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Communication

The Relationships Between the Dimensions of Health Care Quality and Price: The Case of Eye Care

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In response to rapidly increasing health care costs, private and public groups across the United States are developing information systems that will help health care consumers to compare hospital and physicians on the basis of price and quality.[1]† The hope is that more informed health care consumers will be able to choose the health care providers offering the lowest quality-adjusted prices. This in turn, may result in health care providers decreasing quality-adjusted prices by decreasing prices and/or increasing the quality of service.‡

There is theoretical support for the hypothesis that dissemination of information about providers' reputations for quality may correct the market failure due to uninformed consumers. Assuming that providers' reputations are public information, Klein and Leffler[2] show that wealth-maximizing firms will provide high-quality products at high-quality prices, rather than providing low-quality products at high-quality prices. Assuming that all consumers prefer higher to lower quality, but differ in their willingness to pay for quality and that some provider-specific information about quality reaches potential consumers, Wolinsky[3] shows that higher-quality products will sell at higher prices and lower-quality products will sell at lower prices. Assuming that providers' reputations are public information, Shapiro[4] shows that the price premium for higher quality will increase as quality attributes become more difficult to observe.

Health care quality is a multidimensional construct that is extremely hard to define, measure, and observe. There are, at least, three components of health care quality: the technical aspects of quality, the interpersonal aspects of quality, and the amenities of care.[5] (Donabedian 1980) The technical aspects of quality refer to how well medical science and knowledge are applied to the diagnosis and treatment of the medical problem. The interpersonal component of quality is defined as the quality of the interaction between the patient and the provider

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† Also some hospitals and public and private health insurers use information on physician quality to decide which physicians are given privilege to either perform a particular medical procedure or to be paid for performing a particular medical procedure. Some businesses even use patient's evaluations of quality to determine physician reimbursement. Allied-Signal Inc. awards a 10% to 15% bonus on top of fixed monthly fees to physicians evaluated as "outstanding" by patients. (Wall Street Journal 10/13/92).

‡ There is some evidence that physician profiling, the practice of documenting how a physician is practicing and then comparing the physician's profile to a national standard or practice guideline improves performance by physicians.[12]

or the responsiveness, friendliness, and attentiveness of the health care provider. The amenities of care include the appeal and comfort of the health care facility.

Further, measures of quality of care fall into three categories: structure, process, and outcome.[5] Structure refers to the relatively fixed characteristics of the medical delivery system, such as the number, types, and qualifications of health care providers and facilities. Process measures reflect what is done to and for the patient—the application of medical procedures, drugs, etc. Outcome refers to the changes in the patients' current and future health status that can be attributed to antecedent medical care.

Ginsberg and Hammons[6] hypothesized that health care consumers with limited information may be better able to evaluate the interpersonal aspects of quality than the technical aspects of quality. They argue that consumers can evaluate interpersonal quality on the basis of their own experiences and their friends' and relatives' experiences; however, consumers do not have the ability to evaluate technical quality accurately. There have been few studies of whether patient satisfaction is related to technical quality; however, the research suggests that satisfaction is related to the perceived interpersonal and communication skills of the physician.[7] Since consumers must also value technical quality (although they may not be able to evaluate it), this raises an interesting issue. Can consumers use their evaluations of interpersonal quality and the processes of care as signals of technical quality? Do physicians who provide higher interpersonal quality also tend to offer higher technical quality? Unfortunately, we also know very little about the relationship between technical quality or patient outcomes and interpersonal quality or the processes of care.[8]

If consumers are better at judging the interpersonal aspects of quality than the technical aspects, then consumers faced with the decision of which physician to select may make more informed trade-offs between price and interpersonal quality than between price and technical quality. In this case, one would expect health care prices to be more closely related to measures of interpersonal quality than to measures of technical quality. Previous research suggests there is a positive association between prices and qualities measured as time spent with the patient[9] and thoroughness of the examination;[10] however, we know little about the relationship between prices and technical quality or the outcomes of care.

