Minimizing Error, Maximizing Outcome (MEMO): Physician Worklife Study II

Mark Linzer, MD, Principal Investigator (University of Wisconsin-Madison)

Mark Schwartz, MD, Co-Principal Investigator (New York University, NYC)

Linda Baier Manwell, MS, Project Director (University of Wisconsin-Madison)

for the MEMO Investigators:

Deborah Dowell, Joseph Rabatin, Perry An, and Karla Felix, New York University, NY, NY; Julia McMurray, James Bobula, Marlon Mundt, Jessica Sherrieb, Jessica Grettie, William Scheckler, and John Frey, University of Wisconsin, Madison; Laura Paluch, Aurora Sinai Medical Center, Milwaukee, WI; Barbara Horner Ibler, University of Wisconsin, Milwaukee; Elianne Riska, Helsinki University, Finland; Bernice Man and Anita Varkey, Rush University, Chicago IL; Elizabeth Arce, Cook County Hospital, Chicago, IL; JudyAnn Bigby, Brigham & Women's Hospital, Boston, MA; Thomas R. Konrad and Peggy Leatt, University of North Carolina, Chapel Hill; Stewart Babbott, Baystate Medical Center, Springfield, MA; Eric Williams, University of Alabama, Tuscaloosa, AL

University of Wisconsin-Madison
Madison, Wisconsin

September 30, 2003 – March 30, 2005

Ronda Hughes, AHRQ Program Official

Supported by the Agency for Healthcare Research and Quality

Grant Award Number 5 R01 HS011955

Table of Contents

1. Structured Abstract

Purpose: MEMO (Minimizing Error, Maximizing Output) examines the impact of work conditions on physician stress and on quality of care and medical errors.

Scope: MEMO is a longitudinal study of 420 generalist physicians and 2000 patients from New York, Chicago, Milwaukee, Madison, and rural Wisconsin. All patients have hypertension, diabetes, and/or congestive heart failure.

Methods: Physicians completed baseline and 12-month questionnaires on satisfaction, health, organizational climate, past errors, and likelihood of future error. Managers provided data on clinic structure. Researchers collected data on clinic facilities and services. Patient questionnaires queried quality of life, medication use, health literacy, satisfaction, and trust. Charts were audited for care quality and errors.

Results: Sixty-one percent of physicians are stressed, 27% are burning out, and 31% may leave within 2 years. Forty-eight percent of offices are chaotic. Chaotic practices have more Medicaid and minority patients and predict MD dissatisfaction and poorer mental health. Organizational climate domains include leadership values, quality emphasis, trust, information, and cohesiveness. Lack of quality emphasis is linked to past errors. Low information emphasis predicts likelihood of future error. Female physicians see more complex patients and report more stress and burnout and fewer shared values with administration. Minority physicians have more complex patients and less value concordance but are similar to non-minority MDs in satisfaction, stress, and burnout. Lower perceived leadership integrity is linked to stress, burnout, and intent to leave. MEMO establishes the primacy of the work environment in affecting physicians' abilities to carry out their roles. Patient impact is being quantified.

MeSH Key words:
Physicians
Burnout, Professional
Stress
Workplace
Job Satisfaction
Female
Women
Minority Groups
Quality of Health Care
Outcome Assessment (Health Care)
Medical Errors
Organizational Culture

2. Purpose

MEMO (Minimizing Error, Maximizing Outcome) is a longitudinal, observational study of physicians and their patients in five clinical sites: New York City, Chicago, Milwaukee, Madison, and rural Wisconsin. MEMO will determine the effect of the work environment on quality of care and the role of physicians as mediators of this effect. Specific aims are:

1. Determine the relationship between workplace conditions, physician reactions to these conditions, and patient outcomes, including medical errors.
2. Develop an instrument to predict the likelihood of error in relation to job stress (the Occupational Stress and Preventable Error measure, or OSPRE).
3. Identify the best physician practices with low error rates and the best outcomes.
4. Examine these issues for physicians who are under-represented minorities, who are women, and who work in rural and inner city areas.

3. Scope

Background

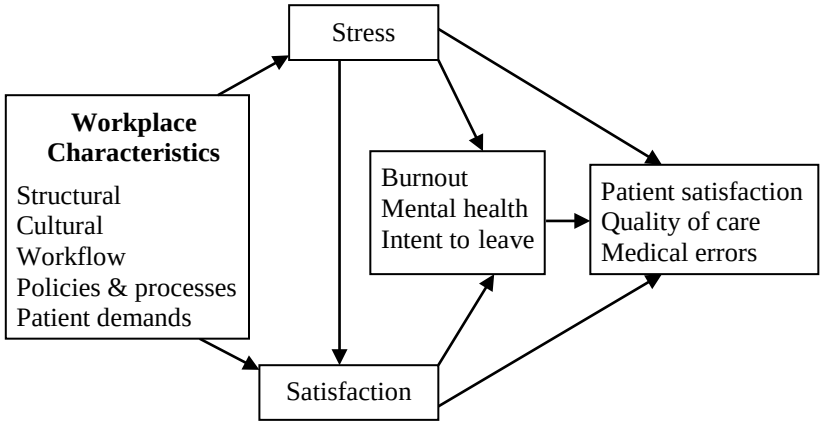
Profound changes in the structure of the U.S. healthcare system have led to increasingly vocal requests on the part of patients, third-party payers, and doctors to examine the quality of healthcare received by Americans. Our previous project, the Physician Worklife Study (PWS), uncovered serious challenges for U.S. physicians, including time pressure during office visits; substantial levels of stress and burnout; and marked gender differences in worklife, control of the work place, and burnout (Linzer, et al, 2000a, 2000b, 2001b; McMurray, et al, 2000; Williams, et al, 2001, 2002). However, the relationship between physicians under stress and the health of their patients remains unknown.

In 2000, an Institute of Medicine report catapulted patient safety into the public consciousness. Healthcare agencies began to focus on improving patient safety and reducing medical errors. Although a substantial body of literature indicated that stress can lead to errors (Leape, 1994), little attention had been directed at evaluating how workplace conditions that exacerbate physician stress could produce medical mistakes. MEMO took the next logical step to investigate the cultures of work and error, how these impact physicians, and how they ultimately affect patient health.

