distribution of providers by group. There were a limited number of specialties represented. For the dependent group t tests, the primary care providers that also had specialty consultant responsibilites (Pediatrics, Internal Medicine, and Ob/Gyn) were grouped together. The provider respondant descriptive statistics for each question under ideal and actual conditions are provided in the results section in Table 5.

Table 1. Provider Group Distribution.

Location	Quantity	Specialty	Quantity	Degree	Quantity
Local	38	Family Practice	32	MD	51
Distant	25	Internal Medicine	6	DO	8
		Pediatrics	9	NP	3
Gender	Quantity	General Practice	10	PA	1
Male	41	Ob/Gyn	4		
Female	22	Other	2		

Hypothesis 3 participants. A total of two hundred and forty - two surveys were completed by beneficiaries who used the nurse call center (n = 242). The response rate was 39.41% (242 of 614 total sample) where 58.31% (358 of 614 total sample) of the potential respondants were successfully reached by telephone. A success rate, those respondants reached by telephone who participated in the study, of 67.60% (242 of 358)

was accomplished. The data was acquired throughout the study according to Table 2. Table 3 shows the respondant group distribution. The respondant's mean age was 31.39 years with a standard deviation of 8.65 years; the maximum and minimum ages were 62 years and 19 years respectively. Seven (7) or 2.89% of the respondants said they had taken this survey before. Appendix 4 contains the inferential statistical data and models.

Table 2. Data Collection Summary.

Day of Week	Mon	Tues	Wed	Thurs	Fri	Sat & Sun
Respondents	39	48	33	43	34	45
Reached by Phone	62	64	55	77	41	59
Total Sample	102	97	92	134	88	101

Table 3. Independent Variable Data for Respondant Groups (n = 242).

Reason for Call	Responses	%	Location	Responses	%	Beneficiary Category	Responses	%
Advice	46	19	Local	155	64.05	Active Duty	83	34.3
Family Member Advise	64	26.5	Distant	87	35.95	Active Duty Family Member	120	50
Appointment	73	30				Retirees	12	5
Information	16	6.6	Gender	Responses	%	Civilians	27	11.6
Advice & Appt	43	17.8	Male	77	30.17			
			Female	165	69.83	Socio-Economic	Responses	%
Self-Care Class	Responses	%	Health Self-Efficacy	Responses	%	Low	72	29.75
Not Attended	175	72.31	Yes	214	88.43	Middle	125	51.65
Attended	67	27.69	No	28	11.57	High	45	18.6

The O'Brien (1981) Homogeniety of Variance test was conducted on the beneficiary data. No significant difference was found in group (location and gender) variances. The ANOVA results were $F(2, 241) = 1.1008$, $p = 0.2282$.

Demand management system background. The US Army Medical Department Activity in Heidelberg (USAMH) is responsible for nine communities, approximately 73,000 beneficiaries, covering a 6,200 square mile area. All beneficiaries work in some capacity for the US government (Department of Defense and State Department) or within the North Atlantic Treaty Organization (NATO). All US beneficiaries are dependent on the USAMH system to direct their access to health care. The managed care plan called TRICARE Prime is the health plan most beneficiaries have choosen (85% and increasing). Within this framework, USAMH is similar to a closed panel staff model HMO. Beneficiary categories and summaries, as well as a regional layout by community, are at Appendix 2. Eligible for health care, beneficiary categories are: active duty military, active duty military dependents (family members of active duty military members), US civilian employees, US civilian employee family members, retired US military and their family members, and NATO (British, Dutch, Italian, Belgium, and Canadian) active duty and their family members. All civilian and NATO beneficiaries either pay directly for health care services or USAMH is reimbursed by third party insurers or the foreign sponsoring government.

For the past decade, beneficiaries have accessed health care services through a central appointments system manned by clerks. Telephonic triage did not occur. With the implemetation of TRICARE (the managed care plan), primary care providers (PCMs) are assigned to each enrolled beneficiary for purposes of primary care management. The PCM serves as the system gatekeeper for each patient's health care. As budgets are reduced, beneficiary utilization of health services high, and no additional primary care

assets planned, USAMH realized that a demand management system had to be implemented to place patients in the correct care setting at the appropriate time. Historically, patients accessed the system through the emergency department. For one time period, as reported by Hamilton (1997), where patients presented for 33,989 outpatient visits, almost 69% sought care at the Emergency Room. This trend is consistent with the literature and illustrates the financial strain and lack of continuity of care at USAMH. The demand management concept is one major initiative to correct this problem. This system is planned to relieve pressure on primary care services while maintaining care quality and increasing appropriate beneficiary access to health care.

The demand management system, called the Patient Access and Advice Line (PAAL), operates twelve hours per week day and eight hours on weekends and holidays. After hours, the calls are transferred to the Emergency Room. Registered nurses operate the triage and disposition components of the system and work together with appointment and information clerks who book appointments, provide health plan, and other information. Once a beneficiary calls the PAAL, the nurses use the HealthWise© Call Manager and Knowledgebase software package to triage the patient, determine a disposition (self care in the home, appointments to various levels and sites of care, or an urgent care situation requiring immediate attention), and relay that information to the provider that is responsible for that specific beneficiary. Information is relayed to the provider by CHCS (automated clinical system) patient record, CHCS Mailman, email, fax, or telephone. Samples of nurse documentation are located at Appendix 3.

HealthWise© is the software package utilized in the PAAL system. The triage component is more structured than a protocol system but not as rigid and time consuming as a strict algorithm approach. The system contains reasonable structure but also depends on the experience and expertise of the nurse utilizing the information. It is a database in a Windows (HTL7) platform. Importantly, the HealthWise Knowledgebase© is a

reference library of medical information available to the PAAL nurse and every clinic site in the ten community region.

The call process consists of the following components: 1) the beneficiary calls; 2) the nurse triages the patient using the HealthWise© Call Manager; 3) the nurse decides upon a disposition with the patient (self care in the home, an appointment to the PCM, an appointment to a specialist and the time frame, immediate appointment [emergency], an appointment within twenty-four hours [urgent], an appointment within a week [routine], a specialty appointment [urgent or routine], or a wellness [such as a physical exam] appointment within the month); 4) the nurse prints the report (called a contact and case report summaries) and notifies the patient's PCM by email, fax, CHCS automated patient record (called a t-con), or other expedient method, 5) the patient is "passed" to an appointment clerk if necessary, 6) the appointment is booked and reviewed with the patient, and 7) the call is completed. The nurse also has the option to book/schedule a follow-up call to the patient. In all cases, the patient's PCM is notified of the call, the presenting complaint, and the disposition. The PCM has the authority to immediately change the disposition. Call information and report summary samples are located in Appendix 3. The PAAL nurses were trained together to use the same communication and provider notification procedures to communicate the patient call information to the PCM.

Provider involvement and patient panel management are the responsibility of the PCM. The PCMs and specialist providers were briefed on the PAAL system and implementation. Also, each specialty clinic reviews the HealthWise© information with regard to the triage process and advice given to patients. After review, the clinic provider staff approves the information and structure or submits a change proposal to the clinical supervisor of the PAAL, an experienced physician, where it is reviewed and if warranted, approved by the medical director of USAMH.

Internal Validity

The healthcare system in the study utilizes a managed care concept within a health maintenance organization framework. Both patients and healthcare providers move in and out of the area at approximately 35% per year. This personnel turnover, due to two and three year overseas tours of duties, created a natural control for the project. The system remains, for the most part, intact while the subjects rotate in and out of the system. Since the pilot survey used Heidelberg area subjects, testing could influence the actual study. The pilot was conducted one year before the study. Approximately half of the pilot respondent providers have rotated out of the system having been replaced by new providers.

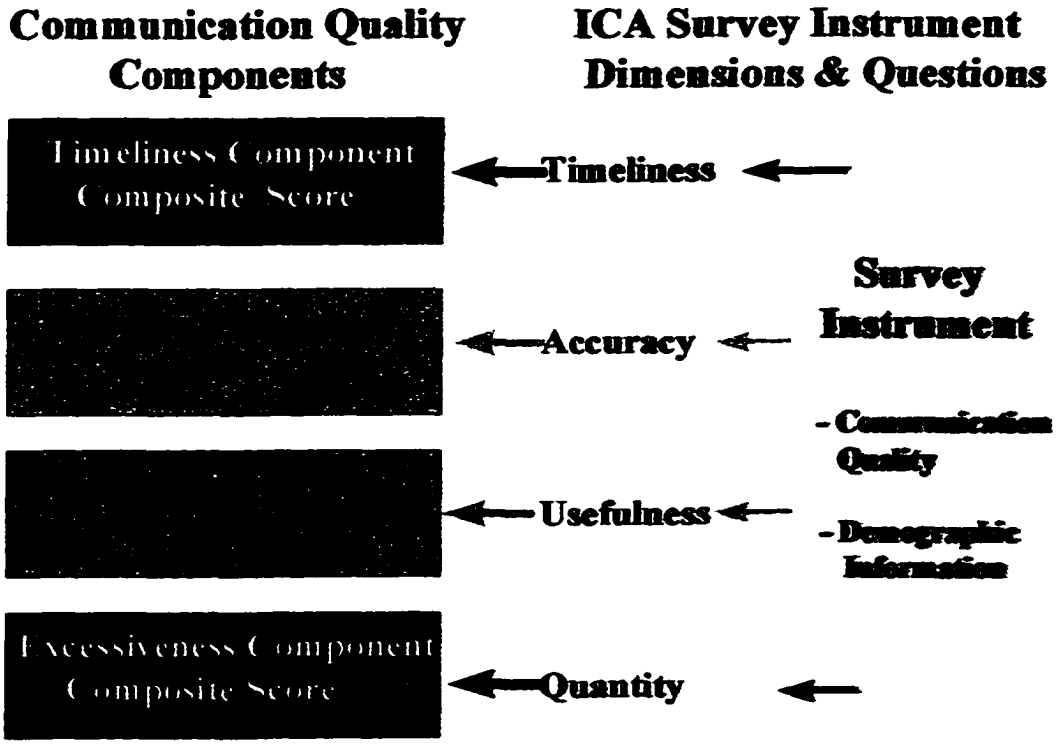


Figure 1. Communication Quality Component Composite Score

Regarding differential selection of subjects, preexisting groups of providers, by specialty, training, and location, were used in the study. The existence of the groups were controlled as independent variables in the design (ANCOVA).

Since the study is not longitudinal, history and maturation (an event occurs that distorts the groups under study over time) should not play a large role. Although, once the self report survey data (providers) and telephonic surveying (beneficiaries) began the researcher documented any change to communication flow in the system until all data was gathered.

Instrumentation must be considered. The telephone interviewers were briefed, given instructions, and followed throughout the telephone surveying of beneficiaries to limit interviewer bias. The provider survey was used for all provider data as the beneficiary survey was used for all beneficiary data. Also, the nurses in the demand management system provide the same information to providers consistently. This is monitored by a quality assurance system where the clinical supervisor (a physician), the nurse supervisor, and the author require each patient interaction to be printed, and checked at random, before it is filed in the patient record. The hardcopy report of the patient interaction is the same information that is sent to the provider. Since the nurses were trained in a similar fashion and use the same database of healthcare information, the beneficiaries (patients) are given the same information regardless of the particular nurse interacting with them.

The healthcare system is a fairly closed system; similar to a closed panel, staff model health maintenance organization (HMO). This fact strengthens internal validity but limits generalizability to healthcare systems operating under a managed care environment with similarity to an HMO system design.

External Validity

This study utilized a real healthcare system that treats real patients while meeting the professional or national standard of health care. The system studied is evaluated by

national criteria (Joint Commission on Accreditation of Healthcare Organizations) and thus mirrors most healthcare systems. The fact that the system is basically a closed panel staff model not-for-profit health maintenance organization gave the research project strong ecological validity. Frey, Botan, Friedman, and Kreps (1991) define ecological validity as research that reflects, or does justice to real life circumstances. Also, the providers of healthcare in the study were trained by their respective professional specialty affiliation in the tradition of that particular specialty and carry the expectations, standards, and bias as specialists in other healthcare systems.

Generalization, to the entire health maintenance organization beneficiary population, is threatened by the study's 39% response rate. Only beneficiaries that could be contacted by telephone (home and work numbers were attempted in most cases) were included in the sample. This fact limits generalization to managed care organizations and weakens, to some extent, external validity for this study.

Design and Variables

The treatment for this ex post facto study was the relationship of the primary care providers and the demand management system. The providers relationship was proximity (local or distant with regard to the demand management system), specialty, training, gender, and communication channel. For the beneficiaries, the treatment consisted of beneficiary category, location (local or distant), self-care training, reason for call, caller relationship to the patient (call for self, child, or spouse for example), and family socio-economic status (expressed as rank/grade of sponsor).

Dependent Variables

The dependent variable is communication quality, determined by four dimensions of communication, as found in the literature and specifically in the International Communication Audit survey instrument (Goldhaber & Rodgers, 1979). The dependent variables were acquired by survey instrument that was modified for this study. The four

dimensions of communication quality are: 1) timeliness; 2) accuracy; 3) usefulness; and 4) quantity. The survey instrument and the development process are described later.

Quantitative or Regression Variables

The regression variables for the study were provider panel size, number of communication episodes, and provider age for hypotheses 1 and 2 and beneficiary/patient age for hypothesis 3.

Provider panel size. Provider panel size was the number of patients the provider is directly responsible for in the health system. The number of patients in a provider's panel range from 300 to 1500.

Provider age. The age of the provider.

Number of Provider Communications with the Nurse Call Center. Estimated number of patient episodes that have been documented and sent to the provider.

Patient/Beneficiary/Caller Age. The age of the beneficiary/caller.

Independent Variables

Provider location. Based upon the provider's primary care work location, a provider was considered distant if over 30 minutes drive or 30 miles or more from the PAAL. The PAAL is located in Heidelberg. Local providers were located in Heidelberg and Mannheim (Sandhofen/Coleman Barracks included in Mannheim). All other sites (Babenhausen, Buedingen, Butzbach, Darmstadt, Friedberg, Hanau, and Stuttgart) were distant.

Provider specialty. Specialties considered as primary care for this study included Family Practice (FP), Internal Medicine (IM), Pediatrics (Peds), General Practice (GP), and Others. Others consisted of OB/Gyn and specialists that have quasi-primary care duties.

Training. Training relates to provider degree held. Providers were trained as Medical Doctors (MD), Doctors of Osteopathy (DO), Nurse Practitioner (NP) which are Masters Degree trained nurses, or Physician's Assistants (PA).

Provider Gender. Gender of the provider.

Channel of Communication. The channel of communication was the method or path the information from the PAAL gets to the provider. The channels were email, CHCS mailman (email in the automated healthcare system network), telephone, intranet fax (LAN printer), fax, face-to-face, written in the patient's record, or direct from the patient.

Caller Location. Patient location that was local or distant where distant was over 30 miles or 30 minutes drive from Heidelberg. Patients/beneficiaries in the Heidelberg and Mannheim communities were considered local; all others (Babenhausen, Buedingen, Butzbach, Darmstadt, Friedberg, Hanau, and Stuttgart) were distant.

Reason for Calling. The patient's reason for calling the PAAL. The reasons for calling could be for advice, self-care instructions, for an appointment, or general information.

Beneficiary Category. This relates to the status of the caller. The caller could be active duty military, an active duty family member, a retiree or retiree family member, or other. For purposes of this study, all North Atlantic Treaty Organization (NATO) military and military family members will be grouped with U.S. active duty military and active duty military family members.

Caller Patient Identified. Who the caller was that called the PAAL for medical help. The caller could call the PAAL for themselves, a spouse, a child, or other.

Caller Gender. The gender of the caller.

Self-Care Class. Identifies if the caller has attended a self-care class or intends to go. This class is given by the healthcare system and when the beneficiary completes the class they are given a self-care instruction and information book to use at home.

Healthcare Self Efficacy. This is determined by a yes or no answer to a survey question. The question asks the respondent if they feel that they can take care of basic healthcare issues in the home.

Rank/Grade of Sponsor. The sponsor's (usually the military member or federal civilian employee and head of household) rank or grade that represents socio-economic status of

the family. The higher the grade/rank, E-8 and above, O-4 and above, and GS-12 and above, the greater the socio-economic status of the family.

These independent variables, listed in this section, were measured as nominal or 'dummy' variables.

Table 4. Regression and Manipulated Independent Variables for Hypothesis 1 & 2.

Hypothesis 1 & 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Local Provider	FP	MD	Male	Face-to-Face			
Distant Provider	IM	DO	Female	CHCS mail/rec			
	Peds	NP		Telephone			
	GP	PA		Fax/LAN			
	Other			Patient			
ANOVA – Manipulated	ANOVA - Manipulated	ANOVA - Manipulated	ANOVA - Manipulated	ANOVA – Manipulated	Regression - Quantitative	Regression– Quantitative	Regression - Quantitative
2 Levels	*5 Levels*	*4 Levels*	*2 Levels*	*5 Levels*			

Tables 4 and 5 represent the independent variables in the study. Table 4 illustrates independent variables for the hypotheses associated with providers of care expectations and perceptions of communication. The ANCOVA design allows manipulated variables (ANOVA variables), shown with the associated levels or possibilities for that particular variable, and quantitative variables (regression variables), shown as placeholders since the variable can be a wide range of possible ratio numbers. Table 5 illustrates the independent variables associated with hypothesis 3. This table shows the patient's / beneficiary's list of variables as both ANOVA and Regression variables.

Table 5. Regression and Manipulated Independent Variables for Hypothesis 3.

Local Caller	Attended	Health Advice	Male	Yes	Active Duty Military	Lower E1 - E4 GS-2/3/4	
Distant Caller	Not Attended	Self-care Instructions or General Information	Female	No	AD Mil Family Member	Middle E5 - E7 O1-O3 GS 5-10	
		Appointment			Retiree or Retiree Family Member	Upper E8-E9 O4-O7+ GS11+	
		Advice for Self and an Appointment			Other / Civilian		
ANOVA – Manipulated	ANOVA - Manipulated	ANOVA - Manipulated	ANOVA - Manipulated	ANOVA – Manipulated	ANOVA - Manipulated	ANOVA - Manipulated	Regression - Quantitative
2 Levels	*2 Levels*	*4 Levels*	*2 Levels*	*2 Levels*	*4 Levels*	*3 Levels*	

Survey Construction

The survey instrument measures the quality of communication based on four components or dimensions: timeliness, accuracy, usefulness, and quantity. Also, the channel of information used in communication was surveyed to provide richer and more informative results. The survey was composed of closed-ended questions in a Likert-type rating scale format. Of note, a major assumption of the study was that respondents

answered the survey questions honestly. As suggested by Weisberg et al. (1996), all demographic questions were placed at the end of the survey.

The survey was developed through a pilot questionnaire, construction of the modified survey, a pilot survey process, and remodification of the survey instrument. Appendix 1 contains the survey instrument development information. The pilot questionnaire and survey process solicited input from healthcare providers, senior healthcare administrative staff, and beneficiaries of the healthcare system. The ICA Communication Audit survey instrument (Goldhaber & Rodgers, 1979) provided the basis for the final instrument used in this study and strengthened the content validity argument for the survey. A pilot questionnaire provided input into each dimension in an open ended qualitative format (response rate of 76%); from this, a list of survey questions were developed. After compiling and grouping the pilot questionnaire (qualitative, open-ended format) input, a pilot development survey was constructed to gather input from providers, administrators, and customers of the healthcare system. Once a sufficient number of pilot development surveys had been returned (n=31; response rate of 74%; 6 development surveys were returned late and were not used), each potential question's descriptive statistics (mean, median, and standard deviation) were compared to each other and ranked. Also, a Spearman's correlation matrix showing the strength and magnitude of each question (per dimension) was performed. The questions (four questions for each dimension) with the highest means, while comparing medians and standard deviations, were used to form the study's survey instrument. The survey development process summary follows:

- The ICA Communication Audit survey instrument (Goldhaber & Rodgers, 1979) provided the basis and dimensions of interest for the survey instrument.
- A pilot qualitative questionnaire was developed for each communication quality dimension.

- The pilot qualitative questionnaire was compiled to list several potential questions for each survey dimension.
- A pilot development survey was developed that listed the potential questions.
- The pilot development survey's input was compiled, descriptive statistics computed, and Spearman's correlation matrix developed to evaluate and choose the survey questions.
- A survey was developed.
- A pilot of the survey instrument was conducted.
- The results of the pilot survey provided improvement opportunities, internal consistency measures, and better methods for conducting the survey.
- The final survey instrument for providers of care and patients/beneficiaries was developed.

The pilot survey consists of four questions for each of the four dimensions (sixteen questions in all), channel of information flow questions, and general demographic questions. Both positive and negative questions were used for each dimension. Two positive and two negative questions comprise the response set for each dimension. The negative questions, once completed by the subject, were reverse coded by the researcher.

Once the pilot survey was developed, the Heidelberg area was used for a pilot study to validate the survey instrument. Cronbach's alpha, an index of internal reliability, was used to determine if the survey, as constructed, was credible for use in the study. Frey, Botan, Friedman, and Kreps (1991) as well as Udinsky, Osterlind, and Lynch (1981) suggest that Cronbach's alpha is an acceptable method of measuring internal consistency or reliability since the test randomly pairs questions that measure the same concept (or dimension) and measures the consistency of the pairings. Over the last twenty years, referencing over four thousand instances of Cronbach's alpha coefficient use in the literature, the coefficients ranged from .06 to .99 with a mean of .77 and

median of .79 (Peterson, 1994). A Cronbach's alpha coefficient score over .70 for the pilot (considering the lower sample size) and .77 or above for the study would be considered reasonable and strong. Peterson (1994) states that self-administered surveys achieve a higher Cronbach's alpha coefficient than telephone (interviewer) administered surveys. For this study, beneficiaries were surveyed by an interviewer over the telephone so it is expected that the Cronbach's alpha coefficient will be slightly lower than the provider (self-administered) survey.

The provider and patient/beneficiary surveys are slightly different. Based on the qualitative pilot questionnaire, wording was changed on the patient/beneficiary survey. Both surveys measure the same communication dimensions. Both surveys are in Appendix 1.

Pilot Survey and Findings

The pilot survey found that negative questions (questions posed in the negative) were not reasonable, nor easily answered, over the telephone. Also, the providers had a more difficult time responding to the negative questions. In light of these findings, the negative questions were converted to positive questions; all final survey questions are posed in the positive. The provider surveys proved to be unreasonably long. An improvement, one that does not negatively affect internal consistency, to the survey was completed by reducing the provider survey from four questions per dimension to three. Initially, the telephone survey was to be conducted by PAAL receptionists (appointment clerks). The author prepared the PAAL receptionists for the telephone survey but quickly found that internal validity could be threatened (instrumentation) since the receptionists, part of the PAAL team, wanted only positive beneficiary feedback and each receptionist asked questions in a somewhat different but still, slanted fashion. This required the author to solicit the Patient Advocate (one person), Patient Liaisons (two persons), Health Plan Specialists (four persons), and Red Cross volunteers (two persons), employees of the healthcare system but not PAAL team members, to conduct the telephone survey.

Internal validity was strengthened by this change. Another issue was beneficiary/patient survey time. Surveying patients at the end of a nurse interaction seemed reasonable at the onset but actually was not reasonable. Patients who called the PAAL usually were ill, or had an ill family member, and did not respond well to survey questioning. Knowing this, the patient was called and given the survey 48 to 72 hours after the PAAL interaction. This worked better and fostered more carefully considered responses.

The Cronbach's alpha measures for each dimension of the provider survey were low for the accuracy dimension due to the small sample size (n=12 with a response rate of 80%). A larger sample size, such as in the study, will increase internal consistency. The Cronbach's alpha measures, by dimension, for the provider survey instrument follow: 1) timeliness = .7596, 2) accuracy = .5662, 3) usefulness = .8871, and 4) quantity = .9244. The provider survey instrument used three questions per dimension to compute the internal consistency measurements.

The Cronbach's alpha measures for each dimension of the patient/beneficiary survey instrument were sufficient based on a sample size of 56 respondents (n=56 with a response rate of 78.8%). The Cronbach's alpha measures for the patient/beneficiary survey instrument follow: 1) timeliness = .9224, 2) accuracy = .9149, 3) usefulness = .927, and 4) quantity = .7765. The patient/beneficiary survey instrument used four questions per dimension to compute the internal consistency measurements. The final survey instruments for providers and patients/beneficiaries are shown in Appendix 1.

The summary of pilot survey findings are below:

- Three questions per dimension for the provider survey are sufficient.
- Patient/beneficiary surveys should be completed 48 - 72 hours after PAAL interaction.
- PAAL team members should not conduct the telephonic survey; use other interviewers.

- Branching logic over the telephone does not work well; telling the respondent that the scale is a rating from 1 to 5 is better, faster, and less confusing.
- Negative questions in the survey were confusing; each question should be positive.

Table 6. Data Collection Timeframes for Study.

	October 1997 - November 1997*	July 1998 - October 1998	Hypothesis
[illegible]	Ideal and Actual *	[illegible]	1 , 2, & 3
[illegible]	Actual *	[illegible]	2
[illegible]	Actual *	[illegible]	1 & 2
[illegible]	Actual *	[illegible]	3

* Pilot study conducted in Heidelberg only.

Data Analysis

Empirical data were measured using descriptive statistics. Inferential analysis was performed using a dependent group t test for hypothesis 1 (ideal versus actual communication quality) and a nonorthogonal analysis of covariance (ANCOVA) for hypothesis 2 and 3 (communication with regard to group) by utilizing an algorithm (Maxwell and Delaney, 1989; Rodgers, 1997). Basically, the algorithm calculates the regression/quantifable variables first, retains the significant variables (eliminates these variables for the ANOVA/ manipulated variables), then uses the Appelbaum and Cramer Method with the O'Brien adaptation for the ANOVA/manipulated variables to find the significant variables in each model. The Applelbaum and Cramer Method, with the

O'Brien adaptation tests each manipulated variable, eliminating other variables, and the interactions of manipulated variables to detect the best model that significantly fits but is also parsimonious. The O'Brien adaptation handles potential suppressor variables in each model. The Appelbaum and Cramer method with the O'Brien adaptation summary for an ANCOVA follows:

- Test the quantitative variables while eliminating the manipulated variables
    - If quantitative variables are significant, retain them in model
    - If quantitative variables are not significant, remove them from model
- Test the Interaction (γ) of manipulated variables in the presence of main effects
    - If significant, stop and adopt full model.
    - If not significant, then remove the interactions from the model
    - Example: SSR($\gamma \mid \alpha, \beta$)
- Do eliminating tests:
    - If significant, then adopt manipulated variables
    - If one is significant adopt that variable
    - If neither is significant do both ignoring tests
- Ignoring tests
    - If both are significant adopt either but do not know which
    - If one is significant adopt that effect
    - If neither is significant adopt Ho: $Y = \mu + e$
- The O'Brien Adaptation: tests for suppressor variables
    - One or more manipulated variables were never tested
    - if one is significant, test it in an ignoring test

- if it is significant, adopt model with that manipulated variable
- if not significant, then adopt the two main effect model.

* Note: During the model comparison process, the F ratio and probability of the findings must be considered.

The ANCOVA design tested for differences by group, such as the Family Practice Medical Doctors (MD) and Doctors of Osteopathy (DO) from Internal Medicine MDs and DOs and by location (remote from the demand management system versus local). Each dependent variable (timeliness, accuracy, usefulness, and quantity) was analyzed with a separate ANCOVA. Typically, this design has higher power than an ANOVA. More important for this study, the ANCOVA has the freedom to change the slope of the prediction line for each group in the study. So, the prediction line "fits" the observed data for each group (given that the groups are different with regard to communication needs) with less error. As the linear relationship between the regression variable (called covariate in ANCOVA designs) and the dependent variables becomes stronger, there is less prediction error in the ANCOVA design than an ANOVA method. Since this study attempts to find ideal and actual communication quality, with regard to provider specialty, location, and training and beneficiary location, this methodology serves as a more accurate and sensitive framework for determining results of interest. In summary, the ANCOVA design allows a prediction line for each group in the study that better represented the empirical data and thus was a more powerful method for this research since smaller effects were detected than in an ANOVA design.