Accordingly, this study examines the relationships between the multiple dimensions of health care quality and examines the relationship between the multiple dimensions of health care quality and health care prices, using a data set from the market for ophthalmic services. This data set was collected by the Federal Trade Commission (FTC) and includes numerous measures of the quality of care.[11] The data are described in the next section and the empirical results are discussed in the Empirical Section.

The Eyeglass Data

To collect the data the FTC trained 19 survey interviewers from the Institute for Survey Research, a survey firm affiliated with Temple University in Pennsylvania, and then sent the interviewers to optometrists' offices to purchase the examinations and eyeglasses.§ Training of the interviewers took place at the State University of New York, College of Optometry (SUNY) and at the Pennsylvania College of Optometry

§ The interviewers were divided into three groups—The Blurred, the 20/20, and the Binocular. The Blurred group consisted of twelve healthy but myopic individuals who went to their appointments without wearing their glasses. The 20/20 group consisted of five healthy but myopic individuals who went to their appointments with appropriate corrective lenses. The Binocular group consisted of two subjects who went to their appointments wearing glasses that did not correct for their binocularity (double vision due to problems of the eye muscle). This paper uses only the observations from the subjects in the Blurred group. Thus health status is held relatively constant across patients.

TABLE 1. The Eyeglass Data

Variable	Description	
Technical quality[a]		
RXOK	Accuracy of eyeglass prescription	Yes = 177 No = 37
ACGLOK	Accuracy of the eyeglasses	Yes = 165 No = 22
WRKGLOK	Workmanship of the eyeglasses	Yes = 148 No = 21
Process of care		
THOROUGH1	Thoroughness of the eye exam	Mean = 58.15 SD = 21.56
THOROUGH2	Thoroughness of the eye exam	Mean = 60.60 SD = 18.71
Interpersonal quality		
ODTIME	OD willing to spend time?	Yes = 149 No = 78
Patient satisfaction		
CONFID	Confidence in competency of OD?	Yes = 122 No = 99
ADEQUATE	Adequate eye health exam performed?	Yes = 95 No = 135
RECOMMEND	Recommend for vision testing?	Yes = 123 No = 108

[a] Judged passing by either PCO or SUNY.

(PCO) in November 1977. During the five-day training period, interviewers were taught to identify the components of eye examinations. In addition, interviewers were given eye examinations, so there would be independent opinions regarding the corrective lenses each subject required for proper vision. During November and December of 1977 interviewers called optometrists and requested appointments within 2 or 3 days because they had misplaced their eyeglasses. In addition, the interviewers mentioned that it had been about 5 years since their last eye examination, so they wanted an appointment for a complete examination.

The eyeglass data (Table 1) include: 1) three measures of medical outcomes or technical quality: the accuracy of the eyeglass prescription (RXOK), the accuracy of the eyeglasses (ACGLOK), and the workmanship of the eyeglasses (WRKGLOK); 2) two measures of the processes of care: an index of the thoroughness of the eye examination developed by Dr. Kenneth Myers, Director of the Optometric Service, Department of Medicine and Surgery, U.S. Veterans Administration (THOROUGH1) and an index of the thoroughness of the eye examination developed by the National Association of Opticians and Optometrists (THOROUGH2); 3) one measure of interpersonal quality: the patient's response to the question — Was the optometrist willing to spend time to examine your eyes thoroughly and explain the findings? (ODTIME); and 4) three measures of patient satisfaction: the patient's responses to the questions — Do you have confidence in the overall competency of the optometrist (CONFID)? In your opinion, was an adequate eye health exam performed (ADEQUATE)? and Would you send a member of your family or a personal friend to this office for vision testing for a prescription (RECOMMEND)?