Context

The context is framed by six hypotheses:

1. Physicians who believe they have insufficient time with their patients will provide lower-quality care and commit more errors than physicians with adequate time.
2. High physician stress and burnout will lead to higher error rates and lower-quality care.



Conceptual Model

3. Physicians who perceive more work control not only will be more satisfied but also will provide higher-quality care and make fewer mistakes than physicians with low work control.
4. Practices that nurture professionalism in their physicians will provide higher-quality care than practices that do not support professionalism.
5. Practice cultures that are more relational will make errors more visible and will thus result in improved quality.
6. Organizations that support work-family balance will result in lower physician stress, higher physician and patient satisfaction, lower error rates, and improved patient health.

Settings

The MEMO investigators recruited outpatient primary care practices from five regions: Bellevue-Gouverneur Lower East Side clinics in New York City; Cook County Ambulatory Community Health Network clinics in Illinois; academic and managed care clinics in Milwaukee and Madison, Wisconsin; and small/rural clinics in central Wisconsin. These areas and clinics were selected because 1) they have a diverse patient base; 2) they feature a wide range of payers, including commercial fee-for service plans, managed care plans, Medicare, Medicaid, and significant numbers of indigent or uninsured patients; and 3) a local MD could be identified as a Site Director to facilitate the research process.

Participants

Phase 1 began with focus group sessions of primary care physicians (n=32), other clinic personnel (n=9), and patients (n=21) in the five regions. The second half of Phase 1 entailed clinic recruitment. Overall, 102 ambulatory care practices were recruited:

- 2 large inner city clinics in New York City
- 23 suburban managed care and academic clinics in the Madison, Wisconsin, area
- 33 mid-size inner city, managed care, and academic clinics in the Milwaukee area
- 33 rural or smaller clinics in central Wisconsin
- 11 mid-sized inner city clinics in Cook County, Illinois

During Phase 2, general internists and family practitioners from participating clinics were recruited. A total of 420 (61% of those approached) consented and completed a baseline survey. Eighty-five percent of these completed the 12-month follow-up survey. Both surveys queried health and workplace characteristics. The manager of each clinic completed a survey on organizational processes. Up to six patients per participating physician completed a survey concerning their satisfaction with healthcare and quality of life (n=2000). Only patients with at least one of three tracer conditions were invited: diabetes, hypertension, or congestive heart failure.

Prevalence

We studied physician stress in a prior project, the Physician Worklife Study or PWS (Linzer et al, 2002a). The PWS surveyed a stratified random sample of 5704 primary care and subspecialty physicians across the U.S. Stress was measured by a four-item stress scale adapted from Cohen et al (1983). The results showed a mean stress score of 2.4 on a scale of 1-5 (1=no stress, 5=high stress), with 22% of the sample scoring a 3 or higher.

A second study assessed physician burnout in two countries by comparing data from the PWS and a Dutch study of physician worklife, the Dutch Study of Motivation Among Medical Consultants (Visser et al, 2003).

Results indicated that burnout was prevalent -- 22% in the U.S. sample and 11-20% in the Dutch sample. Burnout was predicted by similar variables in both countries, most importantly by stress, work-home interference, and lack of work control (Linzer et al, 2001a). Gender comparisons of respondents from both studies indicated that U.S. women experienced more burnout than U.S. men (28% vs. 21%, $p<.01$); however, the sex difference among Dutch physicians, of whom 79% of women MDs were part-time, was not significant. The investigators concluded that "gender parity in physician burnout in the Netherlands may be due to fewer work hours and greater work control of women compared to those in the United States" (Linzer et al, 2002).

4. Methods

Study design

During the initial 6-month qualitative phase, focus group sessions with physicians, other clinic personnel, and patients elicited information regarding the successes and challenges of their day-to-day healthcare experiences. This information was utilized to develop self-administered surveys for the second phase, a 2-year prospective evaluation of physicians, patients, and their outcomes. Physicians were surveyed at baseline and at 12 months regarding stress, satisfaction, professionalism, burnout, and the structure and culture of their practice organizations. A clinic manager survey gathered data regarding organization processes and clinic management. Onsite observations by researchers assessed clinic facilities and services. Up to six patients per physician with one of three tracer conditions (diabetes, hypertension, or congestive heart failure) completed a survey concerning their satisfaction with healthcare and quality of life. Medical errors in treatment and diagnosis were assessed via chart review (see page 9 for discussion of errors). Data analyses to develop a "best practice index" will determine the characteristics associated with low error rates and the best physician health outcomes. Dissemination activities include preparation of manuscripts for publication, a nontechnical monograph, and presentations at national primary care meetings using the "Knowledge Café" method.

Data sources/collection

Phase 1 - Focus groups were held at each of the five regions. The moderators used a standardized question guide centered on features of good care. Each focus group session was audiotaped, and the tapes were transcribed. Several members of the research team independently read the transcripts and, via multiple telephone conferences, reached consensus on major themes. Two coders then independently assigned each transcript statement to one of the themes. To date, two papers have resulted from these data (Dowell et al, 2005; Williams et al, in review). The focus group information was utilized to develop surveys for the next phase of the study.

Phase 2 - Primary care physicians from the participating clinics completed a self-administered baseline survey querying stress, satisfaction, mental health, organizational climate (OC), past errors, and likelihood of future error. These same physicians were asked to complete a 12-month follow-up survey querying work control, job satisfaction, burnout, perceived leadership integrity, past error, and likelihood of making future errors.

Managers from each participating clinic provided data on office structure and procedures. An onsite observation of each clinic was performed by a MEMO researcher to gather information on

clinic attributes, including safety, cleanliness, comfort, educational materials, transportation, and atmosphere. Patients of participating physicians were asked to complete a survey, querying 1) satisfaction and trust with their physician and clinic; 2) quality of life; 3) disease symptoms and medication use; 4) medical literacy; and 5) sociodemographic variables. Medical errors in patient treatment and diagnosis were assessed via medical chart review by MEMO researchers at the conclusion of phase 2.