An ANCOVA design was appropriate for this study considering Type I and II error rates. Since this research used an ex post facto design, homogeniety of variance could not be assumed. This issue is of concern primarily for the beneficiary respondants. To test for homogeniety of variance, the O'Brien (1981) r transformation test was performed. The r transformation utilizes a regular ANOVA, on transformed data, to test

for differences in variance and "appears to be: a) robust to departures from normality, b) easy to apply..., c) relatively powerful, and d) generalizable to factorial designs with equal and unequal number of observations in the cells" (O'Brien, 1981). An insignificant r transformation ANOVA, failure to reject the null hypothesis, reasonably assures homogeniety of variance. The O'Brien homogeniety of variance test was performed on the beneficiary data set by using the independent variables of gender and localtion. Power of the statistical test (Type II) considering research design depends on the sample size. Both designs have essentially equal power according to Maxwell and Delaney (1989). In terms of Power (Type II error), an ANCOVA design was preferred.

The analysis for Hypothesis 1 measured the results of primary care provider's ideal communication quality from the PAAL and actual communication quality. Descriptive statistics for each component of communication quality, timeliness, accuracy, usefulness, and quantity, were produced for the ideal and actual communication quality components. To find significant difference, at the alpha = 0.05 level, a dependent group t test with no hypothesized difference inferentially tested each ideal communication quality component to the actual component. The pair-wise or dependent group t test was performed by isolating groups (such as local and distant, family practice and internal medicine, and MDs and DOs, for example) and inferentially tested the ideal to actual communication. Both the ideal and actual communication quality components were acquired by the survey instrument.

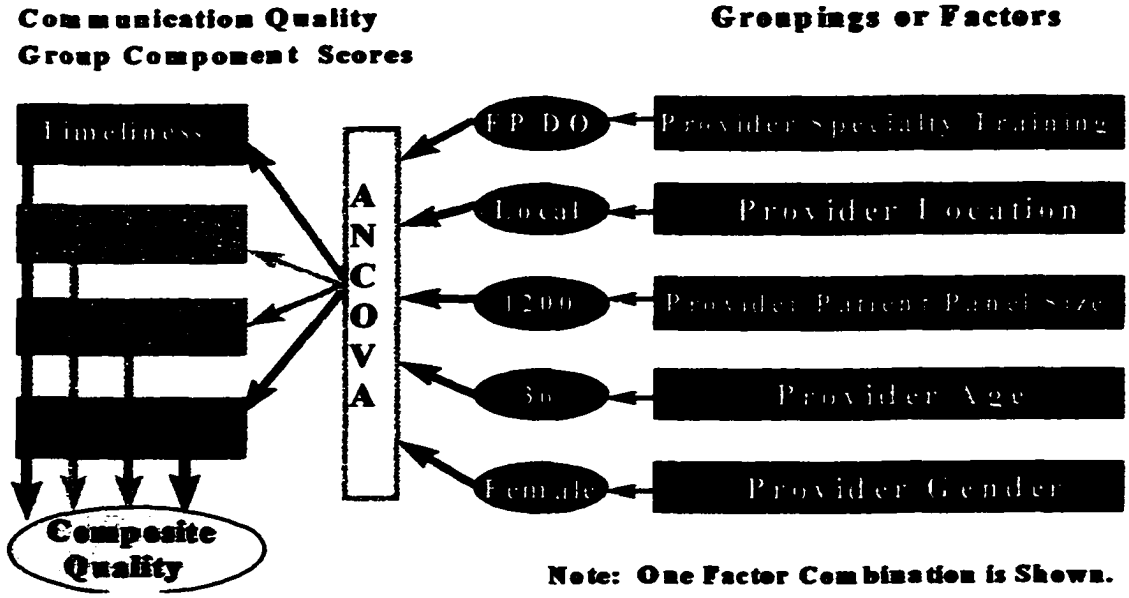


Figure 2. Research Design: ANCOVA Design Concept.

After the Patient Access and Advice Line (PAAL) had been operating in each community for at least thirty days, the survey was given. The number of PAAL communication episodes, an independent variable, will control for varying amounts of time the PAAL had been operating in each community with beneficiaries and providers.

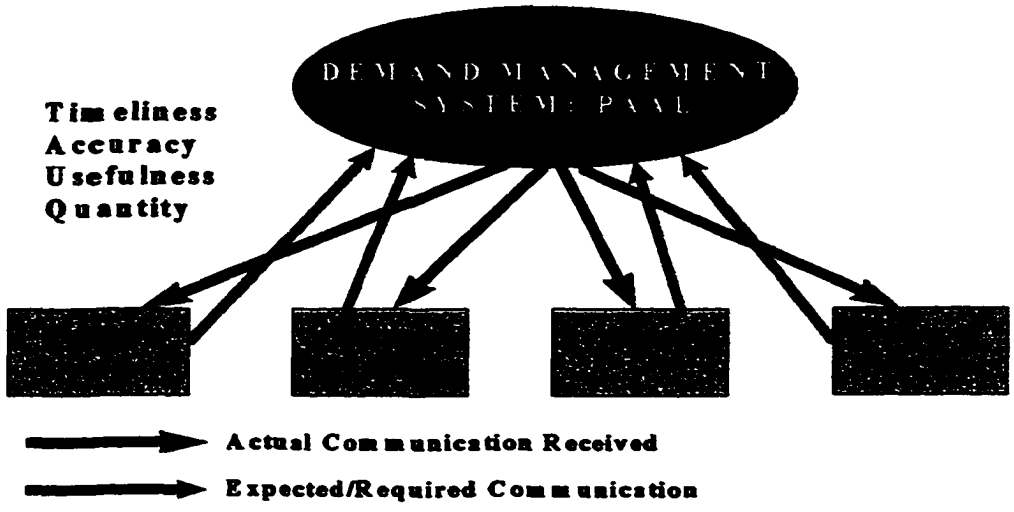


Figure 3. Research Design Concept: Hypothesis 1.

For hypothesis 2, to achieve Power of .80 with $\alpha = 0.05$, for five to six factors (levels), a minimum correlation of .4, and an effect size (d) of 0.75, the sample size should reach a minimum of n =31 (for five factor (level)) and n = 34 (for six factor (level), whereas a Power of .50 for the same criteria requires a sample size of n=19 to n=21 (Maxwell & Delaney, 1989). The factors or levels, for hypothesis 2, are listed in priority of interest: 1) provider specialty, 2) location, 3) provider training, 4) provider gender, 5) provider age, 6) panel size, and 7) channel of communication. Since the study was limited to a relatively set number of providers, reaching the required sample size was difficult for some factors. This issue will be discussed in the results and limitations sections.

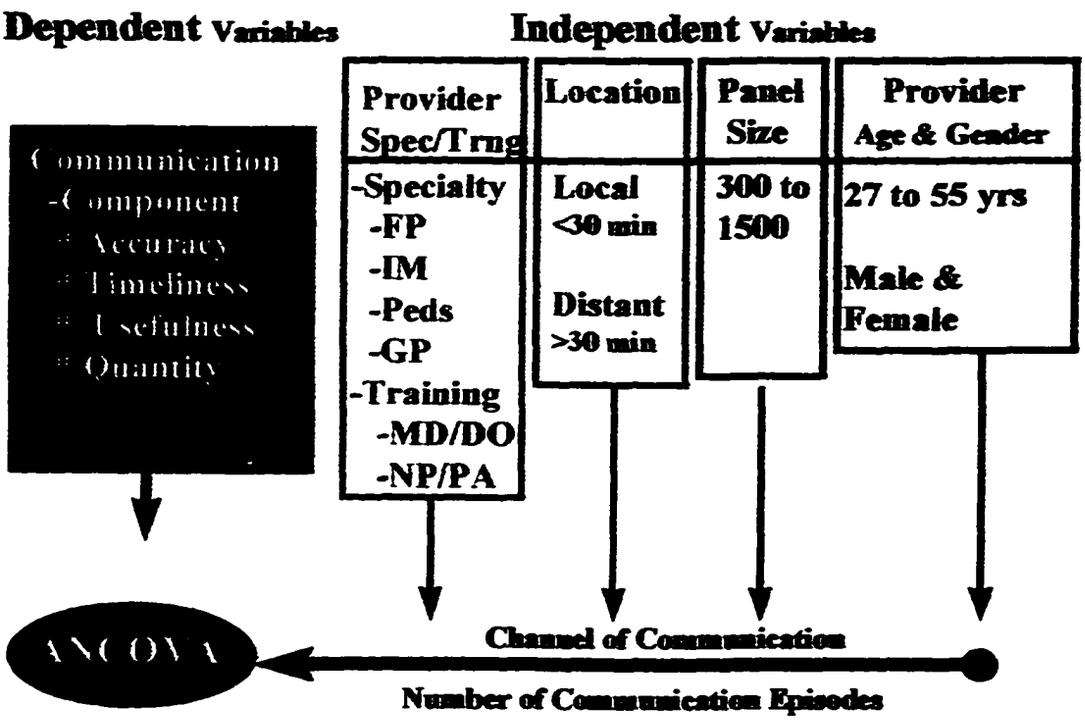


Figure 4. Research Design Concept for Hypothesis 2.

For hypothesis 2, to achieve Power of .80 with $\alpha = 0.05$, for five to six factors (levels), a minimum correlation of .4, and an effect size (d) of 0.75, the sample size should reach a minimum of n =31 (for five factor (level)) and n = 34 (for six factor (level), whereas a Power of .50 for the same criteria requires a sample size of n=19 to n=21 (Maxwell & Delaney, 1989). The factors or levels, for hypothesis 2, are listed in priority of interest: 1) provider specialty, 2) location, 3) provider training, 4) provider gender, 5) provider age, 6) panel size, and 7) channel of communication. Since the study was limited to a relatively set number of providers, reaching the required sample size was difficult for some factors. This issue will be discussed in the results and limitations sections.

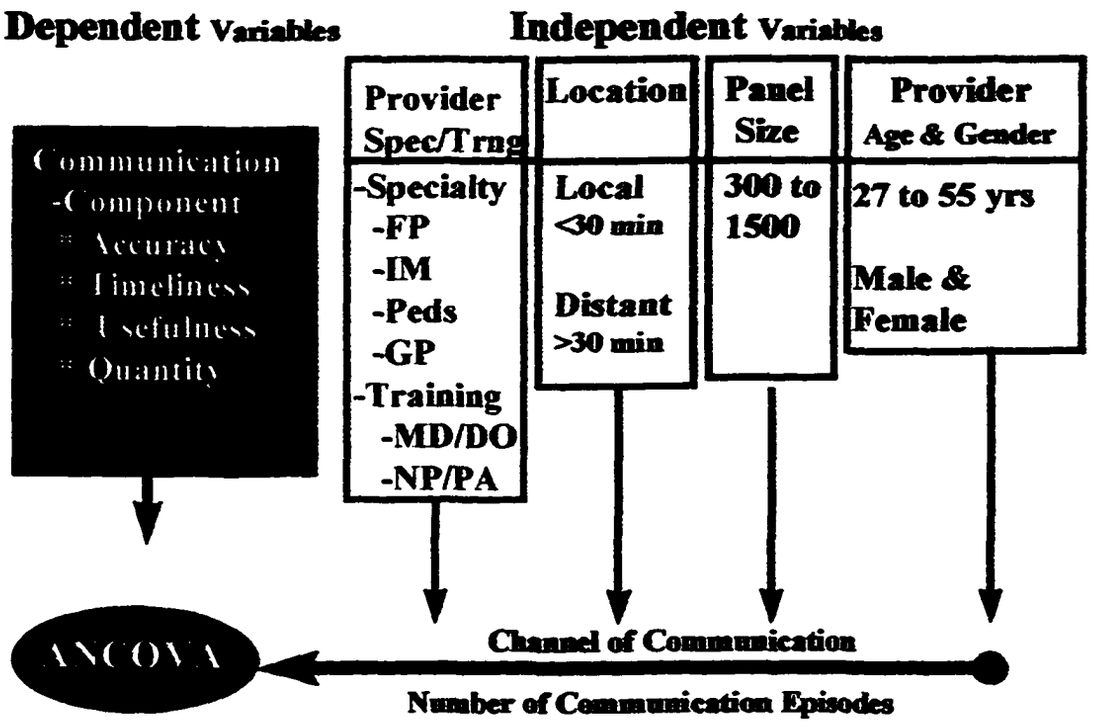


Figure 4. Research Design Concept for Hypothesis 2.

Hypothesis 3 data was gathered from the survey instrument. The modification was tailored to beneficiaries/patients that use the PAAL. Empirical data was gathered after the demand management system had been activated for a minimum of three months. Starting at a random time of the day during PAAL operation, survey data was acquired using a systematic sample (Frey et al., 1991) by telephone using the Patient Advocate, Liaisons, and volunteers who questioned the patients. The questions were asked 48 to 72 hours after the patient completed the interaction with the PAAL. For the pilot, the interviewer utilized a branching format that is easier to use on the telephone (Weisberg, Krosnick, & Bowen, 1996) to question the patients. Branching breaks down the question where a respondent either agrees or disagrees, then the clerk further asks for the extent of the agreement or disagreement for each survey question. The pilot study found that branching did not work well in operation so respondents were told that a rating scale from 1 (very little extent) to 5 (very great extent) would be used to answer the questions.

The PAAL communication procedure was monitored by the author/researcher and the nurse supervisor to detect changes in information transfer and channel of media used for the duration of the study. If a quality improvement was warranted, the change was implemented and documented in the research.

For hypothesis 3, to achieve Power of .80 with $\alpha = 0.05$, for six factors (levels), a minimum correlation of .4, and an effect size (d) of 0.75, the sample size should reach a minimum of $n = 34$, the ANCOVA is the best method for this study (Maxwell & Delaney, 1989). The factors or levels, for hypothesis 3, are listed in priority of interest: 1) reason for call, 2) location of caller, 3) patient category, 4) caller gender, 5) self-care class attendance, 6) health self-efficacy level, and 7) rank/grade of sponsor denoting socio-economic status of the patient or family. Caller age is a regression variable of interest.

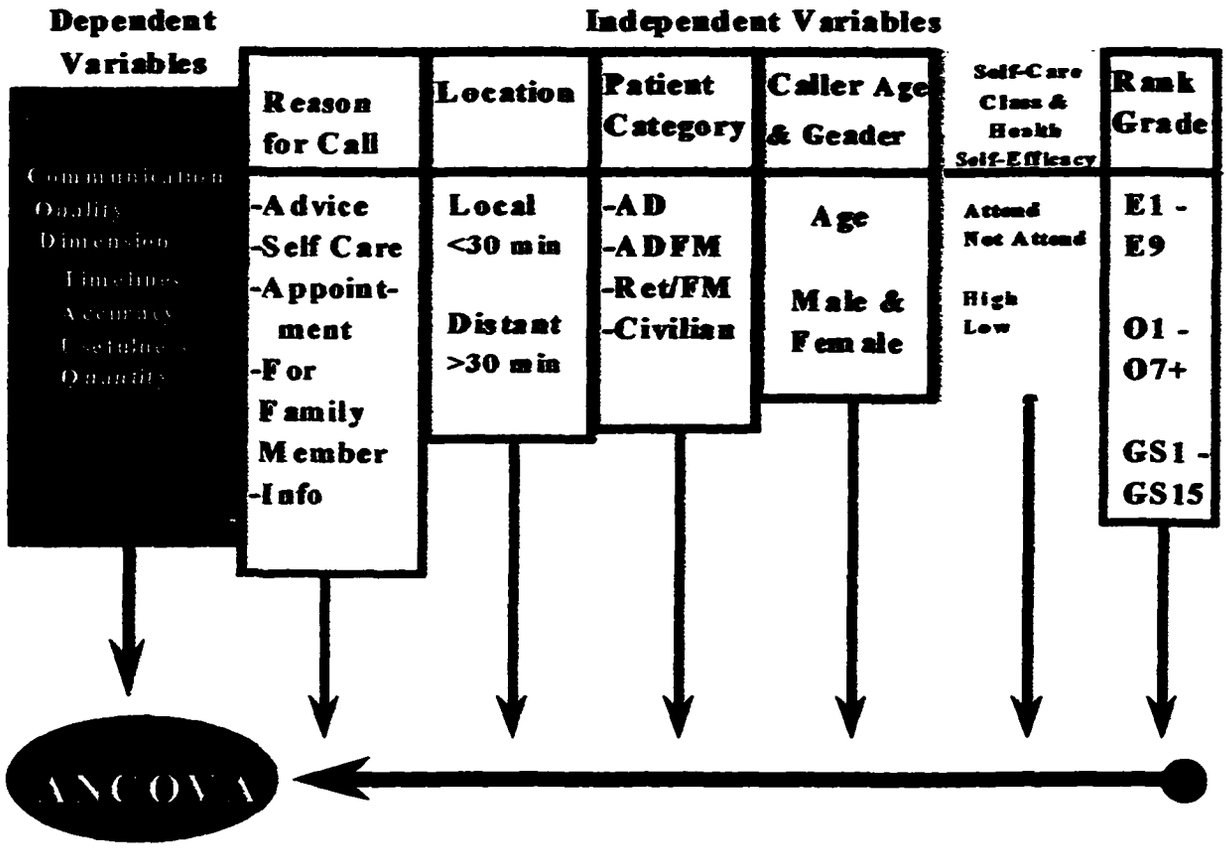


Figure 5. Research Design Concept for Hypothesis 3.

CHAPTER 4

Results

Hypothesis 1

Hypothesis 1 focused on provider satisfaction with communication quality as information flowed to the provider from the nurse call center. The hypothesis stated that there was a significant difference in provider ideal (required/ expected) communication quality and actual communication quality. By matching ideal scores with actual scores for each communication quality dimension, the alternate hypothesis was supported.

The internal consistency measures of each dimension regarding the "ideal" condition, as determined by Cronbach's Coefficient Alpha, were 0.75 for timeliness, 0.93 for accuracy, 0.89 for usefulness, and .72 for quantity. Peterson (1994) suggests that an internal consistency score of 0.77 is reasonably strong. The timeliness and quantity dimensions were slightly below the 0.77 internal consistency score, but not by a considerable margin. The internal consistency measures of each dimension regarding the "actual" condition, as determined by Cronbach's Coefficient Alpha, were 0.72 for timeliness, 0.93 for accuracy, 0.89 for usefulness, and 0.60 for quantity. For the actual condition considering the 0.77 internal consistency guideline, the timeliness dimension scored slightly below and the quantity dimension score was well below the target score.

Table 7. Ideal and Actual Communication Quality Descriptive Statistics Per Question.

Ideal Questions	T1	T2	T3	A1	A2	A3	U1	U2	U3	Q1	Q2	Q3
Mean	3.984	4.031	4.438	4.453	4.438	4.484	4.00	4.266	4.313	2.094	1.906	2.063
Std. Dev.	0.984	0.942	0.906	0.775	0.814	0.943	1.024	1.130	1.220	1.088	1.083	1.582
Actual Questions	T1	T2	T3	A1	A2	A3	U1	U2	U3	Q1	Q2	Q3
Mean	2.594	2.703	3.000	3.609	3.625	3.625	2.875	3.313	3.328	2.609	2.922	2.563
Std. Dev.	1.050	1.079	1.222	0.828	0.787	1.016	1.076	1.233	1.358	1.229	1.131	1.651

- Note: T = Timeliness; A = Accuracy; U = Usefulness; Q = Quantity; the number corresponds to the dimension question in the survey instrument.

Comparing the ideal to the actual scores of each dimension using a dependent group (pair-wise) t test, all four dimensions had significant differences. Since the pediatric, internal medicine, and Ob/Gyn groups had small sample sizes, they were combined using the logic that these providers had primary care duties, as well as, specialty consultant responsibilities. Family practice providers were compared separately and combined with general practice providers to form the primary care group. These results suggest that providers perceive a need for higher quality communication from the nurse call center. Tables 8 through 11 reveal the t test comparisons for each respective communication quality dimension.

Table 8. Timeliness Dimension Comparisons: Ideal and Actual Communication Quality.

Statistic	All Providers		[illegible]		Primary Care Providers Only	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	63	63	[illegible]	[illegible]	42	42
Mean	12.4762	8.2540	[illegible]	[illegible]	12.2619	8.3571
df	62		[illegible]		41	
t statistic	10.9112		[illegible]		8.7412	
probability (two tail)	0.0000		[illegible]		0.0000	
Statistic	**Primary Care With Specialty Duties**		[illegible]		**Distant Providers Only**	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	21	21	[illegible]	[illegible]	25	25
Mean	12.9048	8.0476	[illegible]	[illegible]	12.8400	7.0267
df	20		[illegible]		24	
t statistic	6.5841		[illegible]		6.1851	
probability (two tail)	0.0000		[illegible]		0.0000	

Table 9. Accuracy Dimension Comparisons: Ideal and Actual Communication Quality.

Statistic	All Providers		[illegible]		Primary Care Providers Only	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	63	63	[illegible]	[illegible]	42	42
Mean	13.3333	10.7778	[illegible]	[illegible]	13.2381	11.0238
df	62		[illegible]		41	
t statistic	8.0104		[illegible]		5.3674	
probability (two tail)	0.0000		[illegible]		0.0000	
Statistic	**Primary Care With Specialty Duties**		[illegible]		**Distant Providers Only**	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	21	21	[illegible]	[illegible]	25	25
Mean	13.5238	10.2857	[illegible]	[illegible]	13.3200	10.9200
df	20		[illegible]		24	
t statistic	7.0025		[illegible]		4.4567	
probability (two tail)	0.0000		[illegible]		0.0002	

Table 10. Usefulness Dimension Comparisons: Ideal and Actual Communication Quality.

Statistic	All Providers		[illegible]		Primary Care Providers Only	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	63	63	[illegible]	[illegible]	42	42
Mean	12.3651	9.2540	[illegible]	[illegible]	12.0476	9.2143
df	62		[illegible]		41	
t statistic	7.3166		[illegible]		5.2802	
probability (two tail)	0.0000		[illegible]		0.0000	
Statistic	**Primary Care With Specialty Duties**		[illegible]		**Distant Providers Only**	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	21	21	[illegible]	[illegible]	25	25
Mean	13.0000	9.3333	[illegible]	[illegible]	13.0400	9.9200
df	20		[illegible]		24	
t statistic	5.3047		[illegible]		4.4224	
probability (two tail)	0.0000		[illegible]		0.0002	

Table 11. Quantity Dimension Comparisons: Ideal and Actual Communication Quality.

Statistic	All Providers		[illegible]		Primary Care Providers Only	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	63	63	[illegible]	[illegible]	42	42
Mean	5.7619	7.8254	[illegible]	[illegible]	6.1190	7.9762
df	62		[illegible]		41	
t statistic	5.7805		[illegible]		5.0045	
probability (two tail)	0.0000		[illegible]		0.0000	

Statistic	Primary Care With Specialty Duties		[illegible]		Distant Providers Only	
	Ideal	Actual	[illegible]	[illegible]	Ideal	Actual
Observations	21	21	[illegible]	[illegible]	25	25
Mean	5.0476	7.5238	[illegible]	[illegible]	5.6800	8.4000
df	20		[illegible]		24	
t statistic	3.1764		[illegible]		5.3167	
probability (two tail)	0.0047		[illegible]		0.0000	

Hypothesis 2

Hypothesis 2 focused on finding perceived differences in scores for actual communication quality dimensions by provider groups and determining distinct linear patterns using selected quantitative (regression) variables. Provider groupings consisted of specialty, location (local or distant to the nurse call center), training, and gender. Quantitative variables consisted of provider age and number of prior nurse call center communication episodes.

The ANCOVA inferential statistical test for each communication quality dimension was performed on the provider sample (n = 63). Providers ranked the frequency of communication media channels used by the nurse call center to transfer information to the providers. The channels of communication media

utilization/frequency rate from high to low use was: 1) email; 2) written; 3) from the patient; 4) telephone; 5) intranet CHCS mailman (internal email); 6) fax; and 7) face-to-face. The top media channel, email, is considered moderate in media richness while the second, written, is low in media richness (D'Ambra & Rice, 1994; Daft & Lengel, 1986).

Timeliness dimension. The timeliness dimension scores captured provider communication speed perceptions of patient episodic information from the nurse call center to the provider. The interest was in provider group differences and linear patterns concerning information speed.

The timeliness dimension inferential statistical test did not support the alternate hypothesis; the null hypothesis was not rejected. Table 12 illustrates the finding. The grand mean for this dimension was 8.25 with a standard deviation of 2.53 (n = 63). The high R square statistic suggests that the full model's independent variables accounted for most of the variance of the dependent variable (the timeliness composite score).

Table 12. Timeliness composite dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	49	359.3550	7.1871	2.24	0.0648
Error	13	38.5815	3.2151		
Corrected Total	62	397.9365			R square = 0.9031

Using the model comparison methodology, even though the full model did not support the alternate hypothesis for this dimension, the independent variables of location and age of provider proved to be solid predictors for timeliness as illustrated in Table 13.

The reduced model was Timeliness Composite Score = Location + Provider Age + error. Table 14 shows the group means for the reduced model's predictor variable (manipulated variable).

Table 13. Timeliness composite dimension reduced model results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	2	49.9551	24.9775	4.31	0.0179
Error	60	347.9815	5.7997		
Corrected Total	62	397.9365			R square = 0.1255

Table 14. Group means for the reduced model timeliness communication quality dimension.

Group	n	Mean	Standard Deviation
Grand Mean	63	8.2540	2.5334
Local Providers	38	7.7949	2.3862
Distant Providers	25	9.1200	2.6508

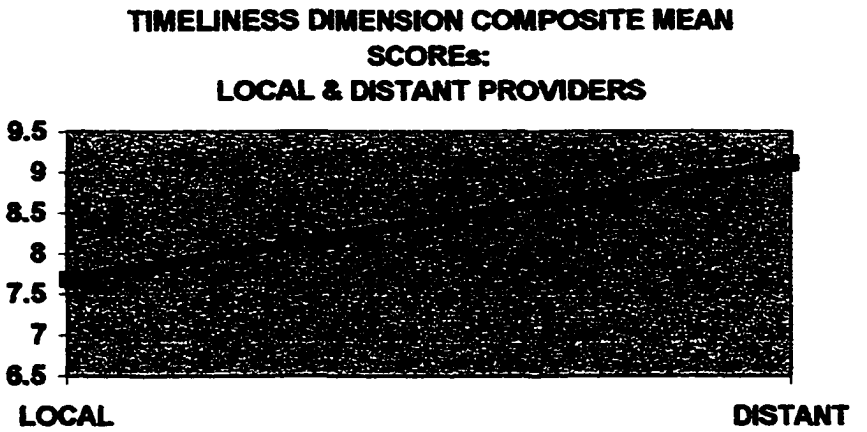


Figure 6. Timeliness Dimension: Mean Scores of Local and Distant Providers.

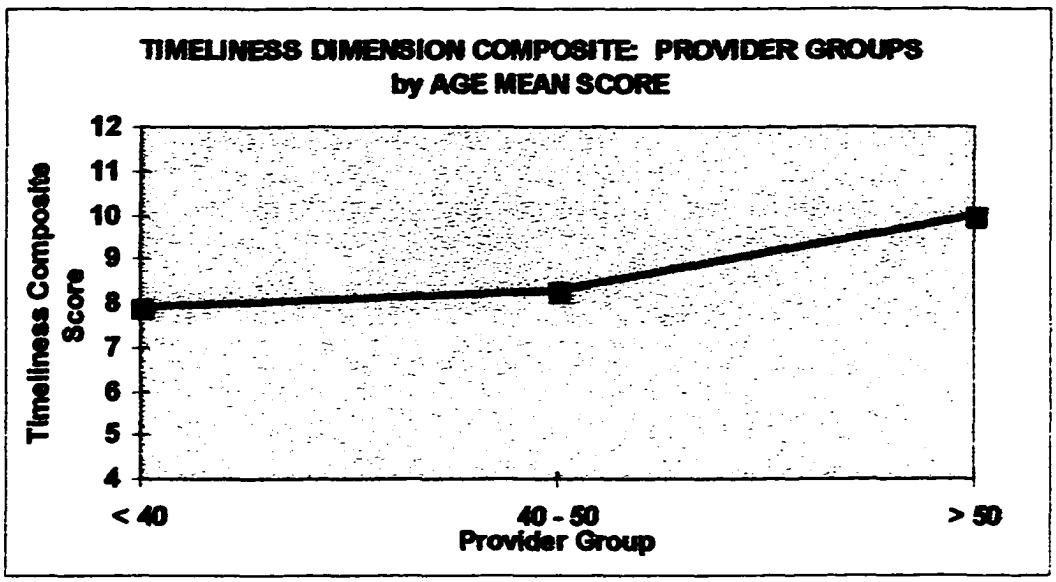


Figure 7. Timeliness Dimension: Score by Provider Age.