Accuracy of the prescription (RXOK) is a measure of the clinical judgment of the con-

TABLE 2. Correlation Coefficients for Measures of Technical Quality

	RXOK	ACGLOK	WRKGLOK
Accuracy of the prescription RXOK	1.0		
Accuracy of the eyeglasses ACGLOK	0.18[a] (n = 169)	1.0	
Workmanship of the eyeglasses WRKGLOK	0.16[a] (n = 169)	0.15[a] (n = 169)	1.0

[a] Significant at the 5% level, 2-tailed test.

sultants at SUNY and PCO about the appropriateness of the prescriptions. The consultants compared their opinions about the corrective lenses each subject required for proper vision with the written prescriptions from optometrists, and then evaluated the prescriptions for the adequacy with which subjects' visual needs were met.

To measure the accuracy of the eyeglasses (ACGLOK) the consultants at SUNY and PCO compared the written prescription to a lensometer reading which measures the sphere, cylinder, axis, and prism of each lens and then evaluated the adequacy of the eyeglasses for the patient. For workmanship of the eyeglasses (WRKGLOK) to be acceptable, the lenses and frames had to be judged by the consultants at SUNY and PCO to be free of significant imperfections, and the lenses had to be well-edged and well-mounted in the frames.

All of the interviewers were to obtain new eyeglasses in the course of their optometric examinations. However, the number of usable observations on eyeglass accuracy (ACGLOK) and workmanship of the eyeglasses (WRKGLOK) was reduced when the experiment was discovered in two Standard Metropolitan Statistical Areas. Since the eyeglasses were being prepared when the experiment was discovered, those observations on eyeglasses were excluded to avoid potential contamination of the data.

Thoroughness of the eye examination (THOROUGH1 and THOROUGH2) is measured as an index of the procedures and tests employed in the eye examination. To construct the indices the consultants weighted each test and procedure by its relative importance.

The correlation coefficients reported in Tables 2 and 3 suggest that there is a positive and statistically significant relationship among the measures of technical quality (Table 2) and among the measures of patient satisfaction (Table 3).

The Empirical Results

The Relationship Between Patient Satisfaction and the Dimensions of Quality

In support of the hypothesis that health care consumers may be better able to evalu-

TABLE 3. Correlation Coefficients for Measures of Patient Satisfaction

	CONFID	ADEQUATE	RECOMMEND
Confidence in OD? CONFID	1.0		
Adequate eye health exam performed? ADEQUATE	0.75[a] (n = 215)	1.0	
Recommend for vision test? RECOMMEND	0.90[a] (n = 218)	0.73[a] (n = 224)	1.0

[a] Significant at 1% level, 2-tailed test.

TABLE 4. Number of Eyeglass Patients by Patient Satisfaction and Interpersonal Quality

	Patient Satisfaction					
	RECOMMEND		CONFID		ADEQUATE	
Interpersonal Quality	Yes	No	Yes	No	Yes	No
ODTIME						
Yes	111	33	112	29	87	59
No	8	69	8	65	6	68
	$\chi^2 = 98.7^a$ n = 221		$\chi^2 = 99.73^a$ n = 214		$\chi^2 = 61.07^a$ n = 220	

[a] Statistically significant at 1% level.

ate the interpersonal aspects of quality than the technical aspects of quality, the results presented in Tables 4, 5, and 6 suggest that patient satisfaction is related to interpersonal quality and the processes of care, but patient satisfaction is independent of technical quality.

The numbers presented in Table 4 allow us to reject the null hypothesis that the three measures of patient satisfaction and the one measure of interpersonal quality are independent at the 1% level. Ninety-three percent of the patients who would recommend the optometrist to a family member or friend, also rated the optometrist highly with respect to interpersonal quality. Likewise, 93% of the patients who had confidence in the overall competency of the optometrist and 94% of the patients who felt they received an adequate eye health exam, also rated the optometrist highly with respect to interpersonal quality.

TABLE 5. Means of Processes of Care Measure by Patient Satisfaction Variables

Patient Satisfaction	Process of Care Thoroughness of Eye Examination
CONFID	
Yes = 122	74.81[a]
No = 99	39.12
ADEQUATE	
Yes = 95	78.10[a]
No = 135	44.10
RECOMMEND	
Yes = 123	73.45[a]
No = 108	40.82

[a] Difference is statistically significant at the 1% level, 2-tailed test.