Measures

The two physician surveys were derived in part from our Physician Worklife Study instrument (Williams et al, 1999; Konrad et al, 1999) and from the MEMO focus group comments. The surveys include our five-item global job satisfaction measure and a newly utilized four-item job stress measure (Motowidlo et al, 1986). We queried burnout with a single-item measure from Freeborn (2001) as well as intent to leave the practice. Single questions regarding workplace emphasis on work-home balance, professionalism, and diversity in office staff, and single items concerning access to resources, interpreters, and referrals, were also included in the survey. Control of the work environment was measured with a 13-item scale used in the Physician Worklife Study. This scale had clusters of items that correlated strongly with overall life stress (Linzer et al, 2000). Scores were normed to a scale from 0-100.

The physicians reported the likelihood of making future errors with a new nine-item scale, querying errors in the management of common chronic medical conditions. Entitled the "Occupational Stress and PReventable Error" measure, or OSPRE, this scale includes questions such as "How likely is it over the next month you will overlook a diagnosis of hypertension in a patient with 2-3 elevated blood pressures?" (scored from "very unlikely" to "very likely"). In addition, physicians were asked to assess the frequency of errors or shortcomings over the past year in five areas: incomplete discussion of treatment, medication errors, lack of attention to illness impact, minimal reaction to a patient's death, and guilt about lack of a humanitarian perspective (scored from "never" to "weekly").

We determined the pace of the office environment using a five-point scale, ranging from calm to hectic or chaotic. Mental health was determined using the 12-item General Health Questionnaire (GHQ-12, Goldberg and Williams 1988), wherein physicians were asked about sadness, self-esteem, ability to concentrate, worry, and strain. A score of 4 or higher was considered a positive screen for mental health issues. Organizational climate was measured at baseline with a scale adapted from Kralewski (1996), who developed the scale for use in physician offices. Kralewski described nine domains of organizational culture: collegiality, cohesiveness, organizational trust, quality emphasis, information emphasis, organizational identity, business emphasis, innovativeness, and autonomy. We tested six domains pertinent to the current study: collegiality, cohesiveness, organizational trust, quality emphasis, information emphasis, and organizational identity.

The Organization Survey, completed by the manager of each participating clinic, captured data from three broad areas: practice information (e.g., staffing ratios, patient mix), organizational processes (e.g., electronic medical records, bottlenecks), and clinic management. The questions were generated from the physician investigators' personal healthcare experience and comments from the focus groups.

"Scenes from the Office" was developed for the MEMO project based on our focus group findings regarding the potential contribution of a hectic office environment to adverse patient outcomes. This onsite assessment of clinic services and environment was completed by MEMO researchers using a standardized checklist.

Much of the patient survey was based on comments elicited from the focus groups. The first section queried satisfaction with overall healthcare and the most recent clinic visit. Section 2 comprised quality of life questions from the SF-12 (Ware, 1995) and depression and anxiety screening questions from the Patient Health Questionnaire (Pfizer, 1999). The next two sections collected information about disease-specific limitations and use of medications. Three medical literacy questions were included in the sixth section, and the seventh asked about trust in the physician. The final section was designed to collect patient sociodemographic information.

The medical record audit form was comprised of six sections. The first queried patient sociodemographics, and the second collected data on chronic problems, current medications, and medication allergies. The third section focused on medical management of our three target conditions: hypertension, diabetes, and congestive heart failure. Preventive activities, such as cancer, lipid, alcohol, and tobacco screening and flu/pneumococcal vaccines (as appropriate), were covered in the fourth section. Medical errors were covered in the fifth and sixth sections. Errors included lack of adherence to published guidelines for care of our three targeted diseases, lack of changes in care after signal events (e.g., hospitalizations, two successive elevated blood sugars or A_1Cs for diabetic patients), and missed common drug-drug or medication/alcohol interactions.

Limitations

Even though MEMO includes a widely diverse group of physicians and patients from five areas in the United States, caution must be used when generalizing the results to other parts of the country, patients with other chronic diseases, patients without chronic disease, specialty clinics, and inpatient clinics. In addition, our analyses have several limitations. First, we are still analyzing the impact of physician-related outcomes on care quality and patient safety. Second, we do not yet know the accuracy of physicians' estimates of past errors or likelihood of future errors. It is possible that stressed physicians are more likely to assume that they will make mistakes, though in reality they may not (Forth-Cozens & Morrison, 1989). Third, although a 61% response rate is less than optimal, it is still well within the range of reasonable response rates for physician surveys (Asch, 1997). Finally, it is possible that some of the results have been inflated due to common method variation (i.e., objects measured at the same time on the same instrument may show an exaggerated association).

5. Results

Principal findings/outcomes

MEMO began with focus groups comprised of clinicians, office staff and patients. A total of 32 physicians, nine non-MD healthcare personnel, and 21 patients participated. Analyses revealed several important findings ,including a high and rising level of "busyness" in a typical practice and that patients are remarkably perceptive about the quality of care they receive and the stresses upon their physicians. One finding, the potential contribution of a hectic office environment to adverse patient outcomes, resulted in the development of an onsite assessment instrument

as well as the inclusion of a single question querying office pace across all instruments (physician, organizational assessment, onsite assessment, and patient surveys). As we coded the transcripts, a theme emerged from the physician focus groups regarding the organization of clinical practices. This theme resulted in the addition of a series of questions in the Organization Survey about bottlenecks, the use of information technology, and communication practices.

Table 1
MEMO Physician Characteristics (n=420)
(Linzer M. *Advances in Patient Safety.* AHRQ, 2005)

Age, mean (SD)	43 (10) range 29-89
Gender (female)	44%
Ethnicity	
Hispanic	4%
White	77%
Black	6%
Asian	12%
Native American	1%
Specialty	
Family Medicine	47%
General Internal Medicine	50%
Other	3%
Years in current practice, mean (SD)	8.4 (8.0)
Open access appointment system	44%
Practice owner	13%
Income, median	$125,000-$150,000
Full-time	84%
Workload (hours/week)	
Seeing patients in office	26
Seeing patients in hospital	5
Patient activities (phone, paperwork)	8
Teaching/research	5
Other work activities (e.g., admin.)	5
Total (not including on-call)	49
On-call days per month (mean)	5

Physician outcomes, including stress, burnout, other mental health issues, physical health, job satisfaction, and intent to leave the practice, were assessed in both MD surveys. The characteristics of the doctors are illustrated in Table 1. The sample of 420 is 84% of the target of 500; 61% of the MDs contacted agreed to participate. The age range was wide, with an average age of 43. Close to half (44%) were women, and 23% were non-White. The MDs, who were evenly split between general internal medicine and family medicine, were a relatively stable group, averaging over 8 years in their current practices. Open access scheduling was utilized by 44% of the practices for an average of 16 months. The average workweek, not including night call, was 49 hours. Eighteen percent of the physicians worked part-time.