Distant providers and providers over the age of fifty scored higher in the timeliness dimension. The full model failed to reject the null hypothesis but the reduced model supported the alternate hypothesis.

Accuracy dimension. The accuracy dimension scores captured provider communication accuracy (reliability of information to be true) perceptions of patient episodic information from the nurse call center to the provider. The interest was in provider group differences and linear patterns concerning information reliability.

The accuracy dimension inferential statistical test did not support the alternate hypothesis; the null hypothesis was not rejected. Table 15 illustrates the finding. The grand mean for this dimension was 10.78 with a standard deviation of 2.22 (n = 63). The R square statistic revealed that the full model accounted for a large portion of the dependent variable's variance.

Table 15. Accuracy composite dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	49	256.4287	5.2332	1.40	0.2577
Error	13	48.4601	3.7277		
Corrected Total	62	304.8889			R square = 0.8411

Using model comparison methodology, no independent variables met the test of significance. The best predictor for the accuracy dimension composite score was the grand mean for this study.

Usefulness dimension. The usefulness dimension scores captured provider communication usefulness (information serves a purpose) perceptions of patient episodic information from the nurse call center to the provider. The interest was in provider group differences and linear patterns concerning information usefulness.

The usefulness dimension inferential statistical test did not support the alternate hypothesis; the null hypothesis was not rejected. Table 16 illustrates the finding. The R square statistic points out that the full model accounted for a large portion of dependent variable variance. The grand mean for this dimension was 9.25 with a standard deviation of 2.63 (n = 63).

Table 16. Usefulness composite dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	49	367.4409	7.4988	1.61	0.1749
Error	13	60.4956	4.6535		
Corrected Total	62	427.9365			R square = 0.8586

Using model comparison methodology, no independent variable met the test of significance. The best usefulness dimension score predictor was the grand mean.

Quantity dimension. The quantity dimension scores captured provider communication adequacy perceptions of patient episodic information from the nurse call center to the provider. The interest was in provider group differences and linear patterns concerning information adequacy of communication flows.

The quantity dimension inferential statistical test supported the alternate hypothesis. Table 17 illustrates the finding. The R square statistic revealed that the full model accounted for most dependent variable variance. The dimension's grand mean was 7.86 with a standard deviation of 2.48 (n = 63).

Table 17. Quantity composite dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	49	400.9460	8.1826	4.29	0.0032
Error	13	24.7683	1.9053		
Corrected Total	62	425.7143			R square = 0.9418

Using a model comparison methodology, the independent variables location, specialty, number of communication episodes with the nurse call center, age of provider, and interactions of communication episodes with location, specialty, and age proved to be solid predictors for the provider's quantity dimension composite scores. Over half of the variance in the dependent variable was accounted for in the reduced model. The reduced model was Quantity Composite Score = Location + Specialty + Number of Communication Episodes + Provider Age + Communication Episodes*Location + Communication Episodes*Specialty + Communication Episodes*Age + error. Table 18

illustrates the reduced model while table 19 shows the means of the reduced model's significant variables (manipulated variables).

Table 18. Quantity composite dimension reduced model results.

Source	df	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	223.8047	14.9203	3.47	0.0005
Error	47	201.9096	4.2960		
Corrected Total	62	425.7143			R square = 0.5257

Table 19. Group means: Reduced model quantity communication quality dimension.

Group	N	Mean	Standard Deviation
Grand Mean	63	7.8254	2.4792
Local Providers	38	7.4474	2.7578
Distant Providers	25	8.4000	1.8930
General Practice Providers	10	8.4000	0.6992
Family Practice Providers	32	7.8438	2.5414
Internal Medicine Providers	6	6.0000	1.7889
Pediatric Providers	9	8.5556	2.7437
Ob/Gyn Providers	4	5.7500	0.9574

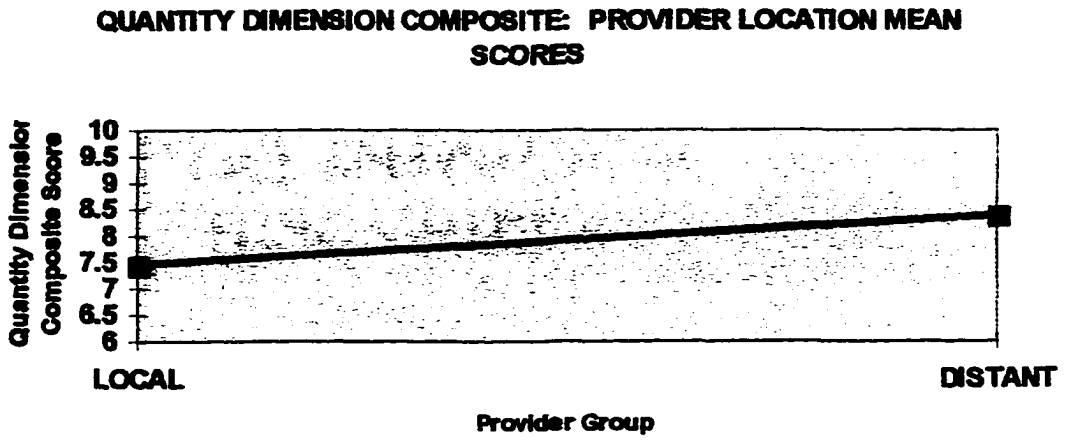


Figure 8. Quantity Dimension Composite: Means for Local and Distant Providers.

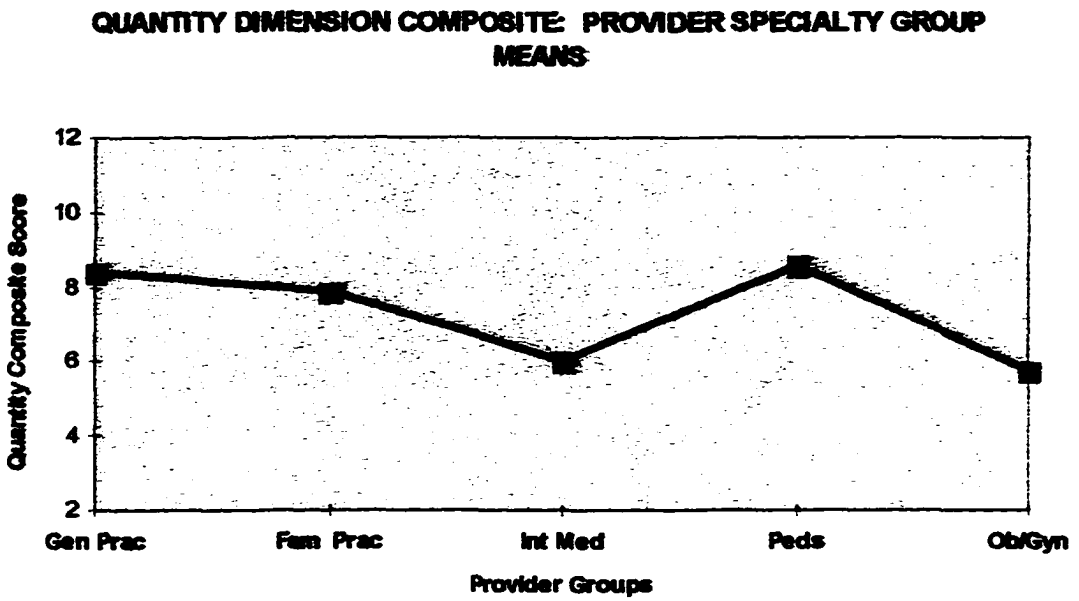


Figure 9. Quantity Dimension Composite: Provider Specialty Group Means.

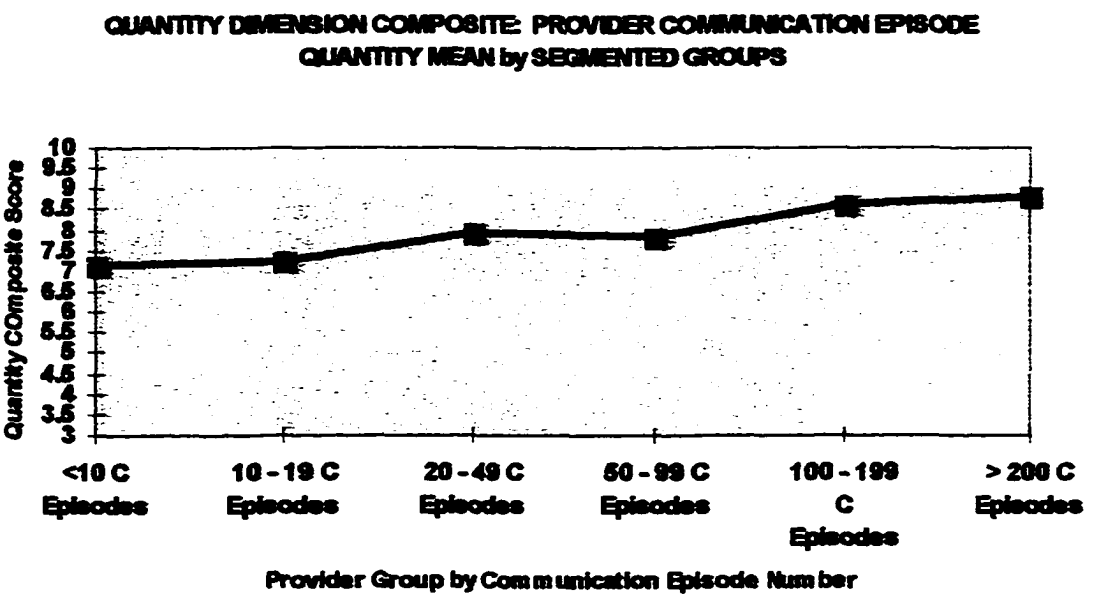


Figure 10. Quantity Composite Mean Score by Communication Episode Quantity.

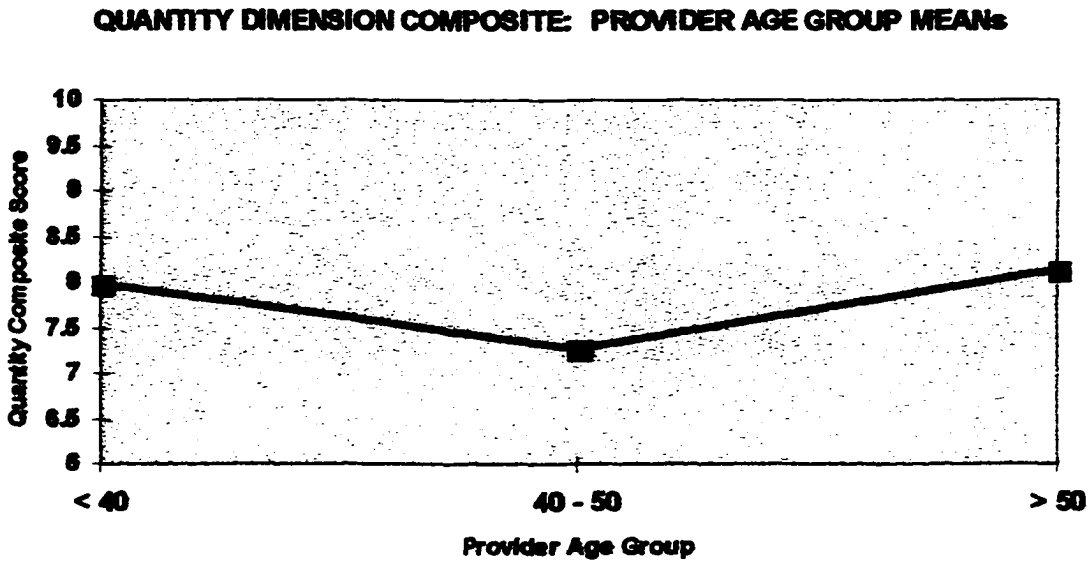


Figure 11. Quantity Composite Mean by Provider Age Group.

Providers who were local, internal medicine and ob/gyn specialties, had fewer prior communication episodes, and were in the forty to fifty year old age group scored lower than other provider groups. Since a lower quantity score revealed higher quality for this dimension, these groups perceived higher quality regarding quantity of communication from the nurse call center.

Hypothesis 2 summary. The data analysis for hypothesis 2 showed that a reduced model for the timeliness dimension supported the alternate hypothesis. The full model for the quantity dimension rejected the null hypothesis in favor of the alternate hypothesis and found that a reduced model had stronger support for the alternate hypothesis. The analysis of the accuracy and usefulness dimensions failed to reject the null hypothesis; the accuracy and usefulness dimension's grand means were the best predictors of communication quality.

Hypothesis 3

Hypothesis 3 focused on beneficiary perceptions of nurse call center communication within the four dimensions of communication quality. For beneficiaries that accessed the nurse call center, location, reason for call, beneficiary category, gender, socio-economic status, self-care class attendance, and health self-efficacy were variables used to group and find distinctions in beneficiary perceptions of nurse call center communication quality. Also beneficiary age was used as a quantitative variable for determining linear patterns in communication quality scores.

The beneficiary survey instrument internal consistency measures of each dimension, determined by Cronbach Coefficient Alpha, for the study were 0.83 for timeliness, 0.93 for accuracy, 0.93 for usefulness, and 0.66 for quantity. The quantity measure, using 0.77 as a reasonable Cronbach Coefficient Alpha measure (Peterson, 1994), would be considered low. Quantity dimension question number three (Q3, survey question 15) and four (Q4, survey question 16) showed the lowest internal consistency. The other dimensions showed high rates of internal consistency. Statistics for the individual questions for the beneficiary survey were computed in Table 20.

Table 20. Individual question statistics for the beneficiary survey instrument (n = 242).

Question	T1	T2	T3	T4	A1	A2	A3	A4
Mean	3.98	3.85	4.08	4.00	4.10	4.11	4.14	4.07
Mode	5	5	5	5	5	5	5	5
Std. Dev.	1.07	1.18	1.13	1.18	1.07	1.05	1.06	1.10
Question	U1	U2	U3	U4	Q1	Q2	Q3	Q4
Mean	4.05	3.91	4.09	4.12	2.56	1.93	2.38	2.11
Mode	5	5	5	5	1	1	1	1
Std. Dev.	1.12	1.18	1.13	1.14	1.43	1.15	1.33	1.29

- Note: T = Timeliness; A = Accuracy; U = Usefulness; Q = Quantity; the number corresponds to the dimension question in the survey instrument.

Timeliness dimension. The timeliness dimension inferential statistical test supported the alternate hypothesis. The full model inferential test results are presented in Table 21. The grand mean for this dimension was 16.21 with a standard deviation of 3.54 (n = 242).

Table 21. Timeliness dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	82	1282.7788	15.6436	1.43	0.0293
Error	159	1744.8907	10.9742		
Corrected Total	241	3027.6694			R square = 0.4237

Using a model comparison approach, the best model included the independent variables gender and health self-efficacy as presented in Table 22. The reduced model was expressed as Timeliness Composite Score = Gender + Health Self-Efficacy + error.

Table 22. Timeliness dimension reduced model results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	2	223.0648	111.5324	9.50	0.0001
Error	239	2804.6046	11.7347		
Corrected Total	241	3027.6694			R square = 0.0737

Males scored significantly lower than females in their perception of timeliness, as well as, individuals with lower health self-efficacy scored lower than those with higher health self-efficacy. When gender and health self-efficacy are combined, the male low health self-efficacy group scored the lowest. Table 23 presents the findings.

Table 23. Group means for the reduced model timeliness communication quality dimension.

Group	n	Mean	Standard Deviation
Grand Mean	242	16.2066	3.5444
Male	77	14.9351	3.6250
Female	165	16.8000	3.3554
Low Health Self Efficacy	28	15.07142	3.9315
High Health Self Efficacy	214	16.3721	3.3346
Male & Low Health Self Efficacy	11	13.0000	4.1231
Male & High Health Self Efficacy	66	15.2576	3.4655
Female & Low Health Self Efficacy	17	16.4118	3.8578
Female & High Health Self Efficacy	148	16.8446	3.3047

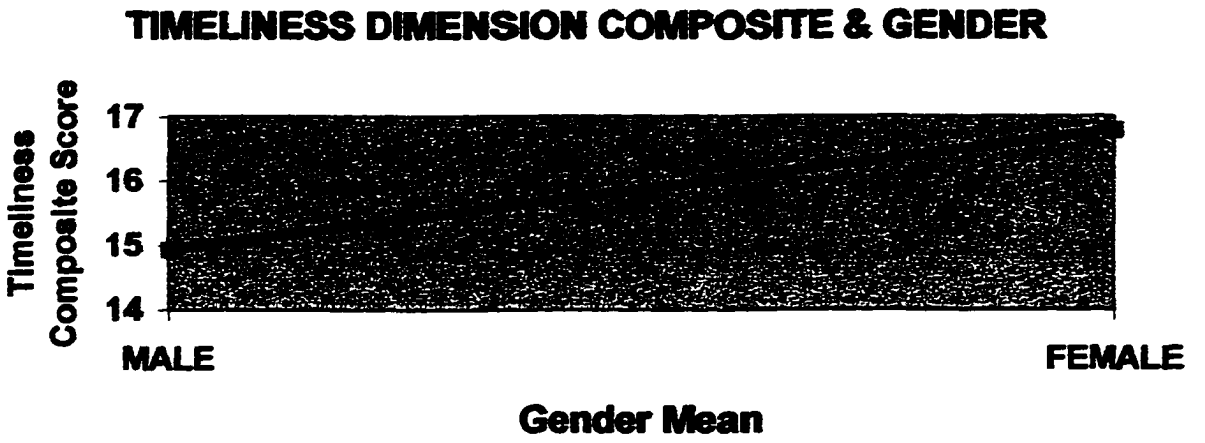


Figure 12. Timeliness and Gender Mean Scores.

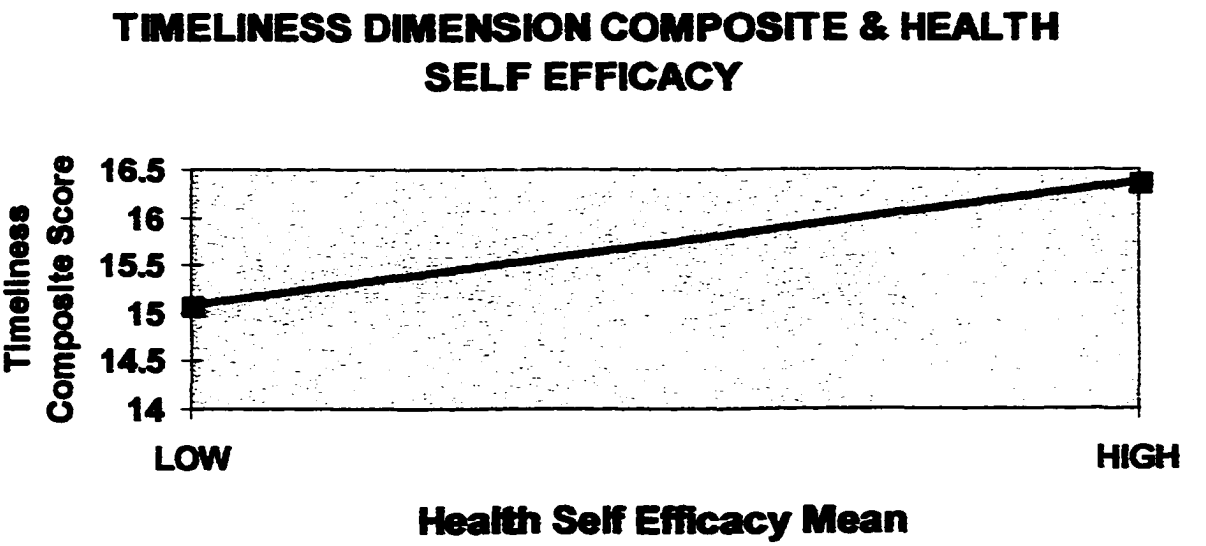


Figure 13. Timeliness and Health Self-Efficacy Mean Scores.

Accuracy dimension. The accuracy dimension inferential statistical test supported the alternate hypothesis. The full model inferential test results are presented in Table 24. The grand mean for this dimension was 16.72 with a standard deviation of 3.74 (n = 242).

Table 24. Accuracy dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	82	1433.0824	17.4766	1.43	0.0279
Error	159	1941.3680	12.2097		
Corrected Total	241	3374.4504			R square = 0.4247

Using a model comparison approach, the best model included the independent variables beneficiary category, location, gender, self care class, and the interactions of location with beneficiary category and location with self care class. These results are presented in Table 25. The best-fit model was expressed as Accuracy Composite Score = Beneficiary Category + Location + Gender + Self Care Class + Location * Beneficiary Category + Location * Self Care Class + error.

Table 25. Accuracy dimension reduced model results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	10	331.8605	33.1860	2.52	0.0068
Error	231	3042.5900	13.1714		
Corrected Total	241	3374.4504			R square = 0.0984

Males scored significantly lower than females in their perception of accuracy. As well, retired individuals and active duty military scored lower than other groups. Civilian and civilian family members scored higher than all other beneficiary groups. Local

civilian beneficiaries scored highest on this dimension, while local retired persons scored lowest. Table 26 presents the findings for the accuracy dimension.

Table 26. Group means: reduced model accuracy communication quality dimension.

Group	n	Mean	Standard Deviation
Grand Mean	242	16.7231	3.7419
Male	77	15.8571	3.7478
Female	165	17.1273	3.6811
Beneficiary Category - Civilians	27	17.8400	2.8531
Beneficiary Category - Active Duty	83	16.4575	3.7722
Beneficiary Category - Active Duty Family Member	120	16.8860	3.6452
Beneficiary Category - Retired	12	14.3333	5.7228
Local Beneficiaries	155	16.8642	3.6450
Distant Beneficiaries	87	16.4375	3.9389
Local Civilians	21	17.9048	3.0316
Local Active Duty	64	17.1250	2.9196
Local Active Duty Family Member	72	16.6111	3.9166
Local Retired	5	12.8000	7.3280
Distant Civilians	6	17.5000	1.9149
Distant Active Duty	30	15.0333	4.9024
Distant Active Duty Family Member	42	17.3571	3.1143
Distant Retired	7	16.2500	2.6300

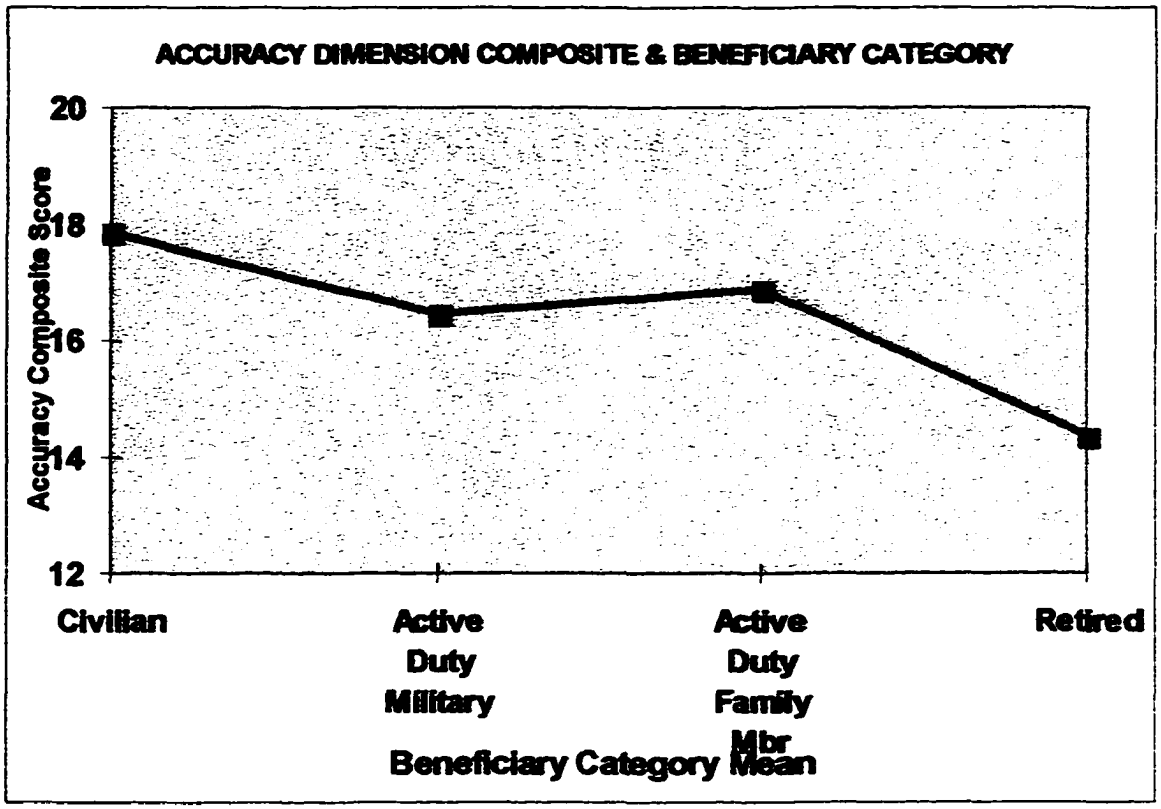


Figure 14. Accuracy and Beneficiary Category Mean Scores.

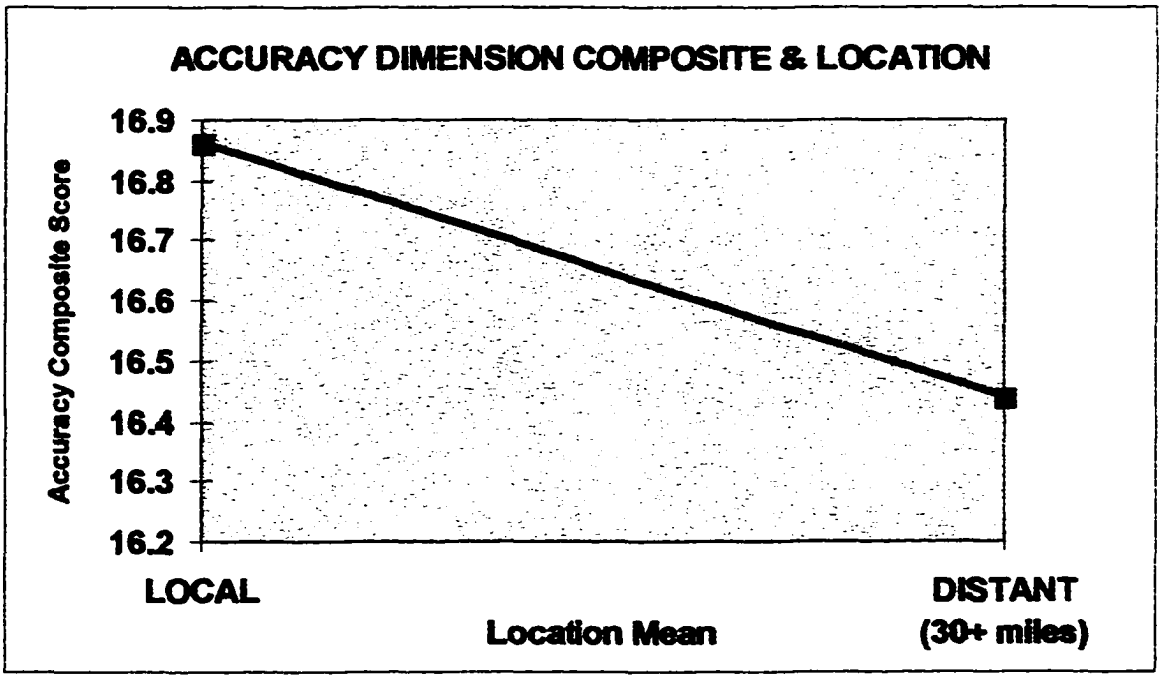


Figure 15. Accuracy Composite Means by Location.

