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# Abstracts: Jefferson Longitudinal Study of Medical Education, 3rd edition [full volume]

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# A B S T R A C T S

## Jefferson Longitudinal Study of Medical Education

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This book is dedicated to her.

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Cover illustration depicts the triple roles of physicians as clinicians, educators, and managers.

# CONTENTS

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	<i>Page</i>
<b>INTRODUCTION</b> .....	<i>17</i>
<b>1 ADMISSIONS</b>	
1.1 STANDARDIZED TESTS .....	<i>25</i>
1.2 ACADEMIC PREPARATION .....	<i>35</i>
<b>2 JEFFERSON EVALUATIONS</b>	
2.1 PRECLINICAL .....	<i>47</i>
2.2 CLINICAL .....	<i>53</i>
<b>3 POSTGRADUATE AND CAREER</b>	
3.1 CLINICAL COMPETENCE .....	<i>69</i>
3.2 SPECIALIZATION & PROFESSIONAL ACTIVITIES .....	<i>85</i>
<b>4 DEMOGRAPHICS</b> .....	<i>121</i>
<b>5 PSYCHOSOCIAL ATTRIBUTES</b> .....	<i>135</i>
<b>6 PROFESSIONALISM</b> .....	<i>163</i>
<b>7 LIST OF PUBLICATIONS</b> .....	<i>183</i>

# TABLE OF CONTENTS

---

Introduction . . . . .	Page 18
------------------------	------------

## 1 ADMISSIONS

### 1.1 STANDARDIZED TESTS

Science, Verbal, or Quantitative Skills: Which Is the Most Important Predictor of Physician Competence? <i>Glaser K, Hojat M, Veloski JJ, Blacklow RS, Goepf CE . . . . .</i>	26
A Validity Study of the Writing Sample Section of the Medical College Admission Test <i>Hojat M, Erdmann JB, Veloski JJ, Nasca TJ, Callahan CA, Julian E, Peck J . . . . .</i>	27
Predictive Validity of the MCAT for Students with Two Sets of Scores <i>Hojat M, Veloski JJ, Zeleznik C. . . . .</i>	28
Delays in Completing Medical School: Predictors and Outcomes <i>Rosenfeld LM, Hojat M, Veloski JJ, Blacklow RS, Goepf CE . . . . .</i>	29
The Overall Validity of the New MCAT <i>Veloski JJ, Hojat M, Zeleznik C. . . . .</i>	30
Predictive Validity of the MCAT as a Function of Undergraduate Institutions <i>Zeleznik C, Hojat M, Veloski JJ. . . . .</i>	31
Long-Range Predictive and Differential Validities of the Scholastic Aptitude Test in Medical School <i>Zeleznik C, Hojat M, Veloski JJ. . . . .</i>	32
The Relationship Between MCAT Science Subtest Scores and Performance in Medical School: The Impact of the Undergraduate Institution <i>Zeleznik C, Veloski JJ, Conly S, Hojat M. . . . .</i>	33

### 1.2 ACADEMIC PREPARATION

Reexamination of Relationships Between Students' Undergraduate Majors, Medical School Performances, and Career Plans at Jefferson Medical College <i>Ashikawa H, Hojat M, Zeleznik C, Gonnella JS . . . . .</i>	36
The Jefferson-Penn State B.S. - M.D. Program: A 26-Year Experience <i>Callahan CA, Veloski JJ, Gang Xu, Hojat M, Zeleznik C, Gonnella JS . . . . .</i>	37
Evaluation of an Enrichment Programme for Entering Medical Students Predicted to be in Need of Academic Preparation <i>Glaser K, Hojat M, Callahan CA. . . . .</i>	38
Premedical Training, Personal Characteristics and Performance in Medical School <i>Herman MW, Veloski JJ. . . . .</i>	39
Postbaccalaureate Preparation and Performance in Medical School <i>Hojat M, Blacklow RS, Robeson MR, Veloski JJ, Borenstein BD. . . . .</i>	40
Evaluation of a Selective Medical School Admissions Policy to Increase the Number of Family Physicians in Rural and Underserved Areas <i>Rabinowitz HK. . . . .</i>	41
A Program to Recruit and Educate Medical Students to Practice Family Medicine in Underserved Areas <i>Rabinowitz HK. . . . .</i>	42