Table 2
Estimated Patient Mix by MEMO Physicians
(Linzer M. *Advances in Patient Safety*. AHRQ, 2005)

Patient Type	**Percent**
Female	62
Elderly	36
Non-English speaking	13
Chronic pain	17
Numerous medical problems	45
Numerous psychosocial problems	35
Frustrating to deal with	12
Alcohol or substance abuse	12

The physicians estimated their patient mix to be predominantly women, with impressive numbers of patients who speak little English (13%), suffer chronic pain (17%), have alcohol or other substance abuse problems (12%), or are generally difficult to care for (12%). Over a third of patients were estimated to have complex or numerous psychosocial problems; a similar amount were felt to visit regularly but ignore medical advice.

We tested six domains from Kralewski's (1996) organizational culture scale. Four remained in the new factor analyses (cohesiveness, trust, quality, and information), and a fifth emerged (leadership values alignment).

Table 3: Organizational Culture Domains Identified by MEMO Physicians

	mean (sd) alpha
Leadership/Governance Alignment Scale	2.2* (0.7) 86
c. Our physician compensation formula is well aligned with our organization's goals.	2.4 (0.9)
e. There is broad involvement of physicians in most financial decisions.	1.8 (0.9)
f. Our administrators obtain and provide us with information that helps us improve the cost effectiveness of our patient care.	2.0 (0.9)
g. Our compensation plan rewards those who work hard for our group.	2.3 (1.1)
k. Our physician compensation formula is well understood by our physicians.	2.1 (1.0)
l. Our administrative decision-making process is described as consensus building.	2.1 (0.9)
o. The business office & administration are considered to be a very important part of our group practice.	2.4 (1.0)
r. There is rapid change in clinical practice among our physicians when studies indicate that we can improve quality/reduce costs.	2.3 (0.7)
Quality Emphasis Scale:	2.5* (0.6) .86
b. Physicians who develop inappropriate patient care practices will be "talked to".	2.6 (1.0)
i. We emphasize patient satisfaction.	2.9 (0.9)
j. The quality of each physician's work is closely monitored.	2.1 (0.8)
m. There is an identifiable practice style that we all try to adhere to.	2.3 (0.8)
u. There is a high level of commitment to measuring clinical outcomes.	2.4 (0.8)
v. Quality of care is goal one.	3.0 (0.8)
bb. We have developed a common standard of care.	2.5 (0.8)
cc. Our clinical leadership is concerned with quality of care issues.	2.9 (0.8)
dd. Adequate training is provided in dealing with quality of care issues.	2.4 (0.8)
ee. Making changes to reduce the possibility of substandard care is difficult.	2.7 (0.8)
aa. There is a general agreement on treatment methods.	2.8 (0.7)
Organizational Trust/Belonging Scale	2.6* (0.7) .79
q. There is a strong sense of belonging to the group.	2.7 (0.9)
s. There is a great deal of organizational loyalty.	2.5 (0.8)
t. There is a strong sense of responsibility to help one of our physicians if he/she has a personal problem.	2.9 (0.9)
y. We encourage the internal reporting of all adverse patient care events.	2.5 (0.9)
z. There is a high degree of organizational trust.	2.2 (0.9)
Information/Communication Scale	2.6* (0.7) .68
n. We have very good methods to assure that our physicians change their practices to include new technologies and research findings.	2.1 (0.8)
p. We rely heavily on electronic information systems to provide cost effective care.	2.4 (1.0)
w. We rely heavily on computer-based information when seeing a patient.	2.5 (1.0)
x. Candid and open communications exist between physicians and nurses.	2.9 (0.8)
Cohesiveness Scale	2.6* (0.6) .66
a. There is widespread agreement about most moral/ethical issues.	3.0 (0.8)
d. There is a great deal of sharing of clinical information.	2.8 (0.8)
h. There is an open discussion of clinical failures.	1.9 (0.8)

* In response to "To what degree do the following statements reflect the conditions in your group practice?" on a scale from 1 to 4, 1=not at all, 4=to a great extent. The letter prior to each statement refers to item on the MEMO Clinician Survey. Adapted from: Kralewski JD et al. Assessing the culture of medical group practices. *Med Care* 1996;34:377-88.

These domains are illustrated in Table 3. Two scales (collegiality and organizational identity) dropped out, with some of their items shifting to remaining domains. Internal consistency scores for the five climate scales ranged from good to excellent and correlate in regression analyses, with a broad range of key physician outcomes, including satisfaction, intent to leave the practice, and past and future error assessments. All five scales were associated with stress in simple correlation analyses; their lack of correlation with stress in regression analyses may have been due to their correlation with the chaotic office environment, which emerged as a strong, independent predictor of stress. The trust, information emphasis, and cohesiveness scales were endorsed most often, meaning that the physicians found these cultural aspects of practice to be most prevalent.

In response to the 13-item work control scale, MDs described a modest to moderate amount of control (50, on a normed scale from 0-100), with a wide range of 7 to 93. For the single-item measures of organizational climate (rated on a scale, of 1=not at all to 4=to a great extent), physicians agreed most with these statements: “Quality of care is goal one” (3.0), “There is widespread agreement about most moral/ethical issues” (3.0), and “Candid and open communication exists between physicians and nurses” (2.9). The least agreement was seen with these statements: “There is broad involvement of physicians in most financial decisions” (1.8), “There is open discussion of clinical failures” (1.9), and “Our administrators obtain and provide us with information that helps us improve the cost effectiveness of our patients’ care” (2.0).