The numbers presented in Table 5 suggest that the patients who were satisfied with the services of the optometrist actually received more thorough eye examinations. Patient satisfaction and the processes of care appear to be directly related. The 122 patients who reported that they had confidence in the overall competency of the optometrist received significantly more thorough eye examinations than the 99 patients who reported that they did not have confidence in the competency of the optometrist.

Likewise the 95 patients who reported that they received an adequate eye health examination received significantly more thorough eye examinations than the 135 patients who felt they did not receive an adequate eye health examination.

Concerning the issue of whether patient satisfaction can be used as an indicator of technical quality, the eyeglass data suggest that patient satisfaction is a poor indicator of technical quality. For two of the measures of patient satisfaction, RECOMMEND (Would the consumer send a family member or friend to this office for vision testing for a prescription?) and CONFID (Does the consumer have confidence in the overall competency of the optometrist?) we cannot reject the null hypothesis that these two vari-

TABLE 6. Number of Eyeglass Patients by Patient Satisfaction and Technical Quality

Patient Satisfaction	Technical Quality: Accuracy of the Prescription — Accurate	Accuracy of the Prescription — Not Accurate	Accuracy of the Eyeglasses — Accurate	Accuracy of the Eyeglasses — Not Accurate	Workmanship of the Eyeglasses — Acceptable	Workmanship of the Eyeglasses — Not Acceptable
Recommend vision test?						
Yes	87	24	81	14	77	8
No	84	13	80	7	66	13
	$\chi^2 = 2.43$, n = 208		$\chi^2 = 2.03$, n = 182		$\chi^2 = 1.83$, n = 164	
Adequate eye health exam performed?						
Yes	67	15	64	11	60	4
No	105	21	97	11	84	17
	$\chi^2 = 0.09$, n = 208		$\chi^2 = 0.83$, n = 183		$\chi^2 = 4.31$[a], n = 165	
Confidence in the overall competency of OD?						
Yes	86	22	80	13	72	10
No	77	14	75	7	64	11
	$\chi^2 = 0.83$, n = 199		$\chi^2 = 1.30$, n = 175		$\chi^2 = 0.21$, n = 157	

[a] Significant at the 5% level.

ables and the three measures of technical quality are independent. The results also suggest that ADEQUATE (Does the consumer think an adequate eye health examination was performed?) is independent of two out of the three measures of technical quality.

The Relationship Between Technical Quality and Interpersonal Quality

The results presented in Table 7 suggest that consumers cannot use their evaluations of interpersonal quality as signals or indicators of the level of technical quality pro-

TABLE 7. Number of Eyeglass Patients by Technical Quality and Interpersonal Quality

	Technical Quality: Accuracy of the Prescription — Accurate	Accuracy of the Prescription — Not Accurate	Accuracy of the Eyeglasses — Accurate	Accuracy of the Eyeglasses — Not Accurate	Workmanship of the Eyeglasses — Acceptable	Workmanship of the Eyeglasses — Not Acceptable
Interpersonal quality						
Is the OD willing to spend time? (ODTIME)						
Yes	109	25	101	13	92	10
No	61	10	58	9	51	11
	$\chi^2 = 0.70$, n = 205		$\chi^2 = 0.16$, n = 181		$\chi^2 = 2.11$, n = 164	

TABLE 8. Correlation Coefficients for Price and Measures of Quality

Quality Dimension	Price of Examination and Glasses
Technical quality	
Accuracy of the prescription (RXOK)	0.03 (n = 212)
Accuracy of the eyeglasses (ACGLOK)	−0.04 (n = 187)
Workmanship of the eyeglasses (WRKGLOK)	0.10 (n = 169)
Interpersonal quality	
ODTIME	0.19[a] (n = 224)
Patient satisfaction	
CONFID	0.21[a] (n = 218)
ADEQUATE	0.22[a] (n = 227)
RECOMMEND	0.18[a] (n = 228)
Process of care	
THOROUGH1	0.25[a] (n = 235)
THOROUGH2	0.29[a] (n = 235)

[a] Significant at the 1% level.

vided. Consumer's judgments of interpersonal quality, measured as the consumer's assessment of whether the optometrist was willing to spend time to examine his/her eyes thoroughly and explain the findings, appeared to be independent of the level of technical quality. We cannot reject the null hypothesis that ODTIME is independent of the three measures of technical quality.