Demographic, Educational and Economic Factors Related to Recruitment and Retention of Physicians in Rural Pennsylvania  
*Rabinowitz HK, Diamond JJ, Hojat M, Hazelwood CE* . . . . . 43

Using Postgraduate Clinical Performance to Monitor Change in the Medical School  
*Veloski JJ* . . . . . 44

Baccalaureate Preparation for Medical School: Does Type of Degree Make a Difference?  
*Zeleznik C, Hojat M, Veloski JJ* . . . . . 45

Levels of Recommendation for Students and Academic Performance in Medical School  
*Zeleznik C, Hojat M, Veloski JJ* . . . . . 46

**2 JEFFERSON EVALUATIONS**

**2.1 PRECLINICAL**

Curricular Reform May Improve Students' Performance on Externally Administered Comprehensive Examinations  
*Damjanov I, Fenderson BA, Hojat M, Rubin E* . . . . . 48

An Empirical Study of the Predictive Validity of Number Grades in Medical School Using 3 Decades of Longitudinal Data: Implications for a Grading System  
*Gonnella JS, Erdmann JB, Hojat M* . . . . . 49

The Fate of Medical Students with Different Levels of Knowledge: Are the Basic Medical Sciences Relevant to Physician Competence?  
*Hojat M, Gonnella JS, Erdmann JB, Veloski JJ* . . . . . 50

Sooner or Later? USMLE Step 1 Performance and Test Administration Date at the End of the Second Year  
*Pohl CA, Robeson MR, Hojat M, Rattner SL, Veloski JJ* . . . . . 51

Using Resident Competence Ratings to Evaluate NBME Passing Standards  
*Turner BJ, Hojat M, Gonnella JS* . . . . . 52

**2.2 CLINICAL**

Students' Ratings of Otolaryngology Clerkship Activities: The Role of Residents  
*Ashikawa H, Xu G, Veloski JJ* . . . . . 54

Validity of Faculty Ratings of Students' Clinical Competence in Core Clerkships in Relation to Scores on Licensing Examinations and Supervisors' Ratings in Residency  
*Callahan CA, Erdmann JB, Hojat M, Veloski JJ, Rattner SL, Nasca TJ, Gonnella JS* . . . . . 55

Subtest Scores of a Comprehensive Examination of Medical Knowledge as a Function of Retention Interval  
*Hojat M, Veloski JJ* . . . . . 56

Students' Gender and Examination of Patients in a Third-Year Family Medicine Clerkship  
*Louis DZ, Gottlieb J, Markham FW, Hojat M, Rabinowitz C, Gonnella JS* . . . . . 57

Evaluations of Medical Students' Clinical Experiences in a Family Medicine Clerkship: Differences in Patient Encounters by Disease Severity in Different Clerkship Sites  
*Markham FW, Rattner SL, Hojat M, Louis DZ, Rabinowitz C, Gonnella JS* . . . . . 58