Analyses of the five-item job satisfaction scale, the four-item stress scale, and the OSPRE measure resulted in Cronbach’s alphas of 0.86, 0.83, and 0.87, respectively. Although 79% of the physicians indicated that they were satisfied with their jobs, 61% thought that their work was stressful, 27% described burnout symptoms, and 31% reported *at least* a moderately high likelihood of leaving their practice within 2 years. Seventy-three percent of physicians described their physical health as very good or better; however, 26% scored 4 or higher on the GHQ-12 (Goldberg and Williams, 1988), a score indicating mental health concerns.

The pace of the office was described as busy by 46% of the physicians, busy tending toward chaotic by 38%, and hectic or chaotic by 10%. Ratings of the office environment were similar for physicians and practice managers at a mean of 3.4 on a scale of 1-5. After comparing practices rated as busy or calm with practices rated as chaotic, we found that chaotic practices had more minority patients (48% vs. 25%, $p<0.001$), minority physicians (21% vs. 12%, $p=0.02$), and minority staff (34% vs. 19%, $p=0.004$) and fewer exam rooms per physician (2.3 vs. 2.6, $p<0.001$). Patients attending chaotic practices were more likely to have Medicaid (18% vs. 12%, $p=0.001$) and less likely to have commercial insurance (24% vs. 37%, $p<0.0001$).

Correlation analyses indicated multiple associations between the organizational climate and physician satisfaction and stress (Table 4). Satisfaction was strongly associated with work control, a sense of trust or belonging, a less hectic environment, and all five organizational climate domains (all $p<.001$). Stress was associated with a lack of work control, a chaotic atmosphere, and all five climate domains (all $p<.001$). A chaotic office was associated with poorer MD mental health ($p=.001$), and a lack of trust in the organization was associated with intent to leave the practice ($p=.001$). Physicians in offices that did not emphasize quality were more likely to report errors in the past year ($p=.002$). Physicians from offices lacking an emphasis on information and communication ($p=.017$) or in practices lacking an emphasis on diversity among clinicians and staff ($p=.001$) predicted a higher likelihood of future errors.

Table 4 - Reactions by 420 Primary Care Physician Participants: Regression Analyses
(Linzer M. *Advances in Patient Safety*. AHRQ, 2005)

Dependent variable	Predictors (*p* value)
Satisfaction	Work control (.001), Trust in organization (.001), Resources (.001), Less chaos (.001)
Stress	Less work control (.001), Younger (.001), White (.006), Fewer resources (.018), More chaos (.001)
Poorer mental health	Fewer resources (.001), Less work control (.006), More chaos (.001)
Intent to leave	Less trust in organization (.001), Fewer resources (.001), Older (.001)
Past errors	*Fewer* work hours (.002), Less organizational emphasis on quality (.002), Male (.024)
Future error (OSPRE)	Lack of organization emphasis on info/communication (.017), Less emphasis on diversity (.001)

Independent variables in the regression analyses: work control, practice emphasis on select factors (e.g., work-home balance, diversity, teamwork, professionalism), office atmosphere (from calm to chaotic), and organizational culture domains. Most regressions also tested the impact of demographics.

Clinics in which women physicians worked cared for more uninsured or Medicaid/Medical Assistance patients compared to those where men worked (37% vs. 30%, p=0.04). Despite more complex patients, we found a downward trend in staffing ratios in clinics where women MDs seemed to cluster (1.11 vs. 0.96; p=0.22). As in our prior studies, women reported more time pressure during office visits than men; women felt they needed 30% more time than allotted for visits, whereas men said they needed 19% more. Women also noted significantly more stress (3.45 vs. 3.23; p<0.003) and burnout (2.32 vs. 2.07; p<0.001), and less work control than men (2.35 vs. 2.69; p<0.001). Women described less organizational trust (2.47 vs. 2.69; p<0.001) and less alignment between their values and those of the administration (1.97 vs. 2.36; p<0.001). In regression analyses, controlling for age, years in practice, and full-time/part-time status, the impact of stress for women on outcomes such as organizational climate, pace of the office, and burnout was nearly twice that of men. In those same regression analyses, stress fell out of any statistical significance for men in areas of trust, cohesion, and alignment, whereas, for women, stress remained a notable variable.

Part-time practice was reported by 77 (18%) respondents (31% of women and 8% of men, p<.0001). We found no significant differences in age, years in practice, marital status, or ethinicity between part-time and full-time physicians. Part-time MDs worked an average of 34.7 (SD 9.9) hours per week, whereas full-time physicians worked significantly more hours, 51.9 (SD 10.5, p<.0001). Part-time physicians spent significantly less time seeing hospitalized patients (6% vs. 10%; p=.0001) and more time on teaching and research (14% vs. 10%, p=.04). Although no significant differences were found between part-time and full-time physicians on measures of well-being, depression, general health, burnout, intent to leave practice, self-reported past errors or prediction of future errors, part-time physicians reported higher job satisfaction (mean score 3.87 vs. 3.62, p=.01). We found no differences between part-time and full-time physicians´ measures of workplace cohesiveness, sense of organizational trust, alignment with leadership values, or control over work. Regression analysis of workplace factors associated with job satisfaction revealed that, for full-time physicians, work control (p=.001) and trust (p=.001) predict satisfaction. For part-time physicians, only trust in the organization predicted satisfaction (p=.03).

Minority physicians reported caring for more minority, non-English-speaking, chronic pain, complex medical, complex psychosocial, and difficult-to-help patients (all $p<0.05$). Minority physicians described less work control, alignment of values between MDs and administration, practice emphasis on quality, organizational trust, cohesiveness, and emphasis on information/communication (all $p<0.05$). However, no differences were found between minority and non-minority MDs for job satisfaction, stress, health, depression, or burnout.

To measure perceived leadership integrity, we included five questions, each on five-point Likert scales, about attitudes of organizational leaders with respect to: the physician´s core values, controlling costs vs. quality, physicians raising quality issues, balancing patient care and the leader´s self-interest, and honesty. We summed responses to create the Perceived Leadership Integrity Index (PLII) with possible values ranging from -10 to 10. In preliminary analyses of 287 responses (68.3% of the 420 participating MDs), mean PLII was 1.97 (SD=4.06), with a Cronbach´s alpha of 0.87. The PLII correlated positively with male physician gender ($p<0.02$), physician ownership of the practice ($p=0.005$), and physician income ($p=0.005$) but not race or ethnicity. Organizational emphasis on quality and cohesiveness, alignment with leadership values, trust, and communication/use of information technology all predicted PLII ($p<0.001$). In multiple linear regression analyses controlling for demographics, organizational climate, and office atmosphere, lower PLII predicted ($p=0001$) physician stress, burnout ($p=0.0001$), and intent to leave the practice ($p=0.026$).