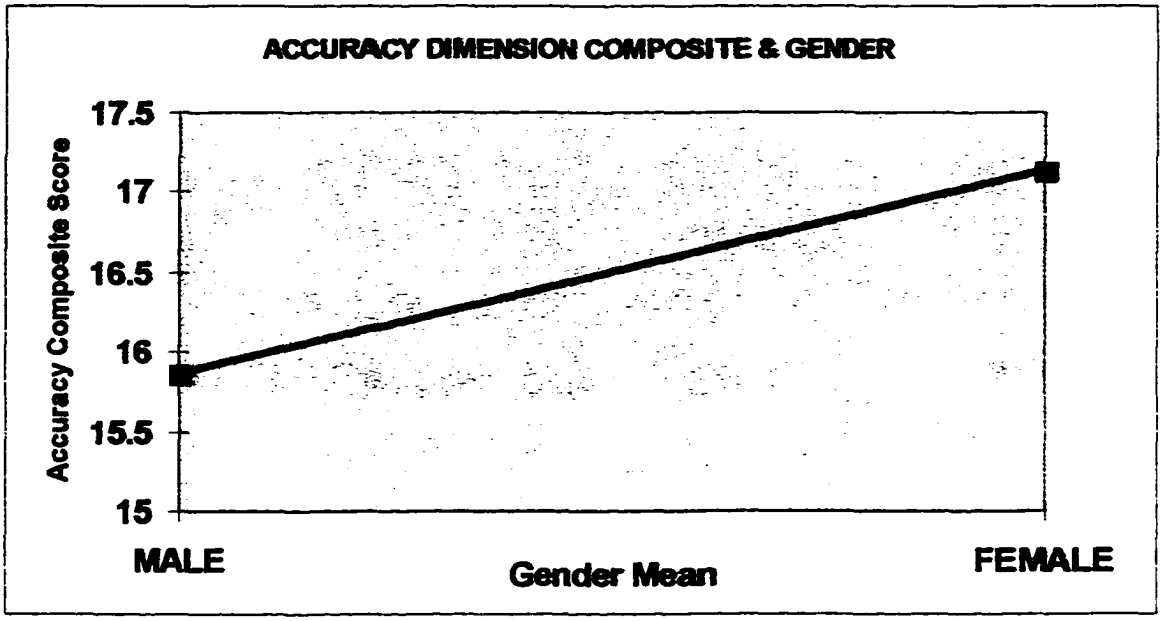


Figure 16. Accuracy Composite Mean by Gender.

Usefulness dimension. The usefulness dimension inferential statistical test supported the alternate hypothesis. The full model inferential test results are presented in Table 27. The grand mean for this dimension was 16.59 with a standard deviation of 3.79 (n = 242).

Table 27. Usefulness dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	82	1609.9521	19.6336	1.69	0.0025
Error	159	1846.7256	11.6146		
Corrected Total	241	3456.6777			R square = 0.4658

When comparing models, the best-fit model included the independent variables for gender, beneficiary category, socio-economic class, age (regression variable), and the interactions of gender with socio-economic class and age with beneficiary category. The

finding is presented in Table 28. The best-fit model was the reduced model expressed as Usefulness Composite Score = Gender + Beneficiary Category + Socio-Economic Class + Age + Gender * Socio-Economic Class + Age * Beneficiary Category + error.

Table 28. Usefulness dimension reduced model results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	12	421.5165	35.1264	2.65	0.0024
Error	229	3035.1612	13.2540		
Corrected Total	241	3456.6777			R square = 0.1219

Males scored significantly lower than females in their perception of usefulness. Individuals in the middle socio-economic class scored lower than those in the lower or higher socio-economic classes. When combining gender and socio-economic class, the male middle socio-economic group scored lowest. Table 29 presents the findings.

Table 29. Group means: Reduced model usefulness communication quality dimension.

Group	n	Mean	Standard Deviation
Grand Mean	242	16.5868	3.7872
Male	77	15.5974	4.1176
Female	165	17.0485	3.5421
Low Socio-Economic Class	78	17.1410	3.2821
Middle Socio-Economic Class	121	16.2397	4.1029
Higher Socio-Economic Class	43	16.5581	3.6794
Male Low Socio-Economic Class	25	16.8000	3.0414
Male Middle Socio-Economic Class	42	14.5952	4.4615
Male Higher Socio-Economic Class	10	16.8000	4.1846
Female Low Socio-Economic Class	53	17.3019	3.4058
Female Middle Socio-Economic Class	79	17.1139	3.6338
Female Higher Socio-Economic Class	33	16.4848	3.5805
Civilian Beneficiary Category	27	17.2800	3.2980
Active Duty Military Beneficiary Cat	83	16.4897	3.7581
Active Duty Family Member Ben Cat	120	16.6579	3.7342
Retired Beneficiary Category	12	14.7778	5.7397

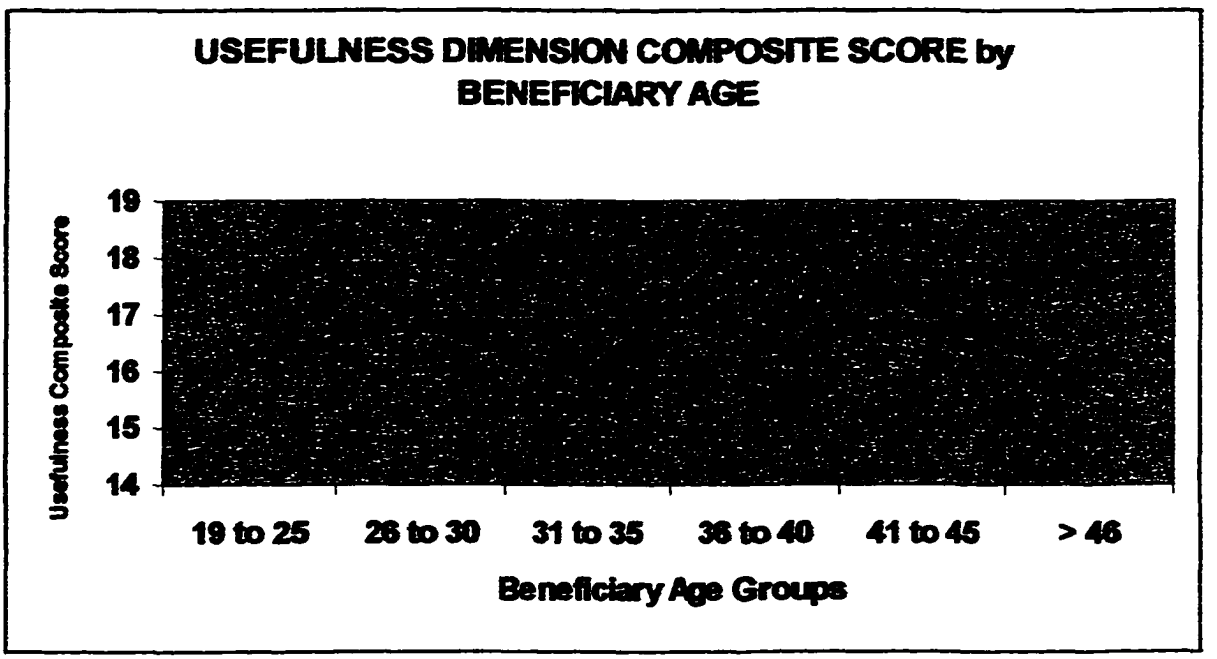


Figure 17. Usefulness Composite Scores by Age Grouping.

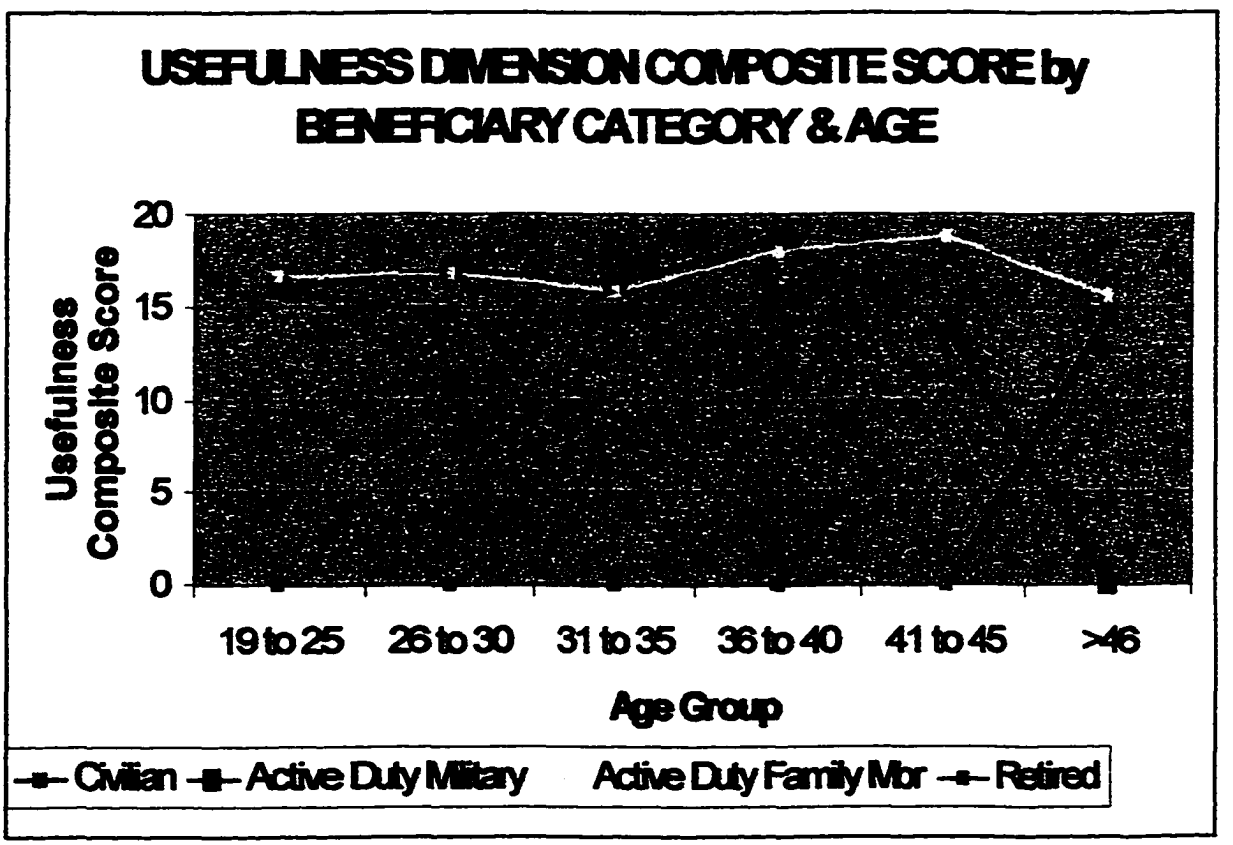


Figure 18. Usefulness Composite Scores by Beneficiary Category and Age Trend.

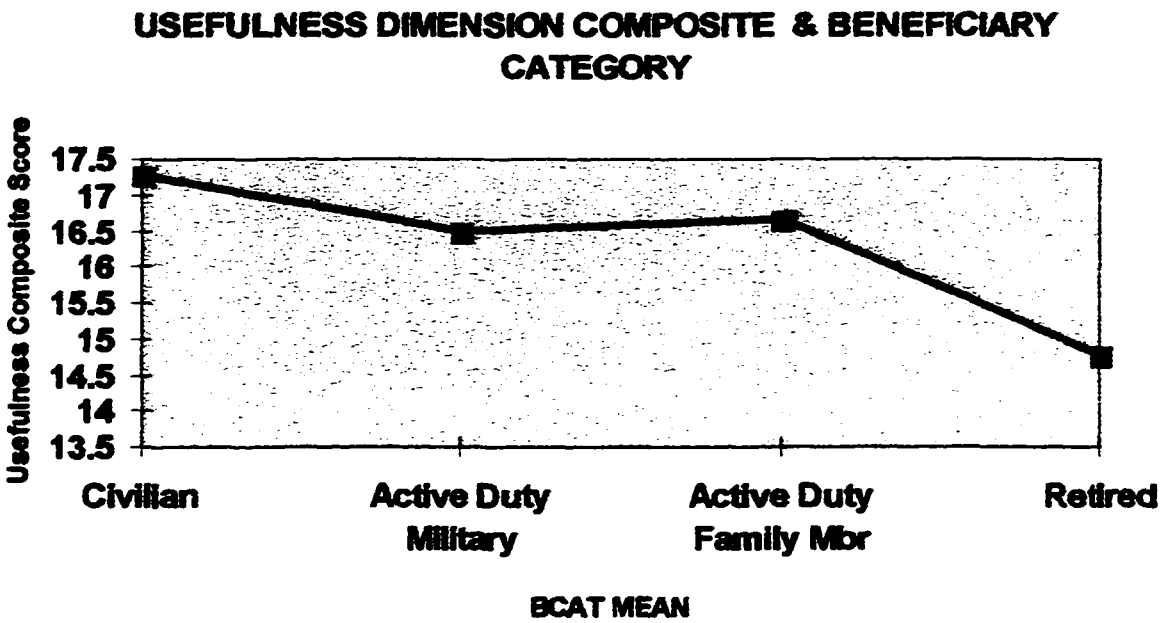


Figure 19. Usefulness Composite Score and Beneficiary Category.

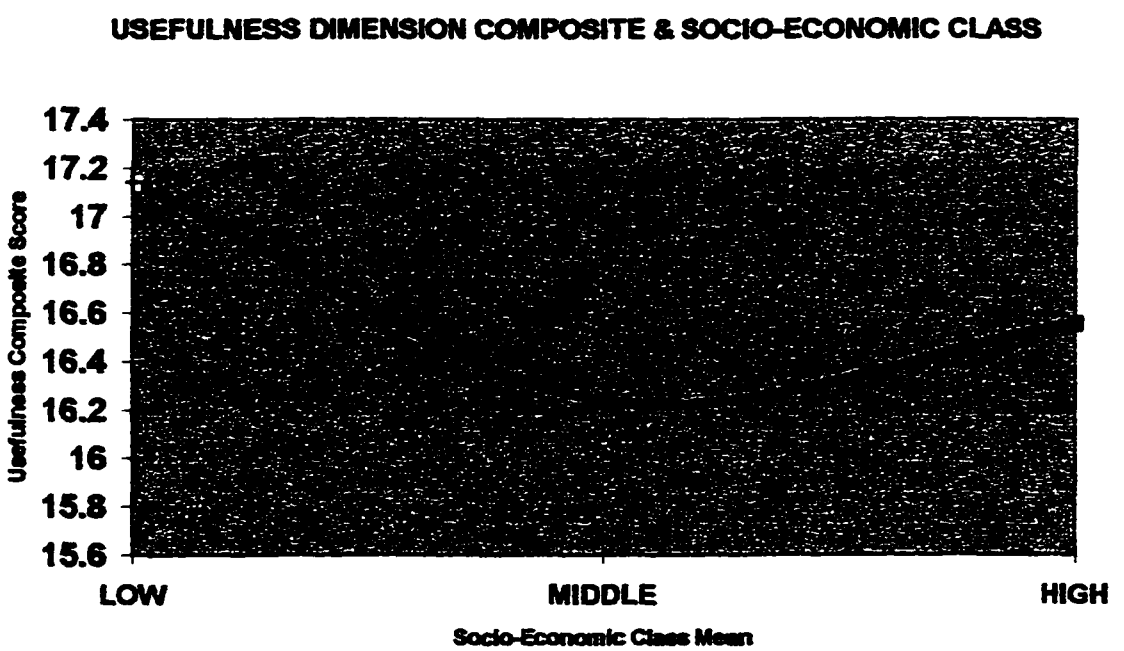


Figure 20. Usefulness Composite and Socio - Economic Class Mean Scores.

Quantity dimension. The quantity dimension inferential statistical test did not support the alternate hypothesis. The full model inferential test results are presented in Table 30. The grand mean for this dimension was 8.88 with a standard deviation of 3.55 (n = 242). A lower score for this dimension was interpreted as higher in communication quality; excessive flows of information received higher scores. The grand mean was the best predictor for this dimension.

Table 30. Quantity dimension full model ANCOVA results.

Source	df	Sum of Squares	Mean Square	F Value	P
Model	82	958.2337	11.6858	0.89	0.7111
Error	159	2078.0473	13.0695		
Corrected Total	241	3036.2810			R square = 0.3156

Hypothesis 3 summary. The best-fit models for each dimension, not including the quantity dimension that did not have significant findings, are:

1) **Timeliness Composite Score** = Gender + Health Self-Efficacy + error;

2) **Accuracy Composite Score** = Beneficiary Category + Location + Gender + Self Care Class + Location * Beneficiary Category + Location * Self Care Class + error; and

3) **Usefulness Composite Score** = Gender + Beneficiary Category + Socio-Economic Class + Age + Gender * Socio-Economic Class + Age * Beneficiary Category + error.

Hypothesis 3 was partially confirmed. The full models for three of four dimensions had significant findings in support of the alternate hypothesis. The independent variables for the best fitted models for the three significant dimensions (the reduced models) are offered in Table 31.

Table 31. Significant variables for communication quality dimensions for hypothesis 3.

[illegible]	[illegible] 1	[illegible] 2	[illegible] 3	[illegible] 4
TIMELINESS	GEN - Gender		SE - Health Self Efficacy	
ACCURACY	GEN - Gender	BCAT - Beneficiary Category	LOC - Location	SCC - Self Care Class
USEFULNESS	GEN - Gender	BCAT - Beneficiary Category	SEC - Socio-Economic Class	AGE
Ind Var Repetition	3	2	1	1

Gender, overwhelmingly, predicted communication quality for beneficiaries in this study; beneficiary category also proved to be a solid predictor. Health self-efficacy, location, socio-economic class, self-care class attendance, and age, respectively, predicted specific dimensions for beneficiary perceptions of communication quality.

CHAPTER 5

Discussion

The discussion of the results and recommendations are presented in order for each of the three hypotheses. The conclusion of the discussion, research implications, and limitations sections provide an integrated closing for the study.

Hypothesis 1

Hypothesis 1 focused on provider satisfaction with communication quality as information flowed to the provider from the nurse call center. The hypothesis stated that there was a significant difference in provider ideal (required/ expected) communication quality and actual communication quality. In comparing provider ideal communication to actual communication from the nurse call center, all dimensions (timeliness, accuracy of information, usefulness, and quantity) revealed significant differences. The finding was powerfully significant, most had probabilities of *0.0016* or less, across all providers and provider groups. The quality of information providers ideally want from the nurse call center is of considerably lower quality when actually delivered to the health care provider. Information is not received fast enough, or with sufficient accuracy and usefulness, and the information is not concise. This suggests that the interdependent relationship (decisions and events that determine patient flow) that causes uncertainty and equivocality has not been adequately addressed.

These findings are from one healthcare system. However, the health system used a nationally recognized automated nurse call center documentation package. It seems imperative that if providers are to depend on nurse call centers for patient information that their communication needs must be met. The goal should be for the nurse call center

to meet and eventually exceed provider expectations for communication. For the nurse call center to improve communication quality, each provider should be an integrated component of the system. That means that providers should be asked to contribute to the documentation quality control process. The nurse call center must tailor documentation to provider needs. Knowing what each provider / provider specialty group wants is the key to improving provider communication quality satisfaction. This is done by frequent interaction with providers by the nurses in the call center so that communication and documentation requirements become known within a trusting environment. As for timeliness, faster communication is necessary. Working as a team, the providers, the provider's nurses in the clinic, and the nurses in the call center must set standards and protocals for appropriate and efficient use of quicker media channels (such as the telephone). Not only is this a process issue but a structural issue; the communication infrastructure may need improvement to facilitate quicker information flow. It may be as simple as speed dialing systems and dedicated provider (in clinic) telephone lines with frequently checked voice mail.

Lastly, to meet provider ideal communication requirements, each provider should have a thorough orientation to the nurse call center and learn the realistic bounds that the nurses must work within. As an expectation (ideal) reduction strategy to improve provider satisfaction with the communication quality and flow, this approach may improve the provider relationship with the nurse call center. A mutually beneficial relationship will create an environment where providers market the nurse call center to their patients, and patients can depend on the nurse call center to quickly, accurately, and

concisely communicate to providers information that contains useful patient episodic data.

Recommendations. First and foremost, providers and their clinic staff and the nurses in the call center must become a team. Becoming an educated and knowledgeable contributing team member must be the paramount internal concern next to the team goal. The team's goal is to provide patient care services to keep beneficiaries healthly and get ill or injured beneficiaries well. The communication process is key to the central goal and the paramount internal concern. However, this creates an unsolveable problem without internal operation education. Educating the patient about the health system's access mechanisms, healthly behaviors, and various other healthcare related topics is the responsibility of the providers, the provider's staff, and the nurses in the call center. It only makes sense to educate each other so that beneficiaries perceive a unified and seamless system. The provider, the provider's staff, and the nurses in the call center, must know each other's operation, standards, protocals, and the unique aspects of each interdependent component of the system. Formal orientation and annual updates (as a minimum) of the nurse call center and clinics' operations will assist in educating each other and becoming a team.

Frequent interaction and feedback are essential to the education process. This feedback system should be continuous and formalized. One method to ensure feedback is random peer and provider review of communication flows. About five to seven percent of episodic patient information can be randomly selected for review. The clinic staff member (nurse preferably) and provider should review the information and provide constructive feedback to the nurse call center. The provider directed feedback should

then be used in a formal (monthly as a suggestion) process improvement program that all call center nurses can participate in and learn from.

Daft and Lengel (1986) found that increasing the richness of media channels can assist in reducing uncertainty and equivocality for interdependent groups of people. Email and written channels were the most frequently used in this study to transfer information. It is essential to determine the strata of provider comfort with information flows. The strata of provider comfort is a function of patient episodic urgency and information importance and thus, determines what channels of information to utilize to transfer information to the providers. Since providers are responsible for patient care, urgency of information must be determined by providers and known to nurses in the call center. As information urgency and importance increase, richer media channels are warranted. For example, internal medicine providers may want telephone contact with the nurse call center for all calls from diabetic patients under 21 and over 62 years of age, regardless of why the patient called. Some providers may dislike or feel uncomfortable with email and prefer other methods of communication.

Creating an efficient and educated team within the healthcare system is the essence of improving provider satisfaction with nurse call center communication quality. Assessing provider needs, educating each other, implementing changes based on constructive provider feedback, and selecting more appropriate media channels are essential to improving provider satisfaction with nurse call center communication. The nurse call center must initiate the actions consistent with these recommendations to improve their value to the healthcare industry.

Hypothesis 2

Hypothesis 2 focused on finding differences in provider perceptions for actual communication quality dimensions by provider groups and determining distinct linear patterns using selected quantitative (regression) variables. Provider groupings consisted of specialty, location (local or distant to the nurse call center), training, and gender. Quantitative variables consisted of provider age and number of prior nurse call center communication episodes.

The analysis of each dimension of communication quality revealed that timeliness perception could be predicted by provider age and location and that quantity of information perception could be predicted from provider location, specialty, number of communication episodes from the nurse call center, and age. The accuracy and usefulness dimension finding showed no provider group distinction. Importantly, the media channels that nurses used most to communicate with providers were relatively low in media richness (email and written) or from the patient (a third party in the nurse to provider communication sequence).

Timeliness dimension. Regarding the timeliness dimension, distant providers perceived higher quality than local providers. Distant providers (those practicing more than 30 miles from the nurse call center) were mostly limited to the email media channel to receive nurse call center communication. Local providers expected more timely information. More timely information could be supported by decentralizing the nurse call center into each clinic so that the nurses are closer to the providers. However, the economies of scope and scale would make a nurse call center very inefficient.

Depending on the spread, over distance, of providers that depend on the nurse call center, centralizing or decentralizing the nurses are a consideration when information timeliness is paramount.

An alternative approach may be a patient and provider friendly compromise between cost/operation efficiency and patient care. Nurses and staff that work directly with providers in the clinic could be the provider's link to nurse call center information. By creating a 'real-time' operation where urgent patient callers could be transferred directly to the clinic nurse, timely and face-to-face communication with the provider could be realized. Since most nurse call center clinical assessment tools are automated, patient 'urgency/transfer' criteria can be included in the hypertext that is used by the nurse in the call center. The important aspect of this approach is 'sending' the on-line patient file and episodic documentation to the nurse in the clinic as the patient call is transferred. Also, the clinic nurse and staff must be well informed and trained on the nurse call center operation and the software package used by the call center.

Timeliness of information directly impacts the need to reduce uncertainty and equivocality; speed of feedback and speed of information relate to media richness level as documented by D'Ambra and Rice (1994) and Daft and Lengel (1986). As provider age increased, the study found that a higher quality level for the timeliness dimension was perceived. Additional research will have to answer why this finding came to light. Further research may find that older providers feel more comfortable with a slower pace of information flow or that older providers have lower timeliness expectations or that they simply do not regard the nurse call center as a valueable asset to their practice.

Accuracy and usefulness dimensions. Provider perceptions towards the accuracy and usefulness dimensions of communication quality did not significantly differentiate provider groups. After analyzing communication quality perceptions of primary care providers that have specialty duties (pediatrics, internal medicine and Ob/gyn), those who tend to care for patients that have more severe conditions, their perceptions did not differ from providers with primary care duties.

Quantity dimension. The more concise, yet useful, the information is, the more valuable the nurse call center communications will be. Quantity perceptions differed among distant and local providers. Local providers perceived a higher level of quality regarding communication quantity than distant providers. More concise documentation, especially to distant providers, would be an improvement to the system. Provider specialty groups scored the quantity dimension differently. Pediatricians perceived the quantity to be the most in excess, followed by general practice, family practice, internal medicine, and Ob/gyns who perceived the communication to be the most concise (higher quality). Simply, providers are very busy; their time is at a premium. Developing systems and processes to ensuring concise, yet adequate, patient episodic information flow from the nurse call center to the provider are critical to increasing nurse call center value in the eyes of the provider. Again, creating a constructive provider feedback system focused on nurse call center communication quality improvement is critical to determining proper information quantity.

Hypothesis 3

Hypothesis 3 focused on beneficiary perceptions of nurse call center communication within the four dimensions of communication quality. For beneficiaries

that accessed the nurse call center, location, reason for call, beneficiary category, gender, socio-economic status, self-care class attendance, and health self-efficacy were variables used to group and find distinctions in beneficiary perceptions of nurse call center communication quality. Also beneficiary age was used as a quantitative variable for determining linear patterns in communication quality scores.

Beneficiaries in this study accessed their healthcare system by interacting with a nurse call center. Of the four components of communication quality, three dimensions had significant findings. The quantity dimension revealed that none of the groups perceived differences. The most substantial finding was attributed to gender differences. Males had significantly lower means of more than 2 to approximately 1.5 scale points, across the dimensions of timeliness, accuracy, and usefulness when compared to females. This indicates that males perceived a much lower level of communication quality when interacting with the nurse call center. This supports the claim that females tend to take the lead in family health issues; this may be due to their comfort in communicating with the healthcare system. In this study, females called the nurse call center about 70% of the time compared to males.

Beneficiary category revealed an interesting finding. Retired beneficiaries tended to perceive a lower communication quality level than active duty military who perceived lower quality than active duty family members and civilian beneficiaries. Retired beneficiaries may take longer to adjust to this new component of the healthcare system than younger beneficiaries; retiree discomfort with the nurse call center as the healthcare system's access mechanism may have resulted in lower quality perceptions. Each

dimension, however, showed improvement possibilities for nurse call center communication quality from the perception of beneficiaries.

Timeliness dimension. Gender and health self-efficacy proved to be the best predictors for perceptions of timeliness. Males perceived quality at significantly lower levels than females. Also, the group with low health self-efficacy perceived timeliness quality at significantly lower levels than the high health self-efficacy group. Males with low health self-efficacy perceived the lowest level of timeliness quality than any other group.

Creating improved processes to facilitate more timely information for males and beneficiaries with low health self-efficacy should not be a daunting task. Speeding up the patient interaction process will increase the communication quality perceptions for these groups. One approach is to increase the frequency of contact but with a shorter duration of actual call center interaction. Identifying those beneficiaries who have low health self-efficacy (just ask them if they feel comfortable about taking care of basic health issues themselves) and following up with those patients will increase their communication quality perception. Nurses should place follow-up calls to beneficiaries that are identified to be in these categories during low volume call times. The goal is to increase the level of reinforcement to the beneficiary. These groups', males and beneficiaries with low health self-efficacy, perception of the lack of timeliness may stem from their agonizing about calling the nurse call center about a problem they have had for a while. By building trust and reinforcing healthy behavior, their apprehension should decrease and they will call as problems present, not after several days of living with the

problem. This is a high value-added solution that positively impacts marketing, clinical, and patient health self-efficacy issues.