# TABLE OF CONTENTS

---

USMLE Step 2 Performance and Test Administration Date in the Fourth Year of Medical School <i>Pohl CA, Robeson MR, Veloski JJ</i> . . . . .	59
A Comparison of the Modified Essay Question and Multiple Choice Question Formats: Their Relationships to Clinical Performance <i>Rabinowitz HK, Hojat M</i> . . . . .	60
Documenting and Comparing Medical Students' Clinical Experiences <i>Rattner SL, Louis DZ, Rabinowitz C, Gottlieb JE, Nasca TJ, Markham FW, Gottlieb RP, Caruso JW, Lane JL, Veloski JJ, Hojat M, Gonnella JS</i> . . . . .	61
Student Ratings of Clerkship Activities as a Basis for Curriculum Modification: A Four Year Comparison of Six Departments <i>Rodgers JS, Veloski JJ, Moses SL</i> . . . . .	62
Evaluation of the Surgical Clerkship Experience in Affiliated Hospitals: Performance on Objective Examinations <i>Schwartz GF, Veloski JJ, Gonnella JS</i> . . . . .	63
Do Global Rating Forms Enable Program Directors to Assess the ACGME Competencies? <i>Silber CG, Nasca TJ, Paskin DL, Eiger G, Robeson MR, Veloski JJ</i> . . . . .	64
A Preliminary Study of the Validity of Scores and Pass/Fail Standards for USMLE Steps 1 and 2 <i>Swanson DB, Case SM, Waechter D, Veloski JJ, Hasbrouck C, Friedman M, Carline J, Maclaren C</i> . . . . .	65
Attendings' and Residents' Teaching Role and Students' Overall Rating of Clinical Clerkships <i>Xu G, Brigham TP, Veloski JJ, Rodgers JF</i> . . . . .	66
Influence of Previous Clerkship Experiences on Students' Satisfaction with Their Current Clerkship <i>Xu G, Veloski JJ</i> . . . . .	67
A Correlation Study of Students' Perception of Their Active Role as Related to Their Clerkship Experiences <i>Xu G, Veloski JJ, Brigham TP</i> . . . . .	68
<b>3 POSTGRADUATE AND CAREER</b>	
<b>3.1 CLINICAL COMPETENCE</b>	
Class Ranking Models for Deans' Letters and Their Psychometric Evaluation <i>Blacklow RS, Goepf CE, Hojat M</i> . . . . .	70
Further Psychometric Evaluations of a Class Ranking Model as a Predictor of Graduates' Clinical Competence in the First Year of Residency <i>Blacklow RS, Goepf CE, Hojat M</i> . . . . .	71
Relationship between Performance in Medical School and Postgraduate Competence <i>Gonnella JS, Hojat M</i> . . . . .	72
The Role of Resident Performance Evaluation in Board Certification <i>Gonnella JS, Hojat M, Erdmann JB, Veloski JJ</i> . . . . .	73
A Case of Mistaken Identity: Signal and Noise in Connecting Performance Assessments Before and After Graduation from Medical School <i>Gonnella JS, Hojat M, Erdmann JB, Veloski JJ</i> . . . . .	74
What Have We Learned and Where Do We Go From Here? <i>Gonnella JS, Hojat M, Erdmann JB, Veloski JJ</i> . . . . .	75

Measuring the Contribution of Medical Education to Patient Care: A Review  
*Gonnella JS, Hojat M, Veloski JJ, Zeleznik C* ..... 76

Social Responsibilities of Medical Schools  
*Gonnella JS, Veloski JJ, Xu G, Hojat M* ..... 77

Validity and Importance of Low Ratings Given to Medical School Graduates in Noncognitive Areas  
*Herman MW, Veloski JJ, Hojat M* ..... 78

Cognitive and Noncognitive Factors in Predicting the Clinical Performance of Medical School Graduates  
*Hojat M, Borenstein BD, Veloski JJ* ..... 79

Is the Glass Half Full or Half Empty? A Reexamination of the Associations between Assessment Measures during Medical School and Clinical Competence after Graduation  
*Hojat M, Gonnella JS, Veloski JJ, Erdmann JB* ..... 80

Components of Clinical Competence Ratings of Physicians: An Empirical Approach  
*Hojat M, Veloski JJ, Borenstein BD* ..... 81

Conceptualization and Measurement of Clinical Competence of Residents: A Brief Rating Form and its Psychometric Properties  
*Nasca TJ, Gonnella JS, Hojat M, Veloski JJ, Erdmann JB, Robeson MR, Brigham TP, Callahan CA* ..... 82

Relationships Between Performance in Medical School and First Postgraduate Year  
*Veloski JJ, Herman MW, Gonnella JS, Zeleznik C, Kellow WF* ..... 83

A Validity Study of Part III of the National Board Examination  
*Veloski JJ, Hojat M, Gonnella JS* ..... 84

3.2 SPECIALIZATION & PROFESSIONAL ACTIVITIES

Correlates of Young Physicians' Support for Unionization to Maintain Professional Influence  
*Collier VU, Hojat M, Rattner SL, Gonnella JS, Erdmann JB, Nasca TJ, Veloski JJ* ..... 86

Stability and Change of Interest in Obstetrics-Gynecology among Medical Students: Eighteen Years of Longitudinal Data  
*Forouzan I, Hojat M* ..... 87

Medical Education and Health Services Research: The Linkage  
*Gonnella JS, Callahan CA, Louis DZ, Hojat M, Erdmann JB* ..... 88

The Impact of Early Career Specialization on Licensing Requirements and Related Educational Implications  
*Gonnella JS, Hojat M, Erdmann JB, Veloski JJ* ..... 89