Table 5: Chronic Disease Prevalence in Patient Sample

Targeted disease	N
Hypertension	485
Diabetes	152
Congestive heart failure	16
Hypertension and diabetes	375
Diabetes and congestive heart failure	18
Hypertension and congestive heart failure	73
All three conditions	156

Patient data from surveys and medical record audits are currently being analyzed. Preliminary data from 1301 surveys indicate that over 90% of patients are satisfied with their healthcare and trust their physician's judgment. This trust includes the MD's ability to put the patient's health above financial considerations and make appropriate medical decisions regardless of health plan rules. The patients report spending an average of 23 minutes with the physician during their last clinic visit, an amount they consider to be adequate. In contrast to our physician and clinic manager findings, most patients consider the clinic atmosphere to be busy, but reasonable, with only 2% indicating that their clinics were chaotic. Table 5 illustrates the prevalence of our three targeted chronic conditions in the 1301 respondents to date. These patients rated their health as very good to excellent (23%), good (40%) and fair to poor (37%). Over half (54%) reported that their physical health limits their activities, and over 44% reported that pain moderately or greatly interferes with their normal work. Mental health problems are common: 38% feel limited by their emotional health, 15% report depressive symptoms on more than half of the days in the past 2 weeks, 20% report symptoms of anxiety, and 28% are taking antidepressants or anxiolytics. MEMO patients take an average of 5.8 prescription medications; however, only 78% of respondents report using them as recommended. Medical literacy is a significant problem, with almost 37% of the patients reporting difficulty in understanding medical information.

Twelve percent (n=151) of the 1301 patients speak a primary language other than English; of these, 31% used a translator (usually a family member) during clinic visits.

Discussion

The nursing shortage and related issues of nurse stress and burnout are currently a focus of national attention, and occupational stress has received substantial attention in industrial settings. However, little attention has been paid to physician stress and even less to its impact on patient outcomes. Preliminary results from the MEMO study reinforce and extend the findings from our earlier Physician Worklife Study. Numerous primary care physicians work in stressful environments described as busy, tending toward hectic or chaotic. More than one quarter report mental health difficulties and burnout symptoms. Nearly one third are moderately likely to leave their jobs in 2 years. Factors that contribute to physician stress include high work demands, low work control, and a difference in perceived values between physicians and healthcare leaders. Mandates to see high volumes of patients in already crowded workdays only serve to increase time pressures. As doctors relinquish practice management to increase clinical time, they find themselves in less control of their work environment and resonating less with the decisions and values of their office leaders. In addition, managed care places doctors in the uncomfortable position of controlling resource utilization. This leads patients to question the medical decisions made by their own doctors, placing a new set of stressors upon physicians. Future research must address these critical issues as well as the patient-related consequences of hectic offices and stressed healthcare providers.

The MEMO data revealed five important domains of organizational climate: leadership, quality, trust, information, and cohesiveness. These five domains, with a hectic office pace, are associated with multiple negative physician reactions including dissatisfaction, stress, tendency to err, and intent to leave the practice, thus demonstrating a relationship between organizational climate and physician outcomes. The impact of these variables on patient outcomes is forthcoming as we complete the final phase of MEMO data analyses. The five organizational climate domains can provide critical information for healthcare leaders on sources of physician dissatisfaction and unsafe environments, allowing management to target emerging issues before physicians leave the practice or begin to make stress-related errors.

The chaotic office environment plays a prominent role in explaining adverse physician reactions including stress, poorer mental health, and dissatisfaction. Additional assessment is needed to identify 1) remediable contributors to a chaotic environment, 2) the relationship between the chaotic environment and adverse patient outcomes, and 3) sources of any variation between different observers (clinicians, managers, research assistants, and patients) concerning this assessment.

Our study population is diverse, with many female, minority, rural and inner city physicians represented. Many findings illustrated in Table 2 highlight the importance of gender and diversity, such as the tendency for men to acknowledge more past errors, for White physicians to acknowledge higher stress than minority physicians, and for future errors to be predicted more often in practices with less emphasis on diversity among clinicians and staff. Multiple issues regarding female physicians have been revealed by the MEMO data. For example, despite widespread promulgation of prior similar data, work-life culture and climate continue to be lower for female physicians.

In a profession that will soon be approaching 50% women, management must focus on the lack of alignment in values between organizational leadership and women MDs. Organizations would also do well to recognize the differences in work-life and practice demands between women and men who are MDs. In addition, organizations may want to re-evaluate physician panel sizes and patient mix with attention to staffing ratios for women. Practices should examine how patients could be divided equitably within a practice, or how differences in patient load (based on complexity, not numbers), could be rewarded.

Leadership is not only an issue for women who are MDs. MEMO data revealed that negative perceptions about the integrity of clinical leaders was correlated with physician stress, burnout, and intention to leave the practice. Although correlation does not prove causation, our data suggest that the integrity of healthcare leaders is another working condition that can have an impact upon important outcomes for physicians and, potentially, their patients.

Conclusions
Early results from MEMO clearly establish the primacy of the work environment in affecting physicians' abilities to carry out their roles as patient care providers. The impact of the stress, burnout, and lack of trust reported by many MDs, and of the chaotic environment seen in many offices, will be quantified in the final (patient) phase of MEMO, now nearing completion.

Significance
1. If findings continue to pinpoint the busy or chaotic environment as a risk factor for stress and error, then physician offices rated as chaotic should become immediate targets for safety improvement efforts.
2. Women physicians and their patients remain at higher risk for as yet undocumented side effects of stress and poor working climate.
3. The integrity of healthcare leaders has an impact on important outcomes for physicians and, potentially, their patients.