The lack of differences among socio-economic class, self-care class attendance, location, and reason for call as predictors of this dimension provides information to nurse call center operations. For these groupings, timeliness was not an issue.

Recommendations. Improvement opportunities for this dimension are with males and those with low health self-efficacy; a shorter interaction with the beneficiary, quick and frequent feedback schedules, and prompt service will improve quality perceptions for this dimension for these groups. By directing or funneling advice and information calls to low density/load/volume calling times, urgent and clinical assessment/triage calls can be handled quickly by focusing all resources during high density/load/volume times. Receptionists or appointment clerks should screen for caller/patient needs and have advice and information calls followed up by the nurse at low volume periods (an administrative triage). Of course, follow up calls promised must be conducted as soon as possible (remember to verify the caller's telephone number at the time the follow up call was promised) by the appropriate nurse call center team member. As caller urgency increases (an increase in uncertainty and ambiguity from the caller perspective), such as an acute problem requiring a same-day appointment or calls involving episodic issues with infants and young children, caller waiting time becomes crucial to beneficiary perceptions of timeliness. Mechanisms and processes that determine immediate level of urgency, path for problem resolution, and caller desire (advice, same-day appointment, information, etc...) will efficiently create a system that reduces uncertainty and ambiguity for beneficiaries. Male beneficiaries should be included in the screening

identification process to target this group for communication quality improvement. These suggestions should improve timeliness perceptions.

Accuracy dimension. Gender was a significant predictor of beneficiary accuracy dimension scores. Males scored significantly lower than females in their perception of accuracy. As well, retired individuals and active duty military scored lower than other groups. Civilian and civilian family members scored higher than active duty family members, who scored higher than active duty and retired persons. Local civilian beneficiaries scored highest on this dimension while local retired persons scored lowest. Over all, local beneficiaries scored slightly higher than distant beneficiaries living thirty or more miles from the nurse call center.

This dimension ties with beneficiary trust in the healthcare system. Retired persons, and to some extent active duty military beneficiaries, trust the system less with reductions in benefits looming (some say actual reductions in benefits have occurred). This equates to lower accuracy dimension scores. Here, telephonic communication does not allow nonverbal cues to be interpreted by the nurse. A media channel with a higher level of richness cannot be utilized easily, so nurses should build trust through more frequent follow-up calls, using better listening skills, and reinforcing positive health behaviors. A better process for effective listening is: 1) stop, 2) listen, 3) ask questions, 4) paraphrase content, and 5) paraphrase feelings (modified from Beebe & Masterson, 1997).

Another powerful strategy that can be used to increase the accuracy of beneficiary perceptions is to use the beneficiary's healthcare provider as a reinforcer of the nurse call center information. This strategy, however, requires a close partnership between the providers and the nurse call center. The discussion provided earlier illustrated how to

'partner' with providers that are dependent and use the nurse call center as an interdependent component of their practice. Providers and their staff in the clinic should reinforce to the beneficiary the value of the nurse call center and the information that the nurses provide. Also important, the provider should explain that all beneficiary episodic call information is sent from the nurse call center to the provider and reviewed. This demonstrates to the beneficiary the close connection between the provider and nurse call center and, over time, accuracy perceptions should improve. This process starts with nurse call centers reaching out to providers to build their trust first, then beneficiary trust will follow. Trust relates directly to perceptions of accuracy and reliability of the nurse call center information throughout the communication process and network. Trust is built by consistent and truthful information but also, in large part, by reducing uncertainty and ambiguity.

Recommendations. As groups (in this case, the nurse call center team, provider, and patient caller) increase in interdependence and share similar process responsibilities, uncertainty and ambiguity increase. Reducing uncertainty and ambiguity are accomplished through trust building processes, empowerment, and partnering strategies that are implanted systematically between the nurse call center and providers in the healthcare system.

Usefulness dimension. This dimension describes how a beneficiary perceives communication to be useful to them and their health concerns. Males scored significantly lower than females in their perception of usefulness. Individuals in the middle socio-economic class scored lower than those with higher and lower socio-economic status. When gender and socio-economic class are combined, males in the middle socio-economic class scored lowest as compared to females in the lowest socio-economic class who scored highest in this dimension. As found by Moore (1998), government managed

care beneficiaries were most satisfied with communication with the healthcare system; these patients were mostly in lower socio-economic strata. In this regard, this study supports the Moore (1998) findings for the low socio-economic class for government beneficiary satisfaction/perception.

Interestingly, reason for call was not a significant factor in predicting the dimension score in this communication component. Callers who were gathering information, advice, or needed an urgent appointment for themselves or another family member did not stand out as a group. The fact that the nurse call center was the only access mechanism for an appointment and the easiest source for healthcare system information may have created similar perceptions and variance across these groups. As long as the expected beneficiary need was met, an appointment, information, and/or advice, the nurse call center interaction was perceived as useful.

Quantity dimension. No independent variables significantly found any group difference, nor was a significant linear trend found in this study for the quantity dimension. Since the scores were relatively low, the nurse call center in the study achieved a good quality score from beneficiary perceptions regarding quantity of information. It is important to note that this dimension, however, scored low in internal consistency measures. This fact could have obscured any possible significant finding.

Conclusion

To improve the nurse call center and the healthcare demand management system as a whole, communication quality must improve between the nurses, providers, and beneficiaries. The responsibility is on the nurse call center to improve. Both providers

of care and beneficiaries have patterns that can be used as starting points for improvement processes that will lead to higher quality communication.

Providers perceived a significant difference between ideal and actual communication. Timeliness, accuracy, usefulness of information, and quantity of information require improvement. Substantial orientation and working with the providers who depend on the nurse call center are required to fine tune and improve the current pattern of documented patient episodic information. An improvement effort that includes providers is the next logical step. Future studies should concentrate on finding the best documentation pattern that is considered the highest, yet efficient, quality of communication from the providers perspective. A study that is part of a peer/provider review of nurse call center communication program will provide findings that can suggest specific information requirements concerning beneficiary episodic call documentation and providers ideal/required information. Future study should differentiate provider specialty and their specific communication requirements.

Provider groups differed on perceptions of timeliness and quantity of information. Tailoring documentation and communication to these findings will improve nurse call center communication quality. Continuous monitoring of provider communication quality perceptions will allow individual nurse communication improvement.

Beneficiaries provided important information for the nurse call center communication quality improvement process. Retired persons and males should be given special care while interacting on the telephone with the nurses. In this study, most retired persons were beneficiaries who were retired from the military and involved in their second career. The retiree in this study should not be confused with the over 65 years of

age MEDICARE population. Tailoring nurse communication and actively pursuing relationship building strategies targeted to the specific group findings from this study will improve the quality of nurse call center communication and benefit the patient more by improving outcomes of the care process. Strategies for these groups include: 1) spending time for more frequent yet quick nurse follow-up calls; 2) reviewing instructions given by the nurse; and 3) limiting individual call time on each telephone call. Mailing information (after nurse interaction) may be a useful strategy to improve trust, foster beneficiary empowerment, achieve better outcomes, and increase communication quality perceptions with these groups. Identifying individuals that belong to 'improvement' groups (low health self-efficacy, retiree, and possibly gender) on the telephone will be a challenging task; however, improvement opportunities begin with this step. Building an automated file along with the electronic patient call record would be a quick way for nurses to identify callers who meet the criteria of the targeted communication quality improvement groups. Once repetitive calls are received by beneficiaries in these improvement groups, patterns can be determined and operational strategies can be refined. Once a group of 'improvement' beneficiaries are identified, a specific nurse communication strategy can be implemented. A follow-on study could concentrate on finding communication and telephone interaction strategies that are successful in improving communication quality perceptions and health outcomes for these groups. Nurses with several years of experience in call center operations should be consulted in developing successful strategies.

Lastly, provider reinforcement of the nurse call center as a valuable tool cannot be overemphasized. The healthcare system, with the nurse call center as the access point for

beneficiaries, depends on providers, the nurse call center, and most importantly patients, to interact, make informed decisions, and communicate well. Additionally, self-care classes for beneficiaries can provide reinforcement of nurse call center importance and improve the beneficiarys' healthcare self-efficacy.

Integrating communication dimensions. Nurse call center combined communication quality, from the provider and beneficiary perspectives, can be presented as themes for immediate customer perception improvement. This multidimensional summary offers general improvements for nurse call center operations.

Providers need to be oriented to the specific nurse call center that they depend upon for management of their patient panel. Once oriented, providers must be solicited for communication improvement opportunities. This constructive improvement initiative should be systematically integrated into clinical and nurse call center operations with a focus on quick and frequent feedback (nurses in call center and provider and their staff). The closer and more efficient, through disclosure, establishment of trust, and relationship building, the provider/clinic – nurse call center team becomes, the greater the improvement potential for communication quality, patient assistance, and clinical outcomes.

As providers increasingly interact and receive information from the call center, communication quality perceptions tend to decrease for providers in the middle of their careers (40 to 50 years of age). For the youngest and oldest providers, a general statement is difficult to make. It seems logical that as providers become accustomed to nurse call center communication that they become more imbedded in their perceptions of

quality (high and low quality). Again, a systematic improvement program, based on provider feedback that is used to initiate positive change, will be welcomed by providers.

Primary care providers with specialty responsibilities (internal medicine, pediatrics, and Ob/gyn) tend to perceive greater communication quality as details about the patient episode are documented thoroughly. This generalization seems valid since these providers' patients tend to create an environment of greater uncertainty and ambiguity due to their age, conditions, and comorbidities. Detailed documentation and quick information flow, based on patient driven protocols, are valued by these provider groups.

Beneficiary perceptions of total communication quality are directed by two variables. Gender and health self-efficacy are prominent predictors of a beneficiary's perception of call center communication quality. Females perceive much greater quality than males. Beneficiaries with high health self-efficacy perceive greater communication quality than those with low levels of health self-efficacy.

Identifying opportunities to increase male communication perceptions are paramount for the call center. Reinforcement, frequent feedback, and empowerment techniques that are aimed at building trust between the call center and the male beneficiaries will improve communication quality and clinical outcomes for this group. Two immediate steps should be taken to improve male perceptions: 1) encouraging males to attend a health system sponsored self-care class (a class that emphasizes the call center as a value-added patient resource) *and*; 2) provider reinforcement of the nurse call center directed at the patient. These initiatives must be established and maintained as on-going endeavors.

Beneficiaries with low health self-efficacy need to be identified by the nurse call center (the health system needs to know as well). Asking beneficiaries if they are comfortable in taking care of basic health care issues in the home and if they have and use health self-care references are simple methods to assess a patient's level of health self-efficacy. Once patients are identified, a systematic program of patient reinforcement, feedback, and trust building must be initiated to improve communication quality perceptions. This approach will also improve the potential of more efficient utilization of healthcare resources by this patient group, as well as, clinical outcomes.

In summary, improvement begins with the nurse call center reaching out to providers to form a more integrated and efficient team. Targeting improvement possibilities and creating programs, based on beneficiary groups, must also be initiated, developed, and maintained by the nurse call center. Increasing the value of the nurse call center is at the heart of these improvement initiatives.

This study provides a foundation for nurse call center communication quality improvement. Regarding the levels of competence in communication, as documented by Beebe and Masterson (1997), unconscious incompetence (we do not know we do not know) can be replaced by conscious incompetence (we know we do not know) and finally move toward conscious competence (we know how to perform a skill but must consciously think about it) and unconscious competence (performance of a skill is second nature).

Limitations

This study was performed in a managed care system that greatly resembles a health maintenance organization; using findings outside of this environment may not

contribute to significant improvements in communication quality for other systems. Providers in this study had patient panel sizes that were less than 2000 patients; suggestions for improvements should not be used wholeheartedly outside of this range. Providers in certain specialties (pediatrics, internal medicine, and Ob/Gyn) were not adequately represented in the sample.

Beneficiary communication quality improvement suggestions, as determined from the findings, should only be strictly considered within the beneficiary age range of the group of subjects (from 19 years old up to age 62). Also, small sample sizes for the male and female low healthcare self-efficacy groups and retired persons are to be noted.

Research Implications

The findings of this study call into question, offer mixed support, or wholey support previously published studies. This study provides a serious starting point for communication quality improvement for nurse call center operations. Follow-on studies will provide greater insight into specific issues addressed in this study.

Provider and beneficiary satisfaction. Physician aggreement and patient satisfaction with nurse call center recommendations were found to be high by Brayden et al. (1997), O'Connor (1996), Informed Access Systems (1995), Wolcott et al. (1995), and Poole et al. (1993). This study questions the all encompassing conclusions of support by these previous studies of nurse call centers. While some provider groups perceived a higher level of communication quality than other groups, every provider group was not satisfied with the communication quality when comparing ideal to actual communication. Patients also differed in communication quality perceptions. Males especially perceived

much lower levels of communication quality and thus, were not entirely satisfied with nurse call center communication.

Documentation and communication. Bell (1996) presented the need for real time documentation while Glasper and McGrath (1993) concluded that accurate and concise documentation was required for all nurse call center operations. O'Connor (1996) and Wolcott (1996) both suggested that timely and accurate communication between providers, patients, and the nurse call center was invaluable in achieving adequate provider and patient comfort levels for the longevity of call systems. All of these findings and suggestions were supported by this study's findings. Timeliness, accuracy, and quantity dimension findings from this study contribute to previous authors' suggestions and requirements for nurse call center success.

Media richness. Daft and Lengel (1986), Daft, Lengel, and Trevino (1987), D'Ambra and Rice (1994), and Walther et al. (1994) suggested that the proper media channel used from the continuum of media richness contributes to uncertainty and ambiguity reduction between interdependant groups who have overlapping responsibilities. Since this study's media channels were naturally limited to mostly email and written (communication to providers) channels and the telephone for beneficiary communication, previous studies and published documents could not be used to solidly interpret research implications. However, logical conclusions support the theory that media richness does play a part of communication quality perception. In the area of trust and relationship building, the nurses in the call center do not have the advantage of full paralanguage feedback. The limited feedback potential offered by the most utilized nurse

call center media channels requires more frequent interaction between all parties in the communication process in order to overcome low communication quality perceptions.

Health self-efficacy and communication quality perceptions. Moore (1998) found that beneficiaries in a managed care health system with a high level of health self-efficacy had the highest degree of communication quality. This study confirms that females with high health self-efficacy had the highest level of perceived communication quality. Yet, females with low health self-efficacy perceived a greater degree of timeliness than males with high or low health self-efficacy. The overall groupings of low and high health self-efficacy beneficiaries fully supports Moore's (1998) findings but the interaction of gender, in this study, offers a different perspective and insight into communication quality perceptions of beneficiaries. The socio-economic class associated findings offered by Moore (1998) seem to be supported.

Nurse call center value. The increased prevalence of nurse call center operations within managed health care raises a critical question for practitioners and scholars. What is the value of the nurse call center? If beneficiaries and healthcare providers are not satisfied (communication quality perceptions impact over all system satisfaction) with this approach to demand management, then are the clinical outcomes, efficiency changes, and marketing potential of the nurse call center worth the operational and 'perception' costs? A cost-benefit analysis (quantitative as well as qualitative) that captures these issues will be important for future research efforts. In this study, technology and interpersonal (high-tech versus high touch) levels should be identified and compared to differing systems. Another issue revolves around the demand management function of nurse call center operations. For the call center, if rationing care and profit are the

primary incentives versus appropriateness and patient quality of care, then either federal or state regulations rather than the market place (market share) may dictate the operational standards. A study that compares nurse call centers across various for-profit, not-for-profit, governmental, and other structural arrangements should provide information that answers questions from this value oriented perspective. Knowledge gained from these value questions will be crucial for the industry to direct positive change; otherwise, statutory law may direct change.

References

Andersson, S., Hallberg, H., & Norstrom, V. (1995). Short of long consultations? Primary care nurses' considerations in making appointments with general practitioners. Journal of Advanced Nursing, 22, 759 - 768.

Anders, G. (1997, February 4). Triage by phone; how nurses take calls and control the care of patients from afar. The Wall Street Journal, Vol. CXXXVI, (24), New York, NY: Dow Jones & Company, Inc., pp. A1, A6.

Barnes, L P. (1995). Using the telephone in patient and family teaching. MCN: American Journal of Maternal/Child Nursing, 20 (6), 341.

Barnes, S., & Greller, L. M. (1994). Computer-mediated communication in the organization. Communication Education, 43, 129 - 142.

Bartholow, T. (1997). Managed care can be better for all citizens: A primary care perspective. Wisconsin Medical Journal, 12 (1), 32 - 35.

Barton, E. L., Brown, J. L., Curtis, P., & Lichtenfeld, L. (1992). Making phone care good care. Patient Care, December 15, 103 - 117.

Beebe, S. A. & Masterson, J. T. (1997). Communicating in small groups: Principles and practices, 5th Ed., New York, NY: Addison-Wesley Educational Publishers Inc.

Bell, W. H. (1996). Telephone-based demand management: What you need to know. Health Care Strategic Management, February, 2 - 4.

Bosna, M. (1995). Legal questions: Telephone triage dial-a-nurse. Nursing, August, 20.

Brayden, Robert M., Kempe, Allison, & Thomasson, George O. (1997). Innovative approaches to child health information. Pediatric Annals, 26 (3), 194 - 197.

Coleman, A. (1997). Where do I stand? Legal implications of telephone triage. Journal of Clinical Nursing, 6 (3), 227 - 231.

Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message equivocality, media selection, and manager performance: Implications for information systems. MIS Quarterly, 11 (3), 355 - 366.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness, and structural design. Management Science, 22 (5), 554 - 571.

Daft, R. L., & Wiginton, J. (1979). Language and organization. Academy of Management Review, 4 (2), 179 - 191.

D'Ambra, J. & Rice, R. E. (1994). Multimethod approaches for the study of computer-mediated communication, equivocality, and media selection. IEEE Transactions on Professional Communication, 37 (4), 231 - 239.

Demand management: A new frontier for cost reductions. (1995, December). Physician's Managed Care Report, 3, (12), 133 - 144.

Demand management holds key to prepaid profits. (1995, March). Capitation Management Report, 2 (3), 33 - 37.

Eddy, J., Burnett, J., Spaulding, D., & Murphy, S. (1997). Technology assisted education. Education, 117 (3), 78 - 81.

Frey, L. R., Botan, C. H., Friedman, P. G., & Kreps, G. L. (1991) Investigating communication: An introduction to research methods. Englewood Cliffs, New Jersey: Prentice Hall, 118 - 138.

Fifield, M. (1995). Telephone triage: Protocols for an unacknowledged practice. Australian Journal of Advanced Nursing, 13 (2), 5 - 9.

Franco, S. M., Mitchell, C. K., & Buzon, R. M. (1997). Primary care physician access and gatekeeping: A key to reducing emergency department use. Clinical Pediatrics, February, 63 - 68.

Fries, J. F. (1996, November 5). Reducing the need for and demand for medical care: A new science. Paper delivered at the Karolinska Institute, Nobel Forum Symposium: Health and Medical Care in the Year 2005, Stockholm, Sweden.

Glasper, A., & McGrath, K. (1993). Telephone triage: Extending practice. Nursing Standard, 7 (15/16), 34 - 36.

Goldhaber, G. M., & Rodgers, D. P. (1979). Auditing organizational communication systems: The ICA communication audit , Dubuque, IA: Kendall/Hunt Publishing Company.

Guy, D. H. (1995). Telephone care for elders: Physical, psychological, and legal aspects. Journal of Gerontological Nursing, December, 27 - 34.

Hamilton, P. H. (1997, June). Design and implementation of a telephone triage/advice service: An instrument of demand management at USA Medical Department Activity-Heidelberg. Baylor University Graduate Degree Program in Healthcare Administration Thesis, San Antonio, TX.

Informed Access Systems, Inc. (1995). Outcomes measurement (revised 12-15-95) [Brochure]. Boulder, Colorado.

Isaacman, D. J. MD., Verdile, V. P., Kohen, F. P., & Verdile, L. A. (1992). Pediatric telephone advice in the emergency department: Results of a mock scenario. Pediatrics, 89 (1), 35 - 39.

Jaklevic, M. C. (1996). Docs are from Mars, hospital execs Venus. Modern Healthcare, October 21, 74.

Katz, H. P., Pozen, J., & Mushlin, A. I. (1978). Quality assessment of a telephone care system utilizing non-physician personnel. American Journal of Public Health, 68, (1), 31 - 37.

Kelly, K. A. (1994). Referring patients from triage out of the emergency department to primary care settings: One successful emergency department experience. Journal of Emergency Nursing, 20, (6), 458 - 463.

Kelly, K. A. (1994). Cost containment in the emergency department: Shifting the cost of caring for patients with nonemergency conditions from crowded emergency departments to primary care settings. Journal of Emergency Nursing, 20, (6), 454 - 457.

Kongstvedt, P. R. (1995). Essentials of managed health care. Gaithersburg, Maryland: Aspen Publishers Inc.

Kreps, G. L., O'Hair, D., & Clowers, M. (1994). The influences of human communication on health outcomes. American Behavioral Scientist, 38, (2), 248 - 257.

Leprohon, J. & Patel, V. (1995). Decision making strategies for telephone triage in emergency medical services. Medical Decision Making, 15, 3, 240 - 253.

Lindeborg, R. A. (1994). Excellent communication. Public Relations Quarterly, 39 (1), 5 - 12.

Lippman, H. (1995). RNs take over for Denver pediatricians. RN, March, 52 – 54.

MacStravic, S. (1995). Remarketing, yes, remarketing health care. Journal of Health Care Marketing, 15 (4), 57 - 58.

Marklund, B., Bengtsson, C., Blomkvist, S., Furunes, B., Gacke-Herbst, R., Silfverhielm, B., & Wennberg, G. (1990). Evaluation of the telephone advisory activity at Swedish primary health care centres. Family Practice - An International Journal, 7 (6), 184 – 189.

Markus, M. L. (1987). Toward a "critical mass" theory of interactive media. Communication Research, 14 (2), 491 - 511.

Maxwell, S. E. & Delaney, H. D. (1989). Designing experiments and analyzing data. Pacific Grove, California: Brooks/Cole Publishing Company.

Medical Source. (1996, October 12). Demand management generates bottom line results. Medical Alliances, Inc. Internet Address: http://www.medsource.com by Internet Medical Systems, Inc.

Mohagen, M., Hoosier, S. J. (1996). Telephone triage: An alternative career for emergency nurses. Journal of Emergency Nursing, 22, (6), 527 - 529.

Mohr, J. J., & Sohi, R. S. (1995). Communication flows in distribution channels: Impact on assessments of communication quality and satisfaction. Journal of Retailing, 71 (4), 393 - 417.

Moore, S. D. (1998). The organizational influence on doctor-patient interaction. Dissertation, University of Oklahoma, Department of Communication, March, Norman, OK.

O'Brien, R. G. (1981). A simple test for variance effects in experimental designs, Psychological Bulletin, 89 (3), 570 - 574.

O'Connor, J. P. (1996). Nurse phone care - a new way of thinking (part 2). Medical Group Management Journal, 43 (3), 58 - 66.

Osterhaus, J. K. S. (1995). Telephone protocols in pediatric ambulatory care. Pediatric Nursing, 21 (4), 351 - 355.

Padgett, D. K., & Brodsky, B. (1992). Psychological factors influencing non-urgent use of the emergency room: A review of the literature and recommendations for research and improved service delivery. Social Science Medicine, 35 (9), 1189 - 1197.

Peterson, R. A. (1994). A meta-analysis of Cronbach's coefficient alpha. Journal of Consumer Research, 21 (2), 381 - 392.

Poole, S. R., Schmitt, B. D., Carruth, T., Peterson-Smith, A., & Slusarski, M. (1993). After-hours telephone coverage: The application of an area-wide telephone triage and advice system for pediatric practices. Pediatrics, 92 (5), 670 - 679.

Rodgers, J. (1997). Advanced statistics. Class lecture for the Psychology Statistics II 5013 given to the Interdisciplinary Ph.D. Program. University of Oklahoma, Advanced Programs, August, Norman, OK.

Robinson, D. L., Anderson, M. M., & Erpenbeck, P. M. (1997). Telephone advice: New solutions for old problems. Nurse Practitioner, 2, (3), 179 - 192.

Schmitz, J., & Fulk, J. (1991). Organizational colleagues, media richness, and electronic mail: A test of the social influence model of technology use. Communication Research, 18 (4), 487 - 523.

Sediak, R. A., & Cartwright, G. P. (1997). Two approaches to distance education: Lessons learned. Change, 29, (1), 54 - 57.

Spalding, J. (1996). Disease state management: Danger and opportunity. Family Practice Management, 3 (3), 71 - 80.

Spears, R., & Lea, M. (1994). Panacea or panopticon: The hidden power in computer-mediated communication. Communication Research, 21 (4), 427 - 459.

Thompson, T. R. (1996). Balancing acts. Hospitals & Health Networks, September 20, 30 - 34.

Trevino, L. K, Lengel, R. H., & Daft, R. L. (1987). Media symbolism, media richness, and media choice in organizations: A symbolic interactionist perspective. Communication Research, 14 (5), 553 - 574.

Udinsky, B. F., Osterlind, S. J., & Lynch, S. W. (1981). Evaluation resource handbook: Gathering, analyzing, reporting data. San Diego, CA: EdITS Publishers, 97 – 108.

University of Idaho, Engineering Outreach, College of Engineering. (1995). Distance education: An overview, Guide #1. www.uidaho.edu/evo/dist1.html, Moscow, ID.

Valacich, J. S., Paranka, D., George, J. F., & Nunamaker, J.F. Jr. (1993). Communication concurrency and the new media. Communication Research, 20 (2), 249 – 276.

Walther, J. B., Anderson, J. F., & Park, D. W. (1994). Interpersonal effects in computer-mediated interaction: A meta-analysis of social and antisocial communication. Communication Research, 21 (4), 460 - 487.

Webster, J., & Trevino, L. K. (1995). Rational and social theories as complementary explanations of communication media choices: Two policy-capturing studies. Academy of Management Journal, 38 (6), 1544 - 1573.

Webster, K. (1996). Telephone nursing telezine an e-zine for and about telephone nursing services 1. Http//ally.ios.com/~webster/triage.html.

Weisberg, H. F., Krosnick, J. A., & Bowen, B. D. (1996). An introduction to survey research, polling, and data analysis, 3d Edition. Thousand Oaks, CA: Sage Publications, Inc., 77 - 102.

Wellman, B., Salaff, J., Dimitrova, D., Garton, L., Gulia, M., & Haythornthwaite, C. (1996). Computer networks as social networks: Collaborative work, telework, and virtual community. Annual Review of Sociology, 22, 213 - 239.

Williams, S., Crouch, R. & Dale, J. (1995). Providing health-care advice by telephone. Professional Nurse, 10, (12), 750 - 752.

Wiersma, W. (1995). Research methods in education: An introduction, 6th Ed. Needham Heights, MA: Allyn and Bacon.

Wolcott, B. W. (1996). Managed care's driving force: Demand management. Info Care: Information Strategies for Managed Care, January/February, 13 - 15.

Wolcott, B., Johnson, D. A., Phillips, J. S., & White, S. D. (1995). Telephone triage safely lessens demand for acute care pediatric services. Managed Care Medicine, 4 (5), 22 – 25.

USAMH HEALTHCARE PRIMARY CARE PROVIDER COMMUNICATION QUALITY SURVEY: PATIENT ACCESS & ADVICE LINE
A Research Project of the US Army Medical Department in Heidelberg, Germany and the University of Oklahoma - Norman Campus

I. Research Project Title: Healthcare Demand Management Communication Among the Provider,
the Beneficiary, and the Nurse Call Center.

- Conducted by the US Army MEDDAC in Heidelberg and the University of Oklahoma – Norman Campus.
- This document gives your consent to participate in the project by completing a questionnaire.