The Relationship Between Prices and Interpersonal and Technical Quality

The data support the hypothesis that health care consumers faced with the decision of which physician to select, make more informed trade-offs between price and interpersonal quality than between price and technical quality. The numbers presented in Table 8 suggest that the total price of the eye examination and eyeglasses is positively correlated with the measure of interpersonal quality, the three measures of patient satisfaction, and the two measures of the processes of care, but uncorrelated with the three measures of technical quality.

The numbers presented in Table 9 suggest that consumers who receive their care from optometrists who are judged to provide high interpersonal quality pay significantly more for their care than other consumers. Consumers who reported that their optometrist was willing to spend time paid $89.91, on average, while consumers who reported that their optometrist was not willing to spend time paid only $76.39, on average. This difference is statistically significant at the 1% level, using a two-tailed test. Further, consumers who were confident in the competency of their optometrist paid approximately 7.5% higher prices than consumers who were not confident. Consumers who responded that they received an adequate

TABLE 9. Means of Price by Quality Dimensions

Quality Dimension	Total Price ($)
Technical quality	
Workmanship of eyeglasses (n = 169)	
Accurate	80.95
Not accurate	76.89
Accuracy of eyeglasses (n = 187)	
Accurate	80.23
Not accurate	81.93
Accuracy of prescription (n = 212)	
Accurate	79.85
Not Accurate	78.81
Interpersonal quality	
OD willing to spend time? (n = 224)	
Yes	81.91[a]
No	76.39
Patient satisfaction	
Confidence in competency of OD? (n = 218)	
Yes	82.53[a]
No	76.79
Adequate eye health exam performed? (n = 227)	
Yes	83.45[a]
No	77.23
Recommend for vision testing for RX? (n = 228)	
Yes	81.95[b]
No	77.15

[a] Difference is statistically significant at 1% level, 2-tailed test.

[b] Difference is statistically significant at 5% level, 2-tailed test.

eye health exam paid approximately 8.1% higher prices. Consumers who would recommend the optometrist to a family member or friend paid approximately 6.2% higher prices. These differences are statistically significant at the 1% or 5% level, using a two-tailed test.

However, the price differences were not statistically significant for the three measures of technical quality. Consumers who received accurate eyeglass prescriptions, accurate eyeglasses, and eyeglasses with acceptable workmanship paid prices similar to the prices paid by consumers who received inaccurate eyeglass prescriptions, inaccurate eyeglasses, and eyeglasses with unacceptable workmanship.

Discussion

Not surprisingly, patient or consumer satisfaction appears to be related to the process of care measured as the thoroughness of the eye examination. The "patients" or survey interviewers involved in the FTC experiment were specially trained to identify components of an eye examination. However, the other results are more striking and have important implications for private and public policy. First, consumer satisfaction does *not* appear to be related to technical quality, even for these specially trained (more informed) consumers of eye care.

Second, market-determined prices do appear to be positively related to interpersonal quality, patient satisfaction, and the process of care. As the first result would suggest, market-determined prices do *not* appear to be related to technical quality. Consumers appear unable to make informed decisions about the tradeoffs between price and technical quality. However, consumers do appear able to make informed decisions about the tradeoffs between price and the other dimensions of health care quality that they seem better able to evaluate.

These results provide empirical support for the hypothesis that increasing comparative information about providers' qualities of care may partly ameliorate the market failure due to asymmetric information between consumers and providers. Further, these results suggest that consumers need the most help in the area of evaluation of technical quality. Public and private attempts to develop information systems for health care consumers should include measures of technical quality.

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