Implications
Given the changing healthcare system, it is important that we understand the impact these changes have on healthcare workers and on their most important product – patient care. Continuing to ignore the impact on workers will exacerbate shortages felt in healthcare professions as qualified professionals leave for less stressful environs. The result will be continuing personnel shortages and a potential decline in quality of care in spite of energy spent on engineering "system" solutions. Until policymakers realize the worker as a key component of the healthcare "system," any efforts to improve patient safety may be doomed to failure.

6. Publications and Products

Journals

1. Dowell D, Baier Manwell L, Maguire A, et al. Patient views on quality and errors: data from the MEMO study. [abstract] *J Gen Intern Med* 2004; 19(s1):187.
2. Linzer M, Baier Manwell L, Bobula J, et al. Impact of organizational climate and hectic office environment on physician stress and error in primary care. [abstract] *J Gen Intern Med* 2004;19(s1):163-4.

3. Dowell D, Baier Manwell L, Maguire A, et al. Urban outpatient views on quality and safety in primary care. *Longwoods Rev* 2005 ;3:2-8.
4. Poses RM, Manwell L, Mundt M, Linzer M. Perceived leadership integrity and physician stress, burnout, and intention to leave practice. [abstract] *J Gen Intern Med* 2005;20(s1):183.
5. Mechaber H, Levine RB, Mundt M, et al. Progress report: part-time physicians – prevalent, connected, and satisfied. [abstract] *J Gen Intern Med* 2005;20(s1):182-3.
6. Schwartz MD, Man B, Manwell L, Mundt M, Varkey AB, Williams E, Linzer M. The chaotic office environment: role of patient ethnicity and impact on physician stress and burnout. [abstract] *J Gen Intern Med* 2005;20(s1):206-7.
7. Horner-Ibler B, McMurray JE, Mundt M, et al. 5 years later, not change in the weather: gender differences in physician worklife and organizational climate. [abstract] *J Gen Intern Med* 2005;20(s1):194-5.

Part of Book

1. Williams ES, McMurray JE, Baier-Manwell L, et al. The effect of workplace stress on patient outcomes. In: Carayon P, editor. *Handbook of human factors and ergonomics in healthcare and patient safety*. Mahwah (NJ): Lawrence Erlbaum. In press.
2. Linzer M, Baier Manwell L, Mundt M, Williams E, Maguire A, McMurray J, Plane MB. Organizational climate, stress, and error in primary care: the MEMO Study. *Advances in patient safety: from research to implementation*. Vol 1, AHRQ Publication No. 050021 (1). Rockville, MD: Agency for Healthcare Research and Quality, 2005. [http://www.ahrq.gov/qual/advances/]
3. Stone P, Harrison M, Feldman P, et al. Organizational climate of staff working conditions and safety – an integrative model. In: Clancy C, et al, editors. *Advances in patient safety: from research to implementation*. Vol 2, AHRQ Publication No. 050021 (2). Rockville, MD: Agency for Healthcare Research and Quality, 2005. [http://www.ahrq.gov/qual/advances/]

Presentations and Posters

1. Linzer M, Baier Manwell L, Bobula J, et al, for the MEMO Investigators and the SGIM Career Satisfaction Study Group. MEMO: the Physician Worklife Study II. Preliminary data. [poster] *Making the health care system safer: 2nd Annual Patient Safety Research Conference of the Agency for Healthcare Research and Quality*; 2003 Mar 2-4; Arlington (VA).
2. Linzer M. MEMO: the Physician Worklife Study II. *CQPI conference series on patient safety*; 2003 April 25; Madison (WI).
3. Babbott S, Williams ES, Rabatin JS, et al. The physician's office and patient safety: qualitative data from the MEMO project. *Generalist physicians as agents for change: education and research practice and policy*: *Society of General Internal Medicine 26th Annual Meeting*; 2003 April 30-May 3; Vancouver (BC).
4. Paluch L, Maguire A, Horner-Ibler B. Primary care physician recruitment methods. [poster] *Aurora scientific day*: Aurora Health Care; 2003 May 15; Milwaukee (WI).
5. Paluch L, Maguire A, Halkowski T. Focus groups as means of data collection for quality of care research. [poster] *Aurora scientific day*: Aurora Health Care; 2003 May 15; Milwaukee (WI).
6. Williams ES, Babbott S, Rabatin J. Understanding the interaction of physician and ambulatory practice in medical mistakes: results from the MEMO project. *Democracy in a knowledge economy, 2003 Annual Meeting of the Academy of Management;* 2003 August 1-6; Seattle (WA).