II. Researcher Information: The principal researcher is CPT Gerald R. Ledlow, MHA, CHE
University of Oklahoma sponsor is Dan O'Hair, Ph.D.
Research approval by COL Donald M. Bradshaw, MD, DCCS

III. Description of Project: The project intends to determine the unique communication requirements of healthcare providers and healthcare system beneficiaries as they interact, use, and depend on a nurse call center operation. The underlying assumption is that communication significantly determines the efficiency and efficacy of the patient flow process and patient - provider relationship as nurse call centers become more prevalent in the healthcare industry. Your individual participation will take about ten (10) minutes to complete a questionnaire.

IV. Potential Risks and Benefits of Participation: Your individual identity will be kept confidential. All questionnaire data will be summed, leaving individual characteristics indiscernible. No other risks of participation exist. Your participation will benefit the local operation and increase the knowledge available to the healthcare industry so communication improvements can be made to increase efficiency and efficacy for providers whose patients utilize nurse call centers.

V. Subject Assurances: Your participation is voluntary. No adverse action, loss of benefits, or penalties will impact you if you choose to decline participation. All information will be confidential and summed so that your individual identity is protected.

VI. Contact for Additional Information: CPT Gerald Ledlow, MHA, CHE at DSN 371 - 3052 or COL Donald M. Bradshaw, MD, DCCS at DSN 371 - 2688.

_____
Signature of Participant

* Please Separate this form from the Completed Questionnaire.

PATIENT ACCESS & ADVICE LINE COMMUNICATION SURVEY INSTRUMENT

There are four (4) parts included in the next three pages. First, your ideal communication expectations from the PAAL will be measured. Second, actual communication perceptions will be measured. Next, You will select the media or avenue information comes to you from the PAAL. The last section asks general questions.

Under Ideal Conditions, To What Extent Do *You* as a Primary Care Manager Want to Receive Information *from* the Demand Management System (PAAL, the Nurse Call Center) concerning your patients:

* *circle one response for each statement.*	To a Very Little Extent	To a Little Extent	To Some Extent	To a Great Extent	To a Very Great Extent
1. You get information when you need it.	1	2	3	4	5
2. You do get information that impacts immediate care decisions.	1	2	3	4	5
3. You can trust the information received.	1	2	3	4	5
4. The information is reliable.	1	2	3	4	5
5. The information impacts care decisions.	1	2	3	4	5
6. You receive more information than can be readily understood or used.	1	2	3	4	5
7. The information is concise.	1	2	3	4	5
8. You receive information in a timely fashion.	1	2	3	4	5
9. The information is accurate.	1	2	3	4	5
10. The information is applicable to your clinical practice.	1	2	3	4	5
11. The information is useful.	1	2	3	4	5
12. The information received is excessive.	1	2	3	4	5

All information will be confidential. Data will be grouped; no individual can be identified. Thank you for providing input for the survey. The PAAL Survey will improve communication in our healthcare system.

To What Extent Do *You* as a Primary Care Manager Actually Receive Information *from* the Demand Management System (PAAL, the Nurse Call Center) concerning your patients:

* *circle one response for each statement.*	To a Very Little Extent	To a Little Extent	To Some Extent	To a Great Extent	To a Very Great Extent
[illegible]	1	2	3	4	5
2. You do get information that impacts immediate care decisions.	1	2	3	4	5
[illegible]	1	2	3	4	5
4. The information is reliable.	1	2	3	4	5
[illegible]	1	2	3	4	5
6. You receive more information than can be readily understood or used.	1	2	3	4	5
[illegible]	1	2	3	4	5
8. You receive information in a timely fashion.	1	2	3	4	5
[illegible]	1	2	3	4	5
10. The information is applicable to your clinical practice.	1	2	3	4	5
[illegible]	1	2	3	4	5
12. The information received is excessive.	1	2	3	4	5

This is the amount of information I receive *now* from the PAAL: Channel of Information

* *circle one for each type.*	Very Little	Little	Some	Great	Very Great
Face-to-Face	1	2	3	4	5
Telephone	1	2	3	4	5
Written (memo, notice, letter)	1	2	3	4	5
CHCS (Automated Patient Record)	1	2	3	4	5
E-Mail (CC:Mail, MS-Mail)	1	2	3	4	5
CHCS Mailman (Intranet E-Mail)	1	2	3	4	5
Direct from the Patient	1	2	3	4	5
Fax (Includes LAN Printer)	1	2	3	4	5
Other, Please Specify	1	2	3	4	5

GENERAL INFORMATION:

1. Where do you work? (Please Circle the Closest One Location)

Babenhausen Buedingen Butzbach Darmstadt Friedberg Giessen Hanau Heidelberg Mannheim Stuttgart

2. What is your Gender? Male☐ or Female☐

3. I am _____ years old.

4. What is your specialty? (mark one please)

Family Practice	Internal Medicine	Pediatrics	General Practice	OB/Gyn	Other
☐	☐	☐	☐	☐	☐

5. Are you a PCM? Yes☐ or No☐

6. What is your patient panel size? (how many patients are assigned to you as PCM) _____ beneficiaries/patients

7. What type of degree do you hold? (mark one please)

MD	DO	NP	PA
☐	☐	☐	☐

8. Have you taken this survey before? Yes ☐ No ☐

9. Approximately how many individual patient encounters (independent communications) have you received from the Patient Access & Advice Line (PAAL, Nurse Call Center)?

Approximately _____ communications.

Please suggest improvements to the system.

_____

_____

_____

_____

All information will be confidential. Data will be grouped; no individual can be identified. Thank you for providing input for the survey. Please return the completed survey to CPT Ledlow in the Managed Care Office; a point of contact can be found by calling DSN 371-3032.

PATIENT ACCESS & ADVICE LINE COMMUNICATION SURVEY INSTRUMENT BENEFICIARY EDITION

To What Extent Do You as a Customer of the Military Health System Actually Receive Information from the Patient Access & Advice Line (PAAL) concerning your Health Needs:

* *circle one response for each statement.*	To a Very Little Extent	To a Little Extent	To Some Extent	To a Great Extent	To a Very Great Extent
[illegible]	1	2	3	4	5
2. You get information that impacts immediate health care decisions.	1	2	3	4	5
[illegible]	1	2	3	4	5
4. The information is reliable.	1	2	3	4	5
[illegible]	1	2	3	4	5
6. The information impacts health care decisions.	1	2	3	4	5
[illegible]	1	2	3	4	5
8. The information is concise.	1	2	3	4	5
[illegible]	1	2	3	4	5
10. You do receive punctual information.	1	2	3	4	5
[illegible]	1	2	3	4	5
12. Good decisions can be made from the information.	1	2	3	4	5
[illegible]	1	2	3	4	5
14. The information is useful.	1	2	3	4	5
[illegible]	1	2	3	4	5
16. There is needless information.	1	2	3	4	5

PATIENT ACCESS & ADVICE LINE COMMUNICATION INSTRUMENT: BENEFICIARY EDITION

GENERAL INFORMATION

1. Why did you call the PAAL? (mark all that apply)
   Health Advice for Self ☐ Health Advice for a Family Member ☐
   An Appointment ☐ Self Care Instructions ☐ Information ☐
   Other (please specify)_____

2. Where do you live in Germany? (circle one please)
   Babenhausen Buedingen Butzbach Darmstadt Friedberg
   Giessen Hanau Heidelberg Mannheim Stuttgart

3. What is your age? _____ years old

4. What is your Gender? (circle one please) Male Female

5. What is your Beneficiary Category?

Active Duty ☐ Active Duty Family Member ☐ Retiree ☐ Retiree Family Member ☐

Civilian (Civ) ☐ Civilian Family Member(CivFM) ☐ Other ☐

(Check the Applicable Box Please)

6. Have you attended a self-care class?
   Yes ☐ If Yes, Did you Receive a Self-Care Book? Yes ☐ No ☐
   No ☐ If No, Do You Intend to go to a Self-Care Class? Yes ☐ No ☐

7. Do you feel that you have enough information to take care of basic healthcare needs in the home?
   Yes ☐ No ☐

8. What is the rank or grade of the sponsor?
   E1 - E4 GS2/3/4 ☐ E5 - E7 O1 - O3 GS5 - GS11 ☐ E8 - E9 O4 - O7+ GS 12+ ☐

9. Have you taken this survey before? Yes ☐ No ☐

Do you have any suggestions to make this service or operation better?

_____

_____

_____

All information will be confidential. Data will be grouped; no individual can be identified. Thank you for providing input for the survey. The PAAL Survey will improve communication in our healthcare system.

Patient Access & Advice Line Communication Survey Instrument
INTERPRETATION

Question Number Beneficiary # / Provider #	Survey Dimension	Positive or Negative	Coding
1 / 1	Timeliness	Positive	Normal
2 / 2	Timeliness	Positive	Normal
3 / 3	Accuracy	Positive	Normal
4 / 4	Accuracy	Positive	Normal
5 / N/A	Usefulness	Positive	Normal
6 / 5	Usefulness	Positive	Normal
7 / 6	Quantity	Positive	Normal
8 / 7	Quantity	Negative	Reverse
9 / 8	Timeliness	Positive	Normal
10 / N/A	Timeliness	Positive	Normal
11 / 9	Accuracy	Positive	Normal
12 / N/A	Accuracy	Positive	Normal
13 / 10	Usefulness	Positive	Normal
14 / 11	Usefulness	Positive	Normal
15 / 12	Quantity	Positive	Normal
16 / N/A	Quantity	Positive	Normal

NOTE: Shaded area Does Not Apply to Provider / Primary Care Manager Survey Instrument Questions.

DIMENSION	Question Numbers to Combine Add Positive, Reverse Negative and Add	Communication Dimension Composite
Timeliness	1, 2, 9, 10	Higher Score is More Timely
Accuracy	3, 4, 11, 12	Higher Score is More Accurate
Usefulness	5, 6, 13, 14	Higher Score is More Useful
Quantity	7, 8, 15, 16	Higher Score is More Excessive

SCORES Per DIMENSION

Minimum Composite Score **Beneficiary Scale** **Maximum Composite Score**

0 ———3——4————————10————————15————————20————→

Minimum Composite Score **Provider Scale** **Maximum Composite Score**

The Tables, above, can be used for all Patient Access & Advice Line Communication Survey Instruments:

- **Primary Care Healthcare Provider Survey Instrument**
- **Patient/Beneficiary Edition Survey Instrument**

Demographic sections of each survey instrument can be interpreted as stated in the instrument.

PROVIDER SURVEY INSTRUMENT RESULTS for IDEAL COMMUNICATION: Cronbach's Alpha Coefficient

TIMELINESS DIMENSION

3 'VAR' Variables: T1 T2 T3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
T1	63	4.031746	0.915252	254.000	2.000000	5.000000
T2	63	4.063492	0.913572	256.000	1.000000	5.000000
T3	63	4.380952	0.791662	276.000	2.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.746391
for STANDARDIZED variables: 0.738920

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
T1	0.750114	0.431868	0.736816	0.435340
T2	0.627837	0.595285	0.608291	0.599678
T3	0.377717	0.857043	0.377643	0.857044

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	T1	T2	T3
T1	1.00000	0.74985	0.42824
	0.0	0.0001	0.0005
T2	0.74985	1.00000	0.27823
	0.0001	0.0	0.0272
T3	0.42824	0.27823	1.00000
	0.0005	0.0272	0.0

ACCURACY DIMENSION

3 'VAR' Variables: A1 A2 A3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
A1	63	4.476190	0.758971	282.000	2.000000	5.000000
A2	63	4.444444	0.818689	280.000	2.000000	5.000000
A3	63	4.412698	0.754234	278.000	2.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.925818
for STANDARDIZED variables: 0.925920

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
A1	0.839283	0.900250	0.837250	0.901913
A2	0.892317	0.857143	0.892273	0.857152
A3	0.818723	0.916296	0.817366	0.917719

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	A1	A2	A3
A1	1.00000 0.0	0.84795 0.0001	0.75001 0.0001
A2	0.84795 0.0001	1.00000 0.0	0.82135 0.0001
A3	0.75001 0.0001	0.82135 0.0001	1.00000 0.0

USEFULNESS DIMENSION

3 'VAR' Variables: U2 U3 U4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
U2	63	3.984127	1.023783	251.000	1.000000	5.000000
U3	63	4.174603	0.871404	263.000	2.000000	5.000000
U4	63	4.206349	0.882788	265.000	1.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.887240
for STANDARDIZED variables: 0.891331

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
U2	0.757797	0.870088	0.758139	0.870130
U3	0.839343	0.792829	0.840115	0.798070
U4	0.758966	0.858898	0.763841	0.865239

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	U2	U3	U4
U2	1.00000 0.0	0.76249 0.0001	0.66399 0.0001
U3	0.76249 0.0001	1.00000 0.0	0.77011 0.0001
U4	0.66399 0.0001	0.77011 0.0001	1.00000 0.0

QUANTITY DIMENSION

3 'VAR' Variables: Q1 Q2 Q3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Q1	63	2.031746	0.966675	128.000	1.000000	4.000000
Q2	63	1.825397	0.773340	115.000	1.000000	4.000000
Q3	63	1.904762	0.962428	120.000	1.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.720708
for STANDARDIZED variables: 0.713457

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q1	0.620720	0.528059	0.600622	0.537335
Q2	0.383084	0.796689	0.383128	0.796693
Q3	0.648982	0.488384	0.630923	0.497556

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	Q1	Q2	Q3
Q1	1.00000 0.0	0.33116 0.0080	0.66209 0.0001
Q2	0.33116 0.0080	1.00000 0.0	0.36737 0.0031
Q3	0.66209 0.0001	0.36737 0.0031	1.00000 0.0

PROVIDER SURVEY INSTRUMENT RESULTS for ACTUAL COMMUNICATION: Cronbach's Alpha Coefficient

TIMELINESS DIMENSION

3 'VAR' Variables: T1 T2 T3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
T1	63	2.619048	1.038432	165.000	1.000000	4.000000
T2	63	2.714286	1.084027	171.000	1.000000	5.000000
T3	63	2.920635	1.051904	184.000	1.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.714759
for STANDARDIZED variables: 0.714919

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
T1	0.724133	0.379636	0.720164	0.379776
T2	0.611329	0.524806	0.613454	0.524838
T3	0.311775	0.873272	0.313167	0.873726

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	T1	T2	T3
T1	1.00000 0.0	0.77577 0.0001	0.35578 0.0042
T2	0.77577 0.0001	1.00000 0.0	0.23440 0.0644
T3	0.35578 0.0042	0.23440 0.0644	1.00000 0.0

ACCURACY DIMENSION

3 'VAR' Variables: A1 A2 A3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
A1	63	3.619048	0.831411	228.000	2.000000	5.000000
A2	63	3.619048	0.791662	228.000	2.000000	5.000000
A3	63	3.539683	0.758296	223.000	1.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.922584
for STANDARDIZED variables: 0.922480

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
A1	0.880273	0.857352	0.879009	0.857806
A2	0.870086	0.865596	0.867084	0.867674
A3	0.782937	0.934823	0.782759	0.935420

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	A1	A2	A3
A1	1.00000	0.87868	0.76628
	0.0	0.0001	0.0001
A2	0.87868	1.00000	0.75102
	0.0001	0.0	0.0001
A3	0.76628	0.75102	1.00000
	0.0001	0.0001	0.0

USEFULNESS DIMENSION

3 'VAR' Variables: U2 U3 U4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
U2	63	2.841270	1.050443	179.000	1.000000	5.000000
U3	63	3.206349	0.900873	202.000	1.000000	5.000000
U4	63	3.206349	0.953072	202.000	1.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.886424
for STANDARDIZED variables: 0.890148

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
U2	0.722922	0.896518	0.722300	0.897302
U3	0.796019	0.828039	0.800066	0.830332
U4	0.829888	0.793743	0.834738	0.799375

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	U2	U3	U4
U2	1.00000 0.0	0.66580 0.0001	0.70989 0.0001
U3	0.66580 0.0001	1.00000 0.0	0.81373 0.0001
U4	0.70989 0.0001	0.81373 0.0001	1.00000 0.0

QUANTITY DIMENSION

3 'VAR' Variables: Q1 Q2 Q3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Q1	63	2.555556	1.160892	161.000	1.000000	5.000000
Q2	63	2.857143	1.013731	180.000	1.000000	5.000000
Q3	63	2.412698	1.144903	152.000	1.000000	5.000000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.600425
for STANDARDIZED variables: 0.585114

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q1	0.509906	0.337459	0.486341	0.339536
Q2	0.148146	0.813935	0.148660	0.813981
Q3	0.630403	0.127170	0.609355	0.128265

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 63

	Q1	Q2	Q3
Q1	1.00000 0.0	0.06853 0.5936	0.68631 0.0001
Q2	0.06853 0.5936	1.00000 0.0	0.20448 0.1079
Q3	0.68631 0.0001	0.20448 0.1079	1.00000 0.0

BENEFICIARY SURVEY INSTRUMENT RESULTS: Cronbach's Alpha Coefficient

TIMELINESS DIMENSION

Correlation Analysis

4 'VAR' Variables: T1 T2 T3 T4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
T1	242	4.041322	1.029818	978.00	1.000000	5.000000
T2	242	3.921488	1.136910	949.00	1.000000	5.000000
T3	242	4.157025	1.074088	1006.00	1.000000	5.000000
T4	242	4.086777	1.110451	989.00	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.830282

for STANDARDIZED variables: 0.831627

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
T1	0.674673	0.779242	0.671843	0.781917
T2	0.579193	0.822471	0.584131	0.820619
T3	0.695137	0.768972	0.693940	0.771860
T4	0.689137	0.771242	0.691334	0.773053

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 242

	T1	T2	T3	T4
T1	1.00000	0.67260	0.50804	0.50121
	0.0	0.0001	0.0001	0.0001
T2	0.67260	1.00000	0.41449	0.41625
	0.0001	0.0	0.0001	0.0001
T3	0.50804	0.41449	1.00000	0.80259
	0.0001	0.0001	0.0	0.0001
T4	0.50121	0.41625	0.80259	1.00000
	0.0001	0.0001	0.0001	0.0

ACCURACY DIMENSION
Correlation Analysis

4 'VAR' Variables: A1 A2 A3 A4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
A1	242	4.181818	1.030651	1012.000	1.00000	5.000000
A2	242	4.190083	1.000531	1014.000	1.00000	5.000000
A3	242	4.198347	1.015399	1016.000	1.00000	5.000000
A4	242	4.152893	1.057169	1005.000	1.00000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.932249
for STANDARDIZED variables: 0.932356

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
A1	0.850892	0.908230	0.851547	0.908235
A2	0.835907	0.913248	0.836232	0.913239
A3	0.831341	0.914617	0.830375	0.915142
A4	0.844781	0.910425	0.844558	0.910523

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 242

	A1	A2	A3	A4
A1	1.00000 0.0	0.83952 0.0001	0.73459 0.0001	0.77412 0.0001
A2	0.83952 0.0001	1.00000 0.0	0.74283 0.0001	0.73345 0.0001
A3	0.73459 0.0001	0.74283 0.0001	1.00000 0.0	0.82590 0.0001
A4	0.77412 0.0001	0.73345 0.0001	0.82590 0.0001	1.00000 0.0

USEFULLNESS DIMENSION

Correlation Analysis

4 'VAR' Variables: U1 U2 U3 U4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
U1	242	4.140496	1.053000	1002.000	1.000000	5.000000
U2	242	3.991736	1.123095	966.000	1.000000	5.000000
U3	242	4.219008	0.984090	1021.000	1.000000	5.000000
U4	242	4.235537	1.025756	1025.000	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.925167
for STANDARDIZED variables: 0.926503

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
U1	0.838735	0.898304	0.838378	0.901070
U2	0.782491	0.919352	0.782128	0.919634
U3	0.814720	0.906993	0.816036	0.908506
U4	0.876852	0.885847	0.879249	0.887254

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 242

	U1	U2	U3	U4
U1	1.00000 0.0	0.74131 0.0001	0.72698 0.0001	0.82975 0.0001
U2	0.74131 0.0001	1.00000 0.0	0.70370 0.0001	0.73287 0.0001
U3	0.72698 0.0001	0.70370 0.0001	1.00000 0.0	0.82013 0.0001
U4	0.82975 0.0001	0.73287 0.0001	0.82013 0.0001	1.00000 0.0

QUANTITY DIMENSION

Correlation Analysis

4 'VAR' Variables: Q1 Q2 Q3 Q4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Q1	242	2.566116	1.439574	621.000	1.000000	5.000000
Q2	242	1.925620	1.003440	466.000	1.000000	5.000000
Q3	242	2.347107	1.330839	568.000	1.000000	5.000000
Q4	242	2.037190	1.243515	493.000	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.656360
for STANDARDIZED variables: 0.639934

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q1	0.458323	0.577049	0.429537	0.564039
Q2	0.152584	0.736930	0.160137	0.738937
Q3	0.589999	0.471804	0.562653	0.464498
Q4	0.572930	0.492702	0.571508	0.457549

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 242

	Q1	Q2	Q3	Q4
Q1	1.00000 0.0	0.00916 0.8872	0.52726 0.0001	0.40542 0.0001
Q2	0.00916 0.8872	1.00000 0.0	0.12195 0.0582	0.25828 0.0001
Q3	0.52726 0.0001	0.12195 0.0582	1.00000 0.0	0.52372 0.0001
Q4	0.40542 0.0001	0.25828 0.0001	0.52372 0.0001	1.00000 0.0

Pilot Survey Cronbach's Coefficient Alpha: Provider Survey Instrument

Timeliness Dimension

Correlation Analysis

3 'VAR' Variables: T1 T2 T3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
T1	12	4.166667	0.834847	50.000	3.000000	5.000000
T2	12	3.916667	1.240112	47.000	2.000000	5.000000
T3	12	4.416667	0.900337	53.000	2.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.726923
for STANDARDIZED variables: 0.759569

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
T1	0.869565	0.315217	0.867426	0.328835
T2	0.495969	0.767802	0.506944	0.769150
T3	0.397017	0.798371	0.443384	0.835250

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 12

	T1	T2	T3
T1	1.00000 0.0	0.71711 0.0087	0.62489 0.0298
T2	0.71711 0.0087	1.00000 0.0	0.19677 0.5399
T3	0.62489 0.0298	0.19677 0.5399	1.00000 0.0

Accuracy Dimension

Correlation Analysis

3 'VAR' Variables: A1 A2 A3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
A1	12	4.583333	0.514929	55.000000	4.000000	5.000000
A2	12	4.500000	0.904534	54.000000	2.000000	5.000000
A3	12	4.416667	0.514929	53.000000	4.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.440476
for STANDARDIZED variables: 0.566183

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
A1	0.240045	0.402235	0.383526	0.452934
A2	0.105409	0.833333	0.105409	0.833333
A3	0.635037	-0.183206	0.749612	-0.216288

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 12

	A1	A2	A3
A1	1.00000 0.0	-0.09759 0.7629	0.71429 0.0091
A2	-0.09759 0.7629	1.00000 0.0	0.29277 0.3558
A3	0.71429 0.0091	0.29277 0.3558	1.00000 0.0

Usefulness Dimension

Correlation Analysis

3 'VAR' Variables: U2 U3 U4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
U2	12	3.666667	1.230915	44.000	2.000000	5.000000
U3	12	4.000000	0.953463	48.000	2.000000	5.000000
U4	12	4.500000	0.674200	54.000	3.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.855204
for STANDARDIZED variables: 0.887097

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
U2	0.783837	0.800000	0.792283	0.828427
U3	0.741305	0.785047	0.747020	0.868017
U4	0.802980	0.805970	0.800018	0.821545

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 12

	U2	U3	U4
U2	1.00000 0.0	0.69714 0.0117	0.76681 0.0036
U3	0.69714 0.0117	1.00000 0.0	0.70711 0.0101
U4	0.76681 0.0036	0.70711 0.0101	1.00000 0.0

Quantity Dimension

Correlation Analysis

3 'VAR' Variables: Q1 Q2 Q3

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Q1	12	1.583333	0.996205	19.0000	1.000000	4.000000
Q2	12	1.916667	1.164500	23.0000	1.000000	5.000000
Q3	12	1.750000	1.138180	21.0000	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.923261
for STANDARDIZED variables: 0.924411

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q1	0.791408	0.932927	0.792529	0.933057
Q2	0.808573	0.921429	0.801747	0.925827
Q3	0.949350	0.798450	0.949376	0.804277

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 12

	Q1	Q2	Q3
Q1	1.00000 0.0	0.67263 0.0165	0.86190 0.0003
Q2	0.67263 0.0165	1.00000 0.0	0.87451 0.0002
Q3	0.86190 0.0003	0.87451 0.0002	1.00000 0.0

Pilot Survey Cronbach's Coefficient Alpha: Beneficiary Survey Instrument

TIMELINESS DIMENSION

Correlation Analysis

4 'VAR' Variables: T1 T2 T3 T4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
T1	56	3.660714	1.225142	205.000000	1.000000	5.000000
T2	56	3.678571	1.336306	206.000000	1.000000	5.000000
T3	56	3.678571	1.207660	206.000000	1.000000	5.000000
T4	56	3.696429	1.249286	207.000000	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.921711
for STANDARDIZED variables: 0.922413

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
T1	0.780794	0.910852	0.777542	0.913432
T2	0.805201	0.904228	0.805181	0.904228
T3	0.838567	0.892167	0.839853	0.892501
T4	0.856608	0.885425	0.859642	0.885717

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 56

	T1	T2	T3	T4
T1	1.00000	0.78731	0.67456	0.69175
	0.0	0.0001	0.0001	0.0001
T2	0.78731	1.00000	0.70093	0.72464
	0.0001	0.0	0.0001	0.0001
T3	0.67456	0.70093	1.00000	0.91030
	0.0001	0.0001	0.0	0.0001
T4	0.69175	0.72464	0.91030	1.00000
	0.0001	0.0001	0.0001	0.0

ACCURACY DIMENSION

Correlation Analysis

4 'VAR' Variables: A1 A2 A3 A4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
A1	56	3.910714	1.066460	219.000	1.000000	5.000000
A2	56	4.017857	1.017860	225.000	1.000000	5.000000
A3	56	3.928571	1.006473	220.000	2.000000	5.000000
A4	56	3.839286	1.005020	215.000	2.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.915120
for STANDARDIZED variables: 0.914918

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
A1	0.849365	0.874425	0.849133	0.874311
A2	0.861288	0.870538	0.860105	0.870412
A3	0.726753	0.916346	0.727215	0.916222
A4	0.789525	0.895491	0.788245	0.895565

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 56

	A1	A2	A3	A4
A1	1.00000	0.83898	0.65458	0.78366
	0.0	0.0001	0.0001	0.0001
A2	0.83898	1.00000	0.72893	0.73157
	0.0001	0.0	0.0001	0.0001
A3	0.65458	0.72893	1.00000	0.63553
	0.0001	0.0001	0.0	0.0001
A4	0.78366	0.73157	0.63553	1.00000
	0.0001	0.0001	0.0001	0.0

USEFULNESS DIMENSION

Correlation Analysis

4 'VAR' Variables: U1 U2 U3 U4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
U1	56	3.767857	1.205911	211.000	1.000000	5.000000
U2	56	3.642857	1.313269	204.000	1.000000	5.000000
U3	56	3.535714	1.413754	198.000	1.000000	5.000000
U4	56	3.767857	1.279077	211.000	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.926249
for STANDARDIZED variables: 0.926969

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
U1	0.829965	0.904781	0.830059	0.904759
U2	0.741545	0.932430	0.740181	0.933992
U3	0.894395	0.881465	0.894327	0.883044
U4	0.858896	0.893973	0.857562	0.895550

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 56

	U1	U2	U3	U4
U1	1.00000	0.68146	0.79947	0.80135
	0.0	0.0001	0.0001	0.0001
U2	0.68146	1.00000	0.74146	0.66413
	0.0001	0.0	0.0001	0.0001
U3	0.79947	0.74146	1.00000	0.87439
	0.0001	0.0001	0.0	0.0001
U4	0.80135	0.66413	0.87439	1.00000
	0.0001	0.0001	0.0001	0.0

QUANTITY DIMENSION

Correlation Analysis

4 'VAR' Variables: Q1 Q2 Q3 Q4

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Q1	56	2.428571	1.425191	136.0000	1.000000	5.000000
Q2	56	2.500000	1.334848	140.0000	1.000000	5.000000
Q3	56	2.392857	1.397121	134.0000	1.000000	5.000000
Q4	56	2.392857	1.485427	134.0000	1.000000	5.000000

Cronbach Coefficient Alpha

for RAW variables : 0.777355
for STANDARDIZED variables: 0.776496

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q1	0.404882	0.811145	0.403111	0.809749
Q2	0.507828	0.759324	0.507423	0.759416
Q3	0.739506	0.638155	0.735838	0.637370
Q4	0.699080	0.657045	0.699592	0.657860

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 56

	Q1	Q2	Q3	Q4
Q1	1.00000 0.0	0.23893 0.0762	0.41612 0.0014	0.37421 0.0045
Q2	0.23893 0.0762	1.00000 0.0	0.51671 0.0001	0.49516 0.0001
Q3	0.41612 0.0014	0.51671 0.0001	1.00000 0.0	0.74781 0.0001
Q4	0.37421 0.0045	0.49516 0.0001	0.74781 0.0001	1.00000 0.0

PATIENT ACCESS & ADVICE LINE COMMUNICATION SURVEY INSTRUMENT: PILOT SURVEY DEVELOPMENT

To What Extent Do You feel the questions or statements relate to the dimension (in bold) for each section. In other words, how accurately does the question or statement pertain to the word in bold for each of the four sections. Your input will help construct the Demand Management System (PAAL) Communication Survey that relates to information you get from the PAAL nurses concerning patient care triage and disposition:

	To a Very Little Extent	To a Little Extent	To Some Extent	To a Great Extent	To a Very Great Extent
1. Timely / Timeliness					
• [illegible]	1	2	3	4	5
• You do not get information too early or late about patients.	1	2	3	4	5
• [illegible]	1	2	3	4	5
• You get information that impacts immediate care decisions.	1	2	3	4	5
• [illegible]	1	2	3	4	5
• You get information by the start of the next business day.	1	2	3	4	5
• [illegible]	1	2	3	4	5
2. Accurate / Accuracy					
• You can trust the information received.	1	2	3	4	5
• [illegible]	1	2	3	4	5
• The information seems clinically correct.	1	2	3	4	5
• [illegible]	1	2	3	4	5
• The information is trustworthy.	1	2	3	4	5
• [illegible]	1	2	3	4	5
• Good decisions can be made from the information.	1	2	3	4	5

Please continue the Pilot Development Survey on the next page.