The Impact of Early Specialization on the Clinical Competence of Residents  
*Gonnella JS, Veloski JJ* ..... 90

Should Half of All Medical School Graduates Enter Primary Care? Perceptions of Faculty Members at Jefferson Medical College  
*Gottlieb J, Fields SK, Hojat M, Veloski JJ* ..... 91

Family Medicine and Primary Care: Trends and Student Characteristics  
*Herman MW, Veloski JJ* ..... 92



## TABLE OF CONTENTS

---

Primary Care and Non-Primary Care Physicians: A Longitudinal Study of Their Similarities, Differences, and Correlates Before, During, and After Medical School <i>Hojat M, Gonnella JS, Erdmann JB, Veloski JJ, Xu G</i> . . . . .	93
Jefferson Medical College Longitudinal Study: A Prototype for Evaluation of Changes <i>Hojat M, Gonnella JS, Veloski JJ, Erdmann JB</i> . . . . .	94
Differences in Professional Activities, Perceptions of Professional Problems, and Practice Patterns between Men and Women Graduates of Jefferson Medical College <i>Hojat M, Gonnella JS, Veloski JJ, Moses SL</i> . . . . .	95
A Program to Increase the Number of Family Physicians in Rural and Underserved Areas: Impact after 22 Years <i>Rabinowitz HK, Diamond JJ, Markham FW, Hazelwood CE</i> . . . . .	96
Critical Factors for Designing Programs to Increase the Supply and Retention of Rural Primary Care Physicians <i>Rabinowitz HK, Diamond JJ, Markham FW, Paynter NP</i> . . . . .	97
Who is a Generalist? An Analysis of Whether Physicians Trained as Generalists Practice as Generalists <i>Rabinowitz HK, Hojat M, Veloski JJ, Rattner SL, Robeson MR, Xu G, Appel MH, Cochran C, Jones RL, Kanter SL</i> . . . . .	98
A Statewide System to Track Medical Students' Careers: The Pennsylvania Model <i>Rabinowitz HK, Veloski JJ, Aber RC, Adler S, Ferretti S, Kelliher GJ, Mochen E, Morrison G, Rattner SL, Sterling G, Robeson MR, Hojat M, Xu G</i> . . . . .	99
Development and Implementation of a Longitudinal Tracking System for Medical School Graduates <i>Rabinowitz HK, Veloski JJ, Robeson MR, Xu G, Hojat M</i> . . . . .	100
Generalist Career Plans: Tracking Medical School Seniors through Residency <i>Rabinowitz HK, Xu G, Robeson MR, Hojat M, Rattner SL, Appel MH, Cochran C, Johnson JJ, Kanter SL, Veloski JJ</i> . . . . .	101
Assessment of Physicians' Interest in Primary Care Training/Retraining <i>Rattner SL, Robeson MR, Veloski JJ</i> . . . . .	102
Changing Specialties: Do Anesthesiologists Differ from Other Physicians? <i>Seltzer JL, Veloski JJ</i> . . . . .	103
Academic Performance of Psychiatrists Compared to Other Specialists Before, During, and After Medical School <i>Sierles FS, Vergare MJ, Hojat M, Gonnella JS</i> . . . . .	104
Performance on the NBME Part II Examination and Career Choice <i>Williams T, Sachs L, Veloski JJ</i> . . . . .	105
Medical Students Who Enter General Surgery Residency Programs: A Follow-Up Between 1972 and 1986 <i>Wolfson PJ, Robeson MR, Veloski JJ</i> . . . . .	106
Perceptions of Practice Problems Encountered by Family Physicians, Pediatricians and Orthopedic Surgeons <i>Xu G, Brigham TP, Veloski JJ, Rodgers JF</i> . . . . .	107
Primary Care and Nonprimary Care Physicians' Concerns in Practice and Perceptions of Medical School Curriculum <i>Xu G, Hojat M, Brigham TP, Robeson MR, Veloski JJ</i> . . . . .	108

Factors Associated with Changing Levels of Interest in Primary Care During Medical School  
*Xu G, Hojat M, Brigham TP, Veloski JJ* ..... 109

Emergency Medicine Career Change: Associations with Performances in Medical School and in the First Postgraduate Year and with Indebtedness  
*Xu G, Hojat M, Veloski JJ* ..... 110

The Changing Healthcare System: A Research Agenda for Medical Education  
*Xu G, Hojat M, Veloski JJ, Gonnella JS* ..... 111