7. Dowell D, Maguire AM, An, et al. Patient views on quality and errors: data from the MEMO (Minimizing Error, Maximizing Outcome) study. *Enhancing patient-physician communication*: *2003 Midwest Society of General Internal Medicine Regional Meeting*; 2003 September 19; Chicago (IL).
8. Plane MB, Man B. MEMO: Minimizing Error, Maximizing Outcome. *National ambulatory primary care research and education conference on patient safety*: *American Academy of Family Physicians*; 2003 September 18-19; Chicago (IL).
9. McMurray J. MEMO: differences in work lives of women and men physicians. From dissatisfaction to action. *University of Wisconsin-Madison Continuing Medical Education Conference for Physicians*; 2003 November 7; Green Lake (WI).
10. McMurray J. MEMO: physician dissatisfaction: challenges and opportunities. *University of Wisconsin-Madison Continuing Medical Education Conference for Physicians*; 2003 November 7; Green Lake (WI).
11. McMurray J, Riska M, Mundt M. Gender and medical practice: structure and culture. *Culture in the Workplace Session* at *Rethinking Careers for a Changing Society: 74th Annual Meeting of the Eastern Sociological Society*, 2004 February 19-22; New York (NY).
12. Linzer M, Baier Manwell L. Working conditions and the quality of primary care: using data from the MEMO project (Minimizing Error, Maximizing Outcome) to change how medicine is practiced. [workshop] *Shaping the future of general internal medicine: 27th Society of General Internal Medicine Annual Meeting*; 2004 May 12-15; Chicago (IL).
13. Linzer M, Baier Manwell L, Bobula J, et al. Impact of organizational climate and hectic office environment on physician stress and error in primary care. [poster] *Shaping the future of general internal medicine: 27th Society of General Internal Medicine Annual Meeting*; 2004 May 12-15; Chicago (IL).
14. Baier Manwell L, Dowell D, Maguire A, et al. Patient views on quality and errors: data from the MEMO study (Minimizing Error, Maximizing Outcome). [poster] *Shaping the future of general internal medicine: 27th Society of General Internal Medicine Annual Meeting*; 2004 May 12-15; Chicago (IL).
15. Bito S, Ozaki M, Matsumura S, et al. MEMO-J: Minimizing Error, Maximizing Outcome Japan. *11th Pfizer Health Research Forum*; 2004 November 6; Tokyo, Japan.
16. Poses RM, Manwell L, Mundt M, et al. Perceived leadership integrity and physician stress, burnout, and intention to leave practice. *Out of chaos: the critical role of generalists*: *28th Society of General Internal Medicine Annual Meeting*; 2005 May 11-14; New Orleans (LA).
17. Mechaber H, Levine RB, Mundt M, et al. Progress report: part-time physicians – prevalent, connected, and satisfied. *Out of chaos: the critical role of generalists*: *28th Society of General Internal Medicine Annual Meeting*; 2005 May 11-14; New Orleans (LA).
18. Schwartz MD, Man B, Manwell L, et al. The chaotic office environment: role of patient ethnicity and impact on physician stress and burnout. [poster] *Out of chaos: the critical role of generalists*: *28th Society of General Internal Medicine Annual Meeting*; 2005 May 11-14; New Orleans (LA).
19. Horner-Ibler B, McMurray JE, Mundt M, et al. 5 years later, not change in the weather: gender differences in physician worklife and organizational climate. [poster] *Out of chaos: the critical role of generalists*: *28th Society of General Internal Medicine Annual Meeting*; 2005 May 11-14; New Orleans (LA).

References

Advances in Patient Safety: From Research to Implementation. Volumes 1-4, AHRQ Publication Nos. 050021 (1-4). February 2005. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/qual/advances/

Asch DA, Jedrziewski MK, Christakis NA. Response rates to mail surveys published in medical journals. *J Clin Epidemiol*, 1997;50:1129-36.

Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*, 1983;24:385-96.

Dowell D, Baier Manwell L, Maguire A, et al. Urban outpatient views on quality and safety in primary care. *Longwoods Rev*, 2005;3:2-8.

Firth-Cozens, J., & Morrison, L. Sources of stress and ways of coping in junior house officers. *Stress Medicine*,1989;5:121-6.

Freeborn DK. Satisfaction, commitment, and psychological well being among HMO physicians. *West J Med*, 2001;174:13-18.

Goldberg DP, Williams P. *User's Guide to the GHQ*. 1988. London: NFER. Nelsen.

Institute of Medicine, Committee on Quality of Health Care in America. *To Err Is Human: Building a Safer Health System.* Washington, DC: National Academies Press, 2000.

Kralewski JE, Wingert TD, Barbouche MH. Assessing the culture of medical group practices. *Med Care*, 1996;34:377-88.

Konrad TR, Williams ES, Linzer M, et al. Measuring physician job satisfaction in a changing workplace and a challenging environment. *Med Care*, 1999;37:1174-82.

Leape LL. Error in medicine. *JAMA*, 1994: 272:1851-7.

Linzer M, Baier Manwell L, Mundt M, Williams E, Maguire A, McMurray J, Plane MB. Organizational climate, stress, and error in primary care: the MEMO Study. In: Advances in Patient Safety: From Research to Implementation. Vols 1-4, AHRQ Publication Nos. 050021 (1-4). Rockville, MD: Agency for Healthcare Research and Quality, 2005: Vol. 1: pp. 65-77. [http://www.ahrq.gov/qual/advances/]

Linzer M, Gerrity M, Douglas JA, et al. Physician stress: results from the Physician Worklife Study. *Stress Health*, 2000a;18:37-42.

Linzer M, Konrad TR, Douglas J, et al. Managed care, time pressure and physician job satisfaction: results from the Physician Worklife Study. *J Gen Intern Med*, 2000b;15:441-50.

Linzer M, McMurray JE, Visser MRM, et al. Sex differences in physician burnout in the United States and the Netherlands. *JAMWA,* 2002;2002:191-193.

Linzer M, Visser MRM, Oort FJ, et al. Predicting and preventing physician burnout: results from the United States and the Netherlands. *Am J Med,* 2001a;111:170-5.

Linzer M, Visser MRM, Oort FJ, et al. A model to predict and prevent physician burnout: results from the US and the Netherlands. *Am J Med,* 2001b;111:170-5.

McMurray JE, Linzer M, Konrad TR, et al. The work lives of women physicians: results from the Physician Worklife Study. *J Gen Intern Med,* 2000;15(6):372-80.

Motowidlo SJ, Packard JS, Manning MR. Occupational Stress: its causes and consequences for job performance. J Appl Psychol 1986;71:618-29.

Pfizer, Inc. Patient Health Questionnaire, adapted from the PRIME-MD. Pfizer, 1999.

Visser MR, Smets EM, Oort FJ, De Haes HC. Stress, satisfaction and burnout among Dutch medical specialists. *CMAJ,* 2003;168:271-5.

Ware JE, Kosinski M, Keller SD. *SF-12: how to score the SF-12 Physical and Mental Health Summary Scales*. Boston, MA: The Health Institute, New England Medical Centre, 1995.

Williams ES, Babbott S, Rabatin J. Understanding the interaction of physician and ambulatory practice in medical mistakes: results from the MEMO Project. [in review]

Williams ES, Konrad TR, Linzer M, et al. Refining the measurement of physician job satisfaction: results from the Physician Worklife Study. *Med Care,* 1999;37:1140-54.

Williams ES, Konrad TR, Linzer M, et al. Physician, practice, and patient characteristics related to primary care physician physical and mental health: results from the physician worklife survey. *Health Serv Res,* 2002;37:121-43.

Williams ES, Konrad TR, Scheckler WE, et al. Understanding physicians' intention to withdraw from practice. The role of job satisfaction, job stress, mental and physical health. *Health Care Manag Rev,* 2001;26:9-21.