	To a Very Little Extent	To a Little Extent	To Some Extent	To a Great Extent	To a Very Great Extent
3. Useful / Usefulness					
[illegible]	1	2	3	4	5
• Is the information beneficial?	1	2	3	4	5
[illegible]	1	2	3	4	5
• Does the information pertain to patient care problems or issues?	1	2	3	4	5
[illegible]	1	2	3	4	5
• The information is useful.	1	2	3	4	5
[illegible]	1	2	3	4	5
4. Quantity / Amount of Information Flow					
• You receive more information than can be readily understood or used.	1	2	3	4	5
[illegible]	1	2	3	4	5
• The amount of information is a burden.	1	2	3	4	5
[illegible]	1	2	3	4	5
• There is too much information.	1	2	3	4	5
[illegible]	1	2	3	4	5
• There is much extraneous information.	1	2	3	4	5

GENERAL INFORMATION:

1. What is your Gender? Male☐ or Female☐ 2. I am _____ years old.

3. Do you work or volunteer in a medical or healthcare capacity? Yes☐ or No☐

If question 3 is Yes, please answer questions 4 - 6.

4. Are you a healthcare provider (a physician, or non-physician provider)? Yes☐ or No☐

5. What is your specialty? (mark one please)

Family Practice	Internal Medicine	Pediatrics	General Practice	OB/Gyn	Other
☐	☐	☐	☐	☐	☐

6. What type of degree do you hold? (mark one please)

MD	DO	NP	PA
☐	☐	☐	☐

All information will be confidential. Data will be grouped; no individual can be identified.

Thank you for your input. The PAAL Survey, once developed, will improve communication in our healthcare system.

Pilot Survey Development Results: Timeliness Dimension

Rank	1	6	5	3	2	7	4
	T1	T2	T3	T4	T5	T6	T7

1. Timely / Timeliness

T1	You get information when you need it to make decisions.
T2	You do not get information too early or late about patients.
T3	You get just-in-time information.
T4	You get information that impacts immediate care decisions.
T5	You receive information in a timely fashion.
T6	You get information by the start of the next business day.
T7	You receive punctual information

Note: 5 Point Likert-type Scale has been recoded using a range of -2 to +2.

Pilot Survey Development Results: Accuracy Dimension

Rank	3	7	6	4	5	1	2
	A1	A2	A3	A4	A5	A6	A7

2. Accurate / Accuracy

A1	You can trust the information received.
A2	The information is generally believable.
A3	The information seems clinically correct.
A4	The information is reliable.
A5	The information is trustworthy
A6	The information is accurate.
A7	Good decisions can be made from the information.

Note: 5 Point Likert-type Scale has been recoded using a range of -2 to +2.

Pilot Survey Development Results: Usefulness Dimension

Rank	2	6	1	5	3	4	7
	U1	U2	U3	U4	U5	U6	U7

3. Useful / Usefulness

U1	You can use the information in patient care decisions.
U2	Is the information beneficial?
U3	The information impacts care decisions?
U4	Does the information pertain to patient care problems or issues?
U5	The information is applicable to your clinical practice?
U6	The information is useful?
U7	The information is helpful?

Note: 5 Point Likert-type Scale has been recoded using a range of -2 to +2.

Pilot Survey Development Results: Quantity Dimension

Rank	3	2	6	7	5	1	4
	Q1	Q2	Q3	Q4	Q5	Q6	Q7

4. Quantity / Adequacy of Information Flow

Q1	You receive more information than can be readily understood or used.
Q2	Is the information concise?
Q3	The amount of information is a burden.
Q4	You get information overload.
Q5	There is too much information.
Q6	The information received is excessive.
Q7	There is much extraneous information.

Note: 5 Point Likert-type Scale has been recoded using a range of -2 to +2.

Pilot Survey Development Results: Demographics

AGE	
Mean Age	36.68
Standard Deviation	10.27
Median	35

LOCATION

GENDER

Male	**19**
Female	**12**
	31

MEDICAL PROFESSION as PRIMARY ROLE?

Yes	**20**
No	**11**
	31

Family Practice	7
Internal Medicine	1
Pediatrics	1
General Practice	1
Ob/Gyn	1
Other	4
	15

WHAT DEGREE DO YOU HOLD?

MD	3
DO	2
No Response	5
	15

US Army MEDDAC Heidelberg Catchment Area

Square Miles: 6,200
Patient Population: 70,000+





Distance in miles one-way from the clinics to the hospital:

- Babenhausen 56
- Buedingen 72
- Butzbach 81
- Darmstadt 39
- Friedberg 75
- Giessen 88
- Hanau 67
- Mannheim 11
- Coleman Barracks 18
- Stuttgart 75

POPULATION BY COMMUNITY:

LOCATION	AD	AD FM	USCIV	USCIV FM	RET & FM	TOTAL
Babenhausen	629	902	111	25	10	1,677
Buedingen	976	1,224	60	31	5	2,296
Butzbach	2,034	2,336	207	250	350	5,177
Darmstadt	2,135	2,612	876	621	505	6,749
Friedberg	1,883	2,141	128	56	20	4,228
Hanau	3,602	5,019	1,346	808	290	11,065
Heidelberg	4,402	6,649	3,478	2,652	820	18,001
Mannheim	4,170	6,081	1,450	1,072	366	12,814
Stuttgart	2,176	4,072	1,018	819	415	8,500
TOTAL	22,007	31,036	8,674	6,334	2,781	70,852

Source: Theater Personnel File (22 SEP 97); DEERS file (SEP 96); 26th ASG data (SEP 95).

Healthwise Call Manager

Care Counselor Case Report

XXXXXXXXXX
Patient

.9
Age

Dependant
Patient Type

XXXXXXXXXX
Subscriber Name

XXX-XX-XXXX
Subscriber ID#

Caller Home Phone XXX-XXX-XXXX

Caller Work XXX-XXX-XXXX

Reasons for Considering MD office visit

Problem Desc: Sinusitus(473.9)

Severity Mild

Impact: Moderate

Glynda Lucas -
Primary Care Provider

Heidelberg -
Home Site

5/18/98
Contact Date

09:44
Time

Jamie A. Damron
Care Counselor

Smith, Jennifer
Caller

Spouse
Caller Type

Call Mother states child has clear nasal drainage and cough that is worse at night. Instructed in home care for cold and cough. Saline nose drops w/syringe to aspirate contents 20 min. before eating and at bedtime, humidifier and to elevate the head of his bed on blocks to elivate post-nasal drip. Mom comfortable w/home care and instructed that if his sx. were not relieved in 3-4 days to call the PAAL for further advice.

Reviewed the following Healthwise Knowledgebase topics:
Allergies (Allergic Rhinitis) -- Assessment
Allergies (Allergic Rhinitis) -- Treatment
ANTIHISTAMINES AND DECONGESTANTS (Systemic)
ANTIHISTAMINES (Systemic)

Reviewed the following Healthwise Knowledgebase topics:
Respiratory Problems, Age 10 and Younger

Healthwise Call Manager

Care Counselor Case Report

XXXXXXXXXX Patient		39.9 Age	Subscriber Patient Type
XXXXXXXXXX Subscriber Name		XXX-XX-XXXX Subscriber ID#	
Caller Home Phone XXX-XXX-XXXX	Caller Work	XXX-XXXX	
Reasons for Considering MD office visit			
Problem Desc: Other(000.00)			
Severity Mild	Impact: Minimal		
- Primary Care Provider		Heidelberg-pay patient - Home Site	
1/27/98 Contact Date	07:06 Time	Vanessa Lopez Care Counselor	
PETERSON, MARK A. Caller		Subscriber Caller Type	

Call Pt. calliing c/o about rapid heart beat, states he had twice in this week HB of 112 per minute. No s/s. Pt. really concern, requesting an appt. SDA made with Dr. Swift.

<= Irregular Heartbeats--Denied irregular heartbeat caused fainting
<= Irregular Heartbeats--Denied very rapid pulse
<= Irregular Heartbeats--Denied very slow pulse
<= Irregular Heartbeats--Denied repeated spells of lightheadedness
<= Irregular Heartbeats--Denied heart seem to beat irregularly all the time
<= Irregular Heartbeats--Denied lightheadedness lasted longer than 3 to 5 days

Reviewed the following Healthwise Knowledgebase topics:
Irregular Heartbeats

Healthwise Call Manager

Care Counselor Case Report

XXXXXXXXXX
Patient

17.4 Dependant
Age Patient Type

XXXXXXXXXX
Subscriber Name

XXX-XX-XXXX
Subscriber ID#

Caller Home Phone XXX-XXX-XXXX

Caller Work XXX-XXX-XXXX

Reasons for Considering Urgent Care appt

Problem Desc: Conjunctivitis(372.3)

Severity Moderate Impact: Moderate

Michael Serwacki -
Primary Care Provider

Heidelberg -
Home Site

2/17/98 08:21
Contact Date Time

Lisa Jenkins
Care Counselor

ARNDT, JAN
Caller

Spouse
Caller Type

Call States child has been sick on and off for 3 months. C/o of "chest rattling, coughing up phlegm. States eyes are crusted shut this morning. Eyes are red with green discharge. Informed of non-availability of SDA and options of ER or PPN. Mom states will bring child to ER.

==>
<== Conjunctivitis--Confirmed eye red with a thick, greenish-yellow discharge

Reviewed the following Healthwise Knowledgebase topics:
Conjunctivitis

Options Discussed:
See MD , ER

Healthwise Call Manager

Care Counselor Case Report

XXXXXXXXXX
Patient

46.1 Spouse/ADFM
Age Patient Type

XXXXXXXXXX
Subscriber Name

XXX-XX-XXXX
Subscriber ID#

Caller Home Phone XXX-XXX-XXXX

Caller Work XXX-XXX-XXXX

Reasons for Considering MD office visit

Problem Desc: Abdominal Pain(789.0)

Severity Moderate Impact: Minimal

Mark 0. Grajcar - 3102/3101
Primary Care Provider

Heidelberg -
Home Site

5/18/98 08:08
Contact Date Time

Jamie A. Damron
Care Counselor

JENNINGS, PAULETTE
Caller

Spouse
Caller Type

Call Caller c/o abd. pain that is severe at times and is only relieved when she stands. Denies this being related to hemorrhoids. Describes pain as starting in her abd. and shoots downward. Abd. seems enlarged.

<= Abdominal Pain--Confirmed severe pain
Denied ongoing severe pain
<= Abdominal Pain--Denied localized pain more than 4 hours
<= Abdominal Pain--Denied generalized abdominal pain or cramping pain that goes away when you pass gas or
have a bowel movement, but the symptoms have lasted longer than 24 hours
<= Abdominal Pain--Denied blood or "coffee grounds" in your vomit
<= Abdominal Pain--Denied blood in your stool
<= Abdominal Pain--Denied suspect that a medication is causing your abdominal pain

Reviewed the following Healthwise Knowledgebase topics:
Abdominal Pain

Options Discussed:
See MD-eda Dr. Woda 1400

PROVIDER SURVEY RESULTS: INFERENTIAL STATISTICS

Class Level Information

Class	Levels	Values
LOC	2	0 1
GEN	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	50	359.35499437	7.18709989	2.24	0.0648
Error	12	38.58151357	3.21512613		
Corrected Total	62	397.93650794			

R-Square	C.V.	Root MSE	TS Mean
0.903046	21.72382	1.79307728	8.25396825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	31.08598162	31.08598162	9.67	0.0090
GEN	1	7.89111891	7.89111891	2.45	0.1432
SPEC	5	12.68951924	2.53790385	0.79	0.5771
DEG	3	38.62763353	12.87587784	4.00	0.0345
PS	1	0.03277678	0.03277678	0.01	0.9212
CQ	1	3.41809200	3.41809200	1.06	0.3228
AGE	1	14.01584272	14.01584272	4.36	0.0588
LOC*GEN	1	9.24609138	9.24609138	2.88	0.1157
LOC*SPEC	3	14.80136492	4.93378831	1.53	0.2562
PCM*LOC	1	1.43625694	1.43625694	0.45	0.5165
LOC*DEG	2	8.64799328	4.32399664	1.34	0.2972
PS*LOC	1	0.33043950	0.33043950	0.10	0.7540
CQ*LOC	1	2.03028643	2.03028643	0.63	0.4422
AGE*LOC	1	1.52998553	1.52998553	0.48	0.5034
GEN*SPEC	4	28.19638408	7.04909602	2.19	0.1314
GEN*DEG	2	0.62847565	0.31423782	0.10	0.9076

PS*GEN	1	0.01707588	0.01707588	0.01	0.9431
CQ*GEN	1	0.03180285	0.03180285	0.01	0.9224
AGE*GEN	1	1.53630206	1.53630206	0.48	0.5026
SPEC*DEG	2	0.99014686	0.49507343	0.15	0.8590
PS*SPEC	4	24.19407955	6.04851989	1.88	0.1785
CQ*SPEC	4	25.83305726	6.45826432	2.01	0.1573
AGE*SPEC	3	58.44253451	19.48084484	6.06	0.0094
PS*DEG	1	13.85749306	13.85749306	4.31	0.0600
CQ*DEG	1	10.82974142	10.82974142	3.37	0.0914
AGE*DEG	0	0.00000000	.	.	.
PS*CQ	1	0.02965509	0.02965509	0.01	0.9251
PS*AGE	1	24.28066127	24.28066127	7.55	0.0177
CQ*AGE	1	24.70420205	24.70420205	7.68	0.0169

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	21	126.01480334	6.00070492	0.90	0.5867
Error	41	271.92170459	6.63223670		
Corrected Total	62	397.93650794			

R-Square	C.V.	Root MSE	TS Mean
0.316671	31.20091	2.57531293	8.25396825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	31.08598162	31.08598162	4.69	0.0363
SPEC	5	14.25071421	2.85014284	0.43	0.8252
DEG	3	35.15268540	11.71756180	1.77	0.1686
PS	1	0.05844071	0.05844071	0.01	0.9257
CQ	1	5.14402171	5.14402171	0.78	0.3836
AGE	1	14.71379535	14.71379535	2.22	0.1440
AGE*SPEC	5	13.67813768	2.73562754	0.41	0.8373
PS*DEG	2	3.92448674	1.96224337	0.30	0.7455
PS*AGE	1	2.69444041	2.69444041	0.41	0.5274
CQ*AGE	1	5.31209950	5.31209950	0.80	0.3760

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	49.95505169	24.97752584	4.31	0.0179
Error	60	347.98145625	5.79969094		
Corrected Total	62	397.93650794			

R-Square	C.V.	Root MSE	TS Mean
0.125535	29.17693	2.40825475	8.25396825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	31.08598162	31.08598162	5.36	0.0240
AGE	1	18.86907007	18.86907007	3.25	0.0763

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	49.96573974	16.65524658	2.82	0.0464
Error	59	347.97076819	5.89780963		
Corrected Total	62	397.93650794			

R-Square	C.V.	Root MSE	TS Mean
0.125562	29.42270	2.42854064	8.25396825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	31.08598162	31.08598162	5.27	0.0253
AGE	1	18.86907007	18.86907007	3.20	0.0788
AGE*LOC	1	0.01068806	0.01068806	0.00	0.9662

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
GEN	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63
General Linear Models Procedure

Dependent Variable: AS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	49	256.42874185	5.23323963	1.40	0.2577
Error	13	48.46014704	3.72770362		
Corrected Total	62	304.88888889			

R-Square	C.V.	Root MSE	AS Mean
0.841056	17.91395	1.93072619	10.77777778

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	0.83836257	0.83836257	0.22	0.6432
GEN	1	3.86445224	3.86445224	1.04	0.3272
SPEC	5	15.22965876	3.04593175	0.82	0.5586
DEG	3	7.99694779	2.66564926	0.72	0.5603
PS	1	7.46607472	7.46607472	2.00	0.1805
CQ	1	0.38419300	0.38419300	0.10	0.7533
AGE	1	3.87509499	3.87509499	1.04	0.3265
LOC*GEN	1	2.68521568	2.68521568	0.72	0.4114
LOC*SPEC	3	14.99795637	4.99931879	1.34	0.3039
LOC*DEG	2	20.91354008	10.45677004	2.81	0.0971
PS*LOC	1	2.89368610	2.89368610	0.78	0.3943
CQ*LOC	1	1.19818981	1.19818981	0.32	0.5804
AGE*LOC	1	9.43920159	9.43920159	2.53	0.1356
GEN*SPEC	4	5.22266121	1.30566530	0.35	0.8392
GEN*DEG	2	21.69932746	10.84966373	2.91	0.0902
PS*GEN	1	0.79528726	0.79528726	0.21	0.6518
CQ*GEN	1	1.29707086	1.29707086	0.35	0.5654
AGE*GEN	1	3.02046994	3.02046994	0.81	0.3844
SPEC*DEG	2	14.10237170	7.05118585	1.89	0.1901
PS*SPEC	4	8.98147173	2.24536793	0.60	0.6677
CQ*SPEC	4	8.87065757	2.21766439	0.59	0.6726
AGE*SPEC	3	9.20913651	3.06971217	0.82	0.5040
PS*DEG	1	8.08412427	8.08412427	2.17	0.1646
CQ*DEG	1	26.37546043	26.37546043	7.08	0.0196
AGE*DEG	0	0.00000000	.	.	.
PS*CQ	1	0.23221079	0.23221079	0.06	0.8068
PS*AGE	1	55.90730603	55.90730603	15.00	0.0019
CQ*AGE	1	0.84861240	0.84861240	0.23	0.6412

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DEG	4	1 2 3 4

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: AS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	15.15106026	2.52517671	0.49	0.8145
Error	56	289.73782863	5.17388980		
Corrected Total	62	304.88888889			

R-Square	C.V.	Root MSE	AS Mean
0.049694	21.10471	2.27461860	10.77777778

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DEG	3	5.26879085	1.75626362	0.34	0.7969
PS	1	0.12667272	0.12667272	0.02	0.8762
AGE	1	9.10487674	9.10487674	1.76	0.1900
PS*AGE	1	0.65071994	0.65071994	0.13	0.7242

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DEG	4	1 2 3 4

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: AS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	38.06437435	6.34406239	1.33	0.2587
Error	56	266.82451454	4.76472347		
Corrected Total	62	304.88888889			

R-Square	C.V.	Root MSE	AS Mean
0.124847	20.25301	2.18282465	10.77777778

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DEG	3	5.26879085	1.75626362	0.37	0.7759
AGE	1	8.99353310	8.99353310	1.89	0.1750
AGE*DEG	2	23.80205040	11.90102520	2.50	0.0914

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
GEN	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63
General Linear Models Procedure

Dependent Variable: US

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	49	367.44093635	7.49879462	1.61	0.1749
Error	13	60.49557159	4.65350551		
Corrected Total	62	427.93650794			

R-Square	C.V.	Root MSE	US Mean
0.858634	23.31106	2.15719853	9.25396825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	18.38598162	18.38598162	3.95	0.0683
GEN	1	1.13185965	1.13185965	0.24	0.6301
SPEC	5	9.54216325	1.90843265	0.41	0.8334
DEG	3	16.32183628	5.44061209	1.17	0.3591
PS	1	4.08740886	4.08740886	0.88	0.3657
CQ	1	1.26881817	1.26881817	0.27	0.6103
AGE	1	3.57524903	3.57524903	0.77	0.3967
LOC*GEN	1	6.77239621	6.77239621	1.46	0.2492
LOC*SPEC	3	5.39685135	1.79895045	0.39	0.7645
LOC*DEG	2	13.06566862	6.53283431	1.40	0.2805
PS*LOC	1	0.69543319	0.69543319	0.15	0.7053
CQ*LOC	1	2.50355083	2.50355083	0.54	0.4763
AGE*LOC	1	0.42639175	0.42639175	0.09	0.7669
GEN*SPEC	4	48.35975801	12.08993950	2.60	0.0854
GEN*DEG	2	11.13098004	5.56549002	1.20	0.3336
PS*GEN	1	0.04060144	0.04060144	0.01	0.9270
CQ*GEN	1	0.15714335	0.15714335	0.03	0.8570
AGE*GEN	1	3.91262497	3.91262497	0.84	0.3759
SPEC*DEG	2	9.56078882	4.78039441	1.03	0.3853
PS*SPEC	4	22.85952486	5.71488121	1.23	0.3464
CQ*SPEC	4	36.67048775	9.16762194	1.97	0.1587
AGE*SPEC	3	37.86584492	12.62194831	2.71	0.0879
PS*DEG	1	4.11253656	4.11253656	0.88	0.3643
CQ*DEG	1	1.87961506	1.87961506	0.40	0.5361
AGE*DEG	0	0.00000000	.	.	.
PS*CQ	1	2.33245985	2.33245985	0.50	0.4915
PS*AGE	1	104.31232730	104.31232730	22.42	0.0004
CQ*AGE	1	1.07263461	1.07263461	0.23	0.6391

Stepwise Procedure for Dependent Variable US

Step 1 Variable AGE Entered R-square = 0.04585291 C(p) = 1.11420173

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	1	19.62213510	19.62213510	2.93	0.0919
Error	61	408.31437284	6.69367824		
Total	62	427.93650794			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	6.78570543	1.47801083	141.09109550	21.08	0.0001
AGE	0.06349553	0.03708536	19.62213510	2.93	0.0919

Bounds on condition number: 1, 1

All variables left in the model are significant at the 0.1500 level.
No other variable met the 0.1500 significance level for entry into the model.

Summary of Stepwise Procedure for Dependent Variable US

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	AGE		1	0.0459	0.0459	1.1142	2.9314	0.0919

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
GEN	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63
General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	49	400.94596460	8.18257071	4.29	0.0032
Error	13	24.76832111	1.90525547		
Corrected Total	62	425.71428571			

R-Square	C.V.	Root MSE	QS Mean
0.941819	17.56758	1.38030992	7.85714286

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	12.21428571	12.21428571	6.41	0.0250
GEN	1	0.00000000	0.00000000	0.00	1.0000
SPEC	5	61.54886926	12.30977385	6.46	0.0032
DEG	3	5.50017045	1.83339015	0.96	0.4398
PS	1	0.02150252	0.02150252	0.01	0.9170
CQ	1	0.20857841	0.20857841	0.11	0.7460
AGE	1	8.18955360	8.18955360	4.30	0.0586
LOC*GEN	1	0.00998953	0.00998953	0.01	0.9434
LOC*SPEC	3	2.05910950	0.68636983	0.36	0.7827
LOC*DEG	2	5.29502406	2.64751203	1.39	0.2838
PS*LOC	1	0.14827295	0.14827295	0.08	0.7847
CQ*LOC	1	17.35297822	17.35297822	9.11	0.0099
AGE*LOC	1	11.48234297	11.48234297	6.03	0.0289
GEN*SPEC	4	41.26804892	10.31701223	5.42	0.0086
GEN*DEG	2	25.36436993	12.68218496	6.66	0.0102
PS*GEN	1	8.92297204	8.92297204	4.68	0.0497
CQ*GEN	1	4.14807097	4.14807097	2.18	0.1639
AGE*GEN	1	0.14895357	0.14895357	0.08	0.7842
SPEC*DEG	2	23.49296059	11.74648030	6.17	0.0131
PS*SPEC	4	8.18961474	2.04740368	1.07	0.4084
CQ*SPEC	4	31.90123226	7.97530806	4.19	0.0215
AGE*SPEC	3	9.24354567	3.08118189	1.62	0.2335
PS*DEG	1	41.34010473	41.34010473	21.70	0.0004
CQ*DEG	1	9.47024608	9.47024608	4.97	0.0440
AGE*DEG	0	0.00000000	.	.	.
PS*CQ	1	0.12104409	0.12104409	0.06	0.8049
PS*AGE	1	29.08049030	29.08049030	15.26	0.0018
CQ*AGE	1	44.22363354	44.22363354	23.21	0.0003

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
GEN	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	33	339.95755609	10.30174412	3.48	0.0005
Error	29	85.75672962	2.95712861		
Corrected Total	62	425.71428571			

R-Square	C.V.	Root MSE	QS Mean
0.798558	21.88620	1.71963037	7.85714286

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	12.21428571	12.21428571	4.13	0.0514
GEN	1	0.00000000	0.00000000	0.00	1.0000
SPEC	5	61.54886926	12.30977385	4.16	0.0057
DEG	3	5.50017045	1.83339015	0.62	0.6077
PS	1	0.02150252	0.02150252	0.01	0.9326
CQ	1	0.20857841	0.20857841	0.07	0.7924
AGE	1	8.18955360	8.18955360	2.77	0.1068
CQ*AGE	1	76.51212329	76.51212329	25.87	0.0001
PS*AGE	1	14.18902992	14.18902992	4.80	0.0367
CQ*DEG	2	1.80293087	0.90146543	0.30	0.7396
PS*DEG	2	13.76469750	6.88234875	2.33	0.1155
CQ*SPEC	5	57.18152382	11.43630476	3.87	0.0083
SPEC*DEG	2	26.80915962	13.40457981	4.53	0.0194
PS*GEN	1	3.86350405	3.86350405	1.31	0.2624
GEN*DEG	1	17.78181240	17.78181240	6.01	0.0205
GEN*SPEC	3	7.90437324	2.63479108	0.89	0.4575
AGE*LOC	1	5.76854672	5.76854672	1.95	0.1731
CQ*LOC	1	26.69689472	26.69689472	9.03	0.0054

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
GEN	2	0 1
SPEC	6	1 2 3 4 5 6
DEG	4	1 2 3 4

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	25	278.59748052	11.14389922	2.80	0.0022
Error	37	147.11680519	3.97612987		
Corrected Total	62	425.71428571			