A National Study of the Factors Influencing Men and Women Physicians' Choices of Primary Care Specialties  
*Xu G, Rattner SL, Veloski JJ, Hojat M, Fields SK, Barzansky B* ..... 112

Comparing the Academic Performances of Geriatricians and Other Family Physicians and Internists  
*Xu G, Veloski JJ* ..... 113

Factors Influencing Physicians' Decisions to Remain in Emergency Medicine  
*Xu G, Veloski JJ* ..... 114

A Comparison of Jefferson Medical College Graduates Who Chose Emergency Medicine with Those who Chose Other Specialities  
*Xu G, Veloski JJ* ..... 115

Comparisons Among Three Types of Generalist Physicians: Personal Characteristics, Medical School Experiences, Financial Aid, and Other Factors Influencing Career Choice  
*Xu G, Veloski JJ, Barzansky B, Hojat M, Diamond JJ, Silenzio VMB* ..... 116

Changing Interest in Family Medicine and Students' Academic Performance  
*Xu G, Veloski JJ, Hojat M* ..... 117

Physicians' Intention to Stay In or Leave Primary Care Specialties and Variables Associated with Such Intention  
*Xu G, Veloski JJ, Hojat M, Fields SK* ..... 118

Factors Influencing Primary Care Physicians' Choice to Practice in Medically Underserved Areas  
*Xu G, Veloski JJ, Hojat M, Politzer RM, Rabinowitz HK, Rattner SL* ..... 119

**4 DEMOGRAPHICS**

Gender Segregation by Specialty During Medical School  
*Boulis A, Jacobs J, Veloski JJ* ..... 122

Comparing the Accuracies of Entire-Group and Subgroup Model to Predict NBME I Scores  
*Erdmann JB, Hojat M, Veloski JJ* ..... 123

African American and White Physicians: A Comparison of Satisfaction with Medical Education, Professional Careers and Research Activities  
*Gartland J, Hojat M, Christian EB, Callahan CA, Nasca TJ* ..... 124

Performance and Career Expectations of Women Medical Students: A Comparison with Men  
*Herman MW, Veloski JJ* ..... 125

Gender Comparisons of Medical Students' Psychosocial Profiles  
*Hojat M, Glaser K, Xu G, Veloski JJ, Christian EB* ..... 126

## TABLE OF CONTENTS

---

Gender Comparisons of Income Expectations in the USA at the Beginning of Medical School During the Past Twenty-Eight Years <i>Hojat M, Gonnella JS, Erdmann JB, Rattner SL, Veloski JJ, Glaser K, Xu G. . . . .</i>	127
Gender Comparisons of Young Physicians' Perceptions of Their Medical Education, Professional Life, and Practice: A Follow-Up Study of Jefferson Medical College Graduates <i>Hojat M, Gonnella JS, Xu G. . . . .</i>	128
Gender Comparisons Prior To, During, and After Medical School Using Two Decades of Longitudinal Data at Jefferson Medical College <i>Hojat M, Robeson MR, Veloski JJ, Blacklow RS, Xu G, Gonnella JS. . . . .</i>	129
Change of Interest in Surgery During Medical School: A Comparison of Men and Women <i>Novielli K, Hojat M, Park PK, Gonnella JS, Veloski JJ. . . . .</i>	130
Prediction of Students' Performance on Licensing Examinations Using Age, Race, Sex, Undergraduate GPAs and MCAT Scores <i>Veloski JJ, Callahan CA, Xu G, Hojat M, Nash DB. . . . .</i>	131
A National Study of Factors Influencing Primary Care Career Choices Among Underrepresented-Minority, White, and Asian American Physicians <i>Xu G, Hojat M, Veloski JJ, Brose J. . . . .</i>	132
Board Certification: Associations with Physicians' Demographics and Performances During Medical School and Residency <i>Xu G, Veloski JJ, Hojat M. . . . .</i>	133
Longitudinal Comparison of the Academic Performances of Asian-American and White Medical Students <i>Xu G, Veloski JJ, Hojat M, Gonnella JS, Bacharach B. . . . .</i>	134
<b>5 PSYCHOSOCIAL ATTRIBUTES</b>	
Outcome Assessment of Economic Diversity in Medical School: Implication of Economic Background on Performance in Medical School and Beyond, Career Choice, Educational Debt, and Income Explanations <i>Cooter R, Xu G, Erdmann JB, Gonnella JS, Callahan CA, Hojat M. . . . .</i>	136
Characteristics of Medical Students Completing an Honors Program in Pathology <i>Fenderson BA, Hojat M, Damjanov I, Rubin E. . . . .</i>	137
Biotechnology and Ethics in Medical Education of the New Millennium: Physician Roles and Responsibilities <i>Gonnella JS, Hojat M. . . . .</i>	138
Medical Students' Opinions on Economic Aspects of the Healthcare System <i>Herman MW. . . . .</i>	139
Medical Students' Opinions Concerning the Healthcare System <i>Herman MW. . . . .</i>	140
Professional Attitudes and Interpersonal Relationships of Physicians: Are They a Problem? <i>Herman MW, Veloski JJ, Hojat M. . . . .</i>	141
Satisfaction with Early Relationships with Parents and Psychosocial Attributes in Adulthood: Which Parent Contributes More? <i>Hojat M. . . . .</i>	142