R-Square	C.V.	Root MSE	QS Mean
0.654424	25.37848	1.99402354	7.85714286

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	12.21428571	12.21428571	3.07	0.0879
GEN	1	0.00000000	0.00000000	0.00	1.0000
SPEC	5	61.54886926	12.30977385	3.10	0.0196
DEG	3	5.50017045	1.83339015	0.46	0.7111
PS	1	0.02150252	0.02150252	0.01	0.9418
CQ	1	0.20857841	0.20857841	0.05	0.8201
AGE	1	8.18955360	8.18955360	2.06	0.1596
CQ*AGE	1	76.51212329	76.51212329	19.24	0.0001
PS*AGE	1	14.18902992	14.18902992	3.57	0.0667
CQ*SPEC	5	54.35821050	10.87164210	2.73	0.0336
SPEC*DEG	2	8.45472063	4.22736032	1.06	0.3557
GEN*DEG	2	20.14615007	10.07307503	2.53	0.0931
CQ*LOC	1	17.25428616	17.25428616	4.34	0.0442

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
SPEC	6	1 2 3 4 5 6

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	223.80471849	14.92031457	3.47	0.0005
Error	47	201.90956723	4.29594824		
Corrected Total	62	425.71428571			

R-Square	C.V.	Root MSE	QS Mean
0.525716	26.37940	2.07266694	7.85714286

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	12.21428571	12.21428571	2.84	0.0984
SPEC	5	58.62741158	11.72548232	2.73	0.0303
CQ	1	0.00683426	0.00683426	0.00	0.9684
AGE	1	9.93508720	9.93508720	2.31	0.1350
CQ*AGE	1	75.49523577	75.49523577	17.57	0.0001
CQ*SPEC	5	46.90660584	9.38132117	2.18	0.0718
CQ*LOC	1	20.61925813	20.61925813	4.80	0.0335

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
SPEC	6	1 2 3 4 5 6

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	174.93949476	17.49394948	3.63	0.0010
Error	52	250.77479096	4.82259213		
Corrected Total	62	425.71428571			

R-Square	C.V.	Root MSE	QS Mean
0.410932	27.94960	2.19604010	7.85714286

Source	DF	Type I SS	Mean Square	F Value	Pr > F
LOC	1	12.21428571	12.21428571	2.53	0.1176
SPEC	5	58.62741158	11.72548232	2.43	0.0470
CQ	1	0.00683426	0.00683426	0.00	0.9701
AGE	1	9.93508720	9.93508720	2.06	0.1572
CQ*AGE	1	75.49523577	75.49523577	15.65	0.0002
CQ*LOC	1	18.66064023	18.66064023	3.87	0.0545

General Linear Models Procedure
Class Level Information

Class	Levels	Values
SPEC	6	1 2 3 4 5 6

Number of observations in data set = 63

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	143.86949740	17.98368717	3.45	0.0028
Error	54	281.84478832	5.21934793		
Corrected Total	62	425.71428571			

R-Square	C.V.	Root MSE	QS Mean
0.337948	29.07659	2.28458923	7.85714286

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CQ	1	0.10413176	0.10413176	0.02	0.8882
AGE	1	3.62222244	3.62222244	0.69	0.4085
SPEC	5	68.67966360	13.73593272	2.63	0.0335
CQ*AGE	1	71.46347960	71.46347960	13.69	0.0005

***Note: TS = Timeliness Composite Score; AS = Accuracy Composite Score; US = Usefulness Composite Score; and QS = Quantity Composite Score; Each represent the dependent variable for their respective inferential statistical test.**

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1
SCC	2	0 1
SE	2	0 1
SEC	3	0 1 2

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	82	1282.77876166	15.64364343	1.43	0.0293
Error	159	1744.89065983	10.97415509		
Corrected Total	241	3027.66942149			

R-Square	C.V.	Root MSE	TS Mean
0.423685	20.44059	3.31272623	16.20661157

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WC	4	47.79108535	11.94777134	1.09	0.3640
BCAT	3	51.44678855	17.14893285	1.56	0.2006
LOC	1	4.72651161	4.72651161	0.43	0.5126
GEN	1	141.11660444	141.11660444	12.86	0.0004
SCC	1	6.07279379	6.07279379	0.55	0.4580
SE	1	55.15928476	55.15928476	5.03	0.0263
SEC	2	44.10825767	22.05412883	2.01	0.1374
WC*BCAT	10	84.98581091	8.49858109	0.77	0.6533
WC*LOC	4	53.82275334	13.45568833	1.23	0.3019
WC*GEN	4	67.41360899	16.85340225	1.54	0.1944
WC*SCC	4	13.79922196	3.44980549	0.31	0.8681
LOC*BCAT	3	49.56110111	16.52036704	1.51	0.2152
LOC*GEN	1	0.23914607	0.23914607	0.02	0.8828
LOC*SCC	1	23.53042784	23.53042784	2.14	0.1451
BCAT*GEN	3	76.31929698	25.43976566	2.32	0.0776
BCAT*SCC	2	9.14384394	4.57192197	0.42	0.6600
GEN*SCC	1	3.37508263	3.37508263	0.31	0.5800

WC*SE	4	63.14785934	15.78696484	1.44	0.2237
WC*SEC	7	73.90208646	10.55744092	0.96	0.4609
LOC*SE	1	6.29131451	6.29131451	0.57	0.4501
LOC*SEC	2	22.34453188	11.17226594	1.02	0.3636
GEN*SE	1	26.66590819	26.66590819	2.43	0.1210
GEN*SEC	2	49.58521079	24.79260539	2.26	0.1078
SCC*SE	1	4.48753180	4.48753180	0.41	0.5234
SCC*SEC	2	11.16089755	5.58044878	0.51	0.6024
SE*SEC	2	53.56728618	26.78364309	2.44	0.0904
AGE*WC	5	110.70640789	22.14128158	2.02	0.0789
AGE*LOC	1	2.26894425	2.26894425	0.21	0.6499
AGE*BCAT	3	75.48608218	25.16202739	2.29	0.0801
AGE*GEN	1	9.26992578	9.26992578	0.84	0.3594
AGE*SCC	1	4.68989118	4.68989118	0.43	0.5142
AGE*SE	1	12.02409499	12.02409499	1.10	0.2968
AGE*SEC	2	24.56915874	12.28457937	1.12	0.3290
AGE	0	0.00000000	.	.	.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GEN	2	0 1
SE	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	223.06481571	111.53240785	9.50	0.0001
Error	239	2804.60460578	11.73474730		
Corrected Total	241	3027.66942149			

R-Square	C.V.	Root MSE	TS Mean
0.073675	21.13706	3.42560174	16.20661157

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GEN	1	182.59409681	182.59409681	15.56	0.0001
SE	1	40.47071890	40.47071890	3.45	0.0545

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GEN	2	0 1
SE	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: TS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	223.06481571	111.53240785	9.50	0.0001
Error	239	2804.60460578	11.73474730		
Corrected Total	241	3027.66942149			

R-Square	C.V.	Root MSE	TS Mean
0.073675	21.13706	3.42560174	16.20661157

Source	DF	Type I SS	Mean Square	F Value	Pr > F
SE	1	52.77019668	52.77019668	4.50	0.0350
GEN	1	170.29461903	170.29461903	14.51	0.0002

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1
SCC	2	0 1
SE	2	0 1
SEC	3	0 1 2

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: AS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	82	1433.08239644	17.47661459	1.43	0.0279
Error	159	1941.36801678	12.20986174		
Corrected Total	241	3374.45041322			

R-Square	C.V.	Root MSE	AS Mean
0.424686	20.89477	3.49426126	16.72314050

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WC	4	80.86960602	20.21740150	1.66	0.1629
BCAT	3	105.41211653	35.13737218	2.88	0.0379
LOC	1	2.53192876	2.53192876	0.21	0.6495
GEN	1	49.12259206	49.12259206	4.02	0.0466
SCC	1	19.69786263	19.69786263	1.61	0.2059
SE	1	46.82863763	46.82863763	3.84	0.0519
SEC	2	11.54263633	5.77131817	0.47	0.6242
WC*BCAT	10	142.42647381	14.24264738	1.17	0.3173
WC*LOC	4	29.73932567	7.43483142	0.61	0.6568
WC*GEN	4	57.77805186	14.44451297	1.18	0.3204
WC*SCC	4	78.00962254	19.50240564	1.60	0.1776
LOC*BCAT	3	112.92168204	37.64056068	3.08	0.0291
LOC*GEN	1	1.07839909	1.07839909	0.09	0.7667

LOC*SCC	1	58.85366772	58.85366772	4.82	0.0296
BCAT*GEN	3	18.18897961	6.06299327	0.50	0.6852
BCAT*SCC	2	10.29399463	5.14699732	0.42	0.6568
GEN*SCC	1	5.73360492	5.73360492	0.47	0.4942
WC*SE	4	53.60771431	13.40192858	1.10	0.3597
WC*SEC	7	133.65754730	19.09393533	1.56	0.1499
LOC*SE	1	8.35444124	8.35444124	0.68	0.4094
LOC*SEC	2	32.68404245	16.34202122	1.34	0.2652
GEN*SE	1	24.68284032	24.68284032	2.02	0.1570
GEN*SEC	2	37.72556902	18.86278451	1.54	0.2165
SCC*SE	1	27.69496023	27.69496023	2.27	0.1340
SCC*SEC	2	5.04864565	2.52432282	0.21	0.8134
SE*SEC	2	43.00025792	21.50012896	1.76	0.1752
AGE	1	42.83059113	42.83059113	3.51	0.0629
AGE*WC	4	86.09722172	21.52430543	1.76	0.1389
AGE*LOC	1	3.53906558	3.53906558	0.29	0.5911
AGE*BCAT	3	53.82682116	17.94227372	1.47	0.2249
AGE*GEN	1	15.20121969	15.20121969	1.24	0.2662
AGE*SCC	1	2.89320041	2.89320041	0.24	0.6271
AGE*SE	1	1.56057811	1.56057811	0.13	0.7212
AGE*SEC	2	29.64849796	14.82424898	1.21	0.2997

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1
SCC	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: AS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	331.86045256	33.18604526	2.52	0.0068
Error	231	3042.58996066	13.17138511		
Corrected Total	241	3374.45041322			

R-Square	C.V.	Root MSE	AS Mean
0.098345	21.70191	3.62924029	16.72314050

Source	DF	Type I SS	Mean Square	F Value	Pr > F
BCAT	3	92.24308213	30.74769404	2.33	0.0747
LOC	1	5.26260207	5.26260207	0.40	0.5279
GEN	1	62.79337123	62.79337123	4.77	0.0300
SCC	1	21.27093610	21.27093610	1.61	0.2051
LOC*BCAT	3	110.85413541	36.95137847	2.81	0.0405
LOC*SCC	1	39.43632563	39.43632563	2.99	0.0849

General Linear Models Procedure
Class Level Information

Class	Levels	Values
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: AS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	276.05715247	34.50714406	2.59	0.0098
Error	233	3098.39326075	13.29782515		
Corrected Total	241	3374.45041322			

R-Square	C.V.	Root MSE	AS Mean
0.081808	21.80582	3.64661832	16.72314050

Source	DF	Type I SS	Mean Square	F Value	Pr > F
BCAT	3	92.24308213	30.74769404	2.31	0.0768
LOC	1	5.26260207	5.26260207	0.40	0.5299
GEN	1	62.79337123	62.79337123	4.72	0.0308
LOC*BCAT	3	115.75809704	38.58603235	2.90	0.0357

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1
SCC	2	0 1
SE	2	0 1
SEC	3	0 1 2

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: US

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	82	1609.95212600	19.63356251	1.69	0.0025
Error	159	1846.72555995	11.61462616		
Corrected Total	241	3456.67768595			

R-Square	C.V.	Root MSE	US Mean
0.465751	20.54663	3.40802379	16.58677686

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WC	4	79.47862660	19.86965665	1.71	0.1502
BCAT	3	53.23896648	17.74632216	1.53	0.2094
LOC	1	0.45772056	0.45772056	0.04	0.8429
GEN	1	96.00229268	96.00229268	8.27	0.0046
SCC	1	7.99079226	7.99079226	0.69	0.4081
SE	1	45.35285695	45.35285695	3.90	0.0509
SEC	2	31.00206184	15.50103092	1.33	0.2662
WC*BCAT	10	215.92099056	21.59209906	1.86	0.0547
WC*LOC	4	58.14583410	14.53645852	1.25	0.2914
WC*GEN	4	42.43371994	10.60842999	0.91	0.4577
WC*SCC	4	69.55989627	17.38997407	1.50	0.2055
LOC*BCAT	3	71.69580431	23.89860144	2.06	0.1080

LOC*GEN	1	0.09351043	0.09351043	0.01	0.9286
LOC*SCC	1	17.88916213	17.88916213	1.54	0.2164
BCAT*GEN	3	42.83134972	14.27711657	1.23	0.3010
BCAT*SCC	2	16.30112819	8.15056409	0.70	0.4972
GEN*SCC	1	5.55288491	5.55288491	0.48	0.4903
WC*SE	4	40.15228346	10.03807086	0.86	0.4868
WC*SEC	7	108.05672997	15.43667571	1.33	0.2398
LOC*SE	1	33.49486031	33.49486031	2.88	0.0914
LOC*SEC	2	22.29864046	11.14932023	0.96	0.3851
GEN*SE	1	32.01284139	32.01284139	2.76	0.0988
GEN*SEC	2	84.08791392	42.04395696	3.62	0.0290
SCC*SE	1	16.71549528	16.71549528	1.44	0.2321
SCC*SEC	2	9.90117012	4.95058506	0.43	0.6537
SE*SEC	2	67.50433746	33.75216873	2.91	0.0576
AGE	1	76.49967967	76.49967967	6.59	0.0112
AGE*WC	4	85.06566850	21.26641713	1.83	0.1254
AGE*LOC	1	0.54569218	0.54569218	0.05	0.8287
AGE*BCAT	3	93.63634963	31.21211654	2.69	0.0484
AGE*GEN	1	6.70633152	6.70633152	0.58	0.4485
AGE*SCC	1	3.28666471	3.28666471	0.28	0.5955
AGE*SE	1	21.51469670	21.51469670	1.85	0.1754
AGE*SEC	2	54.52517280	27.26258640	2.35	0.0989

General Linear Models Procedure
Class Level Information

Class	Levels	Values
BCAT	4	0 1 2 3
GEN	2	0 1
SE	2	0 1
SEC	3	0 1 2

Number of observations in data set = 24
General Linear Models Procedure

Dependent Variable: US

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	12	421.51653948	35.12637829	2.65	0.0024
Error	229	3035.16114647	13.25397881		
Corrected Total	241	3456.67768595			

R-Square	C.V.	Root MSE	US Mean
0.121943	21.94882	3.64060143	16.58677686

Source	DF	Type I SS	Mean Square	F Value	Pr > F
BCAT	3	42.93487396	14.31162465	1.08	0.3584
GEN	1	116.74340448	116.74340448	8.81	0.0033
SEC	2	31.12662537	15.56331269	1.17	0.3109
GEN*SEC	2	71.57923676	35.78961838	2.70	0.0693
AGE	1	64.82071550	64.82071550	4.89	0.0280
AGE*BCAT	3	94.31168341	31.43722780	2.37	0.0712

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GEN	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: US

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	112.88871630	56.44435815	4.03	0.0189
Error	239	3343.78896965	13.99074883		
Corrected Total	241	3456.67768595			

R-Square	C.V.	Root MSE	US Mean
0.032658	22.55062	3.74042094	16.58677686

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GEN	1	110.54608422	110.54608422	7.90	0.0053
AGE	1	2.34263208	2.34263208	0.17	0.6828

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GEN	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: US

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	112.88871630	56.44435815	4.03	0.0189
Error	239	3343.78896965	13.99074883		
Corrected Total	241	3456.67768595			

R-Square	C.V.	Root MSE	US Mean
0.032658	22.55062	3.74042094	16.58677686

Source	DF	Type I SS	Mean Square	F Value	Pr > F
AGE	1	1.53734813	1.53734813	0.11	0.7406
GEN	1	111.35136817	111.35136817	7.96	0.0052

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1
SCC	2	0 1
SE	2	0 1
SEC	3	0 1 2

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	82	958.23365722	11.68577631	0.89	0.7111
Error	159	2078.04733452	13.06948009		
Corrected Total	241	3036.28099174			

R-Square	C.V.	Root MSE	QS Mean
0.315595	40.72961	3.61517359	8.87603306

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WC	4	18.03904698	4.50976175	0.35	0.8472
BCAT	3	56.81332744	18.93777581	1.45	0.2306
LOC	1	0.57439364	0.57439364	0.04	0.8342
GEN	1	53.46709117	53.46709117	4.09	0.0448
SCC	1	0.43570897	0.43570897	0.03	0.8554
SE	1	3.27912612	3.27912612	0.25	0.6171
SEC	2	50.24506432	25.12253216	1.92	0.1497
WC*BCAT	10	75.10951275	7.51095127	0.57	0.8329
WC*LOC	4	55.61094849	13.90273712	1.06	0.3764
WC*GEN	4	9.61837154	2.40459288	0.18	0.9465
WC*SCC	4	45.77416904	11.44354226	0.88	0.4800

LOC*BCAT	3	42.92355559	14.30785186	1.09	0.3531
LOC*GEN	1	12.89874368	12.89874368	0.99	0.3220
LOC*SCC	1	12.24389768	12.24389768	0.94	0.3346
BCAT*GEN	3	27.60479013	9.20159671	0.70	0.5509
BCAT*SCC	2	13.26884923	6.63442461	0.51	0.6029
GEN*SCC	1	0.92494075	0.92494075	0.07	0.7906
WC*SE	4	33.08142689	8.27035672	0.63	0.6398
WC*SEC	7	36.83314312	5.26187759	0.40	0.8996
LOC*SE	1	14.35258330	14.35258330	1.10	0.2963
LOC*SEC	2	14.44464554	7.22232277	0.55	0.5765
GEN*SE	1	0.59209425	0.59209425	0.05	0.8317
GEN*SEC	2	6.01530947	3.00765473	0.23	0.7947
SCC*SE	1	7.31688925	7.31688925	0.56	0.4554
SCC*SEC	2	68.67559159	34.33779579	2.63	0.0754
SE*SEC	2	2.51511215	1.25755607	0.10	0.9083
AGE	1	6.10245653	6.10245653	0.47	0.4954
AGE*WC	4	139.01451257	34.75362814	2.66	0.0348
AGE*LOC	1	36.51090677	36.51090677	2.79	0.0966
AGE*BCAT	3	24.94683882	8.31561294	0.64	0.5927
AGE*GEN	1	24.75786328	24.75786328	1.89	0.1706
AGE*SCC	1	0.02804344	0.02804344	0.00	0.9631
AGE*SE	1	35.95796375	35.95796375	2.75	0.0991
AGE*SEC	2	28.25673902	14.12836951	1.08	0.3417

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
GEN	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	97.03386268	9.70338627	0.76	0.6647
Error	231	2939.24712905	12.72401355		
Corrected Total	241	3036.28099174			

R-Square	C.V.	Root MSE	QS Mean
0.031958	40.18770	3.56707353	8.87603306

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WC	4	18.03904698	4.50976175	0.35	0.8408
GEN	1	18.99358408	18.99358408	1.49	0.2230
AGE	1	43.57855967	43.57855967	3.42	0.0655
AGE*WC	4	16.42267195	4.10566799	0.32	0.8626

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
GEN	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: QS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	97.03386268	9.70338627	0.76	0.6647
Error	231	2939.24712905	12.72401355		
Corrected Total	241	3036.28099174			

R-Square	C.V.	Root MSE	QS Mean
0.031958	40.18770	3.56707353	8.87603306

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GEN	1	12.42990948	12.42990948	0.98	0.3240
WC	4	24.60272157	6.15068039	0.48	0.7479
AGE	1	43.57855967	43.57855967	3.42	0.0655
AGE*WC	4	16.42267195	4.10566799	0.32	0.8626

General Linear Models Procedure
Class Level Information

Class	Levels	Values
WC	5	1 2 3 4 5
LOC	2	0 1
BCAT	4	0 1 2 3
GEN	2	0 1
SCC	2	0 1
SE	2	0 1
SEC	3	0 1 2

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: Composite Score [(T+A+U) - Q]

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	82	13902.13893328	169.53827967	1.44	0.0268
Error	159	18773.58420722	118.07285665		
Corrected Total	241	32675.72314050			

R-Square	C.V.	Root MSE	CS Mean
0.425458	26.73721	10.86613347	40.64049587

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WC	4	560.45821702	140.11455425	1.19	0.3188
BCAT	3	496.70633741	165.56877914	1.40	0.2442
LOC	1	13.57127109	13.57127109	0.11	0.7350
GEN	1	1295.87022688	1295.87022688	10.98	0.0011
SCC	1	82.25125437	82.25125437	0.70	0.4052
SE	1	520.54082228	520.54082228	4.41	0.0373
SEC	2	451.41514739	225.70757370	1.91	0.1512
WC*BCAT	10	1510.68415590	151.06841559	1.28	0.2462
WC*LOC	4	691.72066452	172.93016613	1.46	0.2155
WC*GEN	4	577.00322376	144.25080594	1.22	0.3038
WC*SCC	4	285.32582537	71.33145634	0.60	0.6602
LOC*BCAT	3	860.18930940	286.72976980	2.43	0.0674

LOC*GEN	1	11.20804957	11.20804957	0.09	0.7584
LOC*SCC	1	175.63834234	175.63834234	1.49	0.2244
BCAT*GEN	3	584.81400891	194.93800297	1.65	0.1798
BCAT*SCC	2	45.92527990	22.96263995	0.19	0.8235
GEN*SCC	1	31.65583807	31.65583807	0.27	0.6053
WC*SE	4	408.64185918	102.16046479	0.87	0.4863
WC*SEC	7	1067.66258269	152.52322610	1.29	0.2576
LOC*SE	1	54.72520202	54.72520202	0.46	0.4970
LOC*SEC	2	212.86176635	106.43088318	0.90	0.4081
GEN*SE	1	274.21879313	274.21879313	2.32	0.1295
GEN*SEC	2	506.46249665	253.23124833	2.14	0.1205
SCC*SE	1	76.81582123	76.81582123	0.65	0.4211
SCC*SEC	2	93.86139051	46.93069525	0.40	0.6727
SE*SEC	2	541.23815085	270.61907543	2.29	0.1044
AGE*WC	5	1185.60832252	237.12166450	2.01	0.0803
AGE*LOC	1	3.67172208	3.67172208	0.03	0.8602
AGE*BCAT	3	667.89468075	222.63156025	1.89	0.1342
AGE*GEN	1	210.50862746	210.50862746	1.78	0.1837
AGE*SCC	1	1.39424072	1.39424072	0.01	0.9136
AGE*SE	1	235.67464411	235.67464411	2.00	0.1597
AGE*SEC	2	165.92065882	82.96032941	0.70	0.4968
AGE	0	0.00000000	.	.	.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GEN	2	0 1
SE	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

Dependent Variable: CS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1795.90493560	897.95246780	6.95	0.0012
Error	239	30879.81820489	129.20426027		
Corrected Total	241	32675.72314050			

R-Square	C.V.	Root MSE	CS Mean
0.054961	27.96916	11.36680519	40.64048587

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GEN	1	1350.95950413	1350.95950413	10.46	0.0014
SE	1	444.94543147	444.94543147	3.44	0.0507

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GEN	2	0 1
SE	2	0 1

Number of observations in data set = 242

General Linear Models Procedure

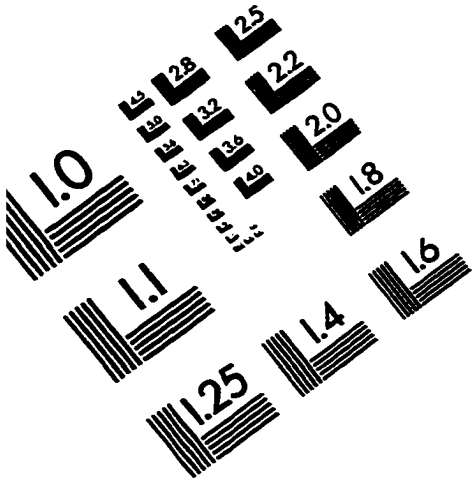
Dependent Variable: CS

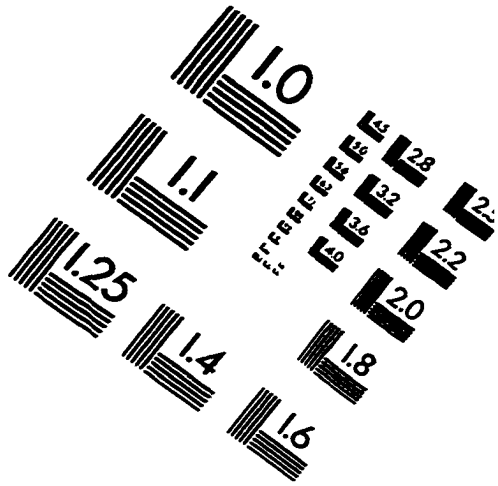
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1795.90493560	897.95246780	6.95	0.0012
Error	239	30879.81820489	129.20426027		
Corrected Total	241	32675.72314050			

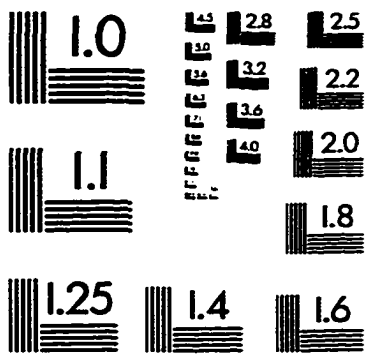
R-Square	C.V.	Root MSE	CS Mean
0.054961	27.96916	11.36680519	40.64049587

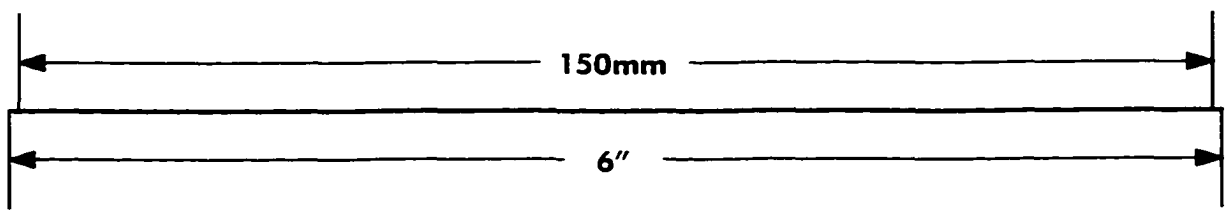
Source	DF	Type I SS	Mean Square	F Value	Pr > F
SE	1	554.14312327	554.14312327	4.29	0.0394
GEN	1	1241.76181233	1241.76181233	9.61	0.0022

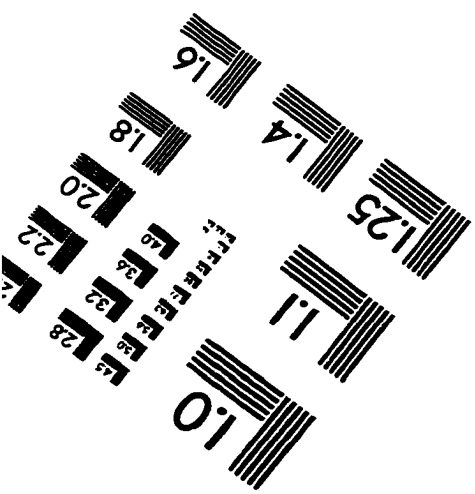
IMAGE EVALUATION TEST TARGET (QA-3)

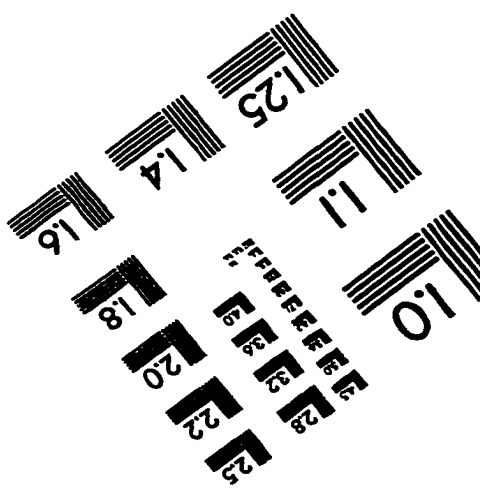












APPLIED IMAGE, Inc
1653 East Main Street
Rochester, NY 14609 USA
Phone: 716/482-0300
Fax: 716/288-5989

© 1993, Applied Image, Inc., All Rights Reserved