Perception of Maternal Availability in Childhood and Selected Psychosocial Characteristics in Adulthood  
*Hojat M.* . . . . . 143

Medical Students' Personal Values and Their Career Choices a Quarter-Century Later  
*Hojat M, Brigham TP, Gottheil E, Xu G, Glaser K, Veloski JJ* . . . . . 144

Students' Personality and Ratings of Clinical Competence in Medical School Clerkships: A Longitudinal Study  
*Hojat M, Callahan CA, Gonnella JS.* . . . . . 145

A Study of Psychometric Characteristics of Abridged Versions of Selected Psychological Measures Given to Medical School Students for the Purpose of Predicting Their Clinical Competence  
*Hojat M, Erdmann JB, Robeson MR, Damjanov I, Glaser K.* . . . . . 146

Associations Between Selected Psychosocial Attributes and Ratings of Physician Competence  
*Hojat M, Glaser KM, Veloski JJ.* . . . . . 147

Physicians' Perceptions of the Changing Healthcare System: Comparisons by Gender and Specialties  
*Hojat M, Gonnella JS, Erdmann JB, Veloski JJ, Louis DZ, Nasca TJ, Rattner SL* . . . . . 148

Medical Student's Cognitive Appraisal of Stressful Life Events as Related to Personality, Physical Well-Being, and Academic Performance: A Longitudinal Study  
*Hojat M, Gonnella JS, Erdmann JB, Vogel WH* . . . . . 149

Psychosocial Characteristics of Female Students in the Allied Health and Medical Colleges: Psychometrics of the Measures and Personality Profiles  
*Hojat M, Lyons K.* . . . . . 150

A Comparison of the Personality Profiles of Internal Medicine Residents, Physician Role Models, and the General Population  
*Hojat M, Nasca TJ, Magee M, Feeney K, Pascual R, Urbano F, Gonnella JS* . . . . . 151

Students' Psychosocial Characteristics as Predictors of Academic Performance in Medical School  
*Hojat M, Robeson MR, Damjanov I, Veloski JJ, Glaser K, Gonnella JS* . . . . . 152

Attitudes Toward Managed Care: A Brief Instrument to Measure Attitudes of Medical Students Towards Change in the Healthcare System  
*Hojat M, Veloski JJ, Gonnella JS, Erdmann JB, Rattner SL* . . . . . 153

Perceptions of Medical School Seniors of the Current Changes in the U.S. Healthcare System  
*Hojat M, Veloski JJ, Louis DZ, Xu G, Ibarra D, Gottlieb JE, Erdmann JB* . . . . . 154

Effects of Academic and Psychosocial Predictors of Performance in Medical School on Coefficients of Determination  
*Hojat M, Vogel WH, Zeleznik C, Borenstein BD.* . . . . . 155

How Much Do Medical Students Know About Physician Income?  
*Nicholson S* . . . . . 156

Correlates of Physicians' Endorsement of the Legalization of Physician-Assisted Suicide  
*Novielli K, Hojat M, Nasca TJ, Erdmann JB, Veloski JJ.* . . . . . 157

# TABLE OF CONTENTS

---

Intra- and Inter-Culture Comparisons of Personality Profiles of Medical Students in Argentina and in the United States  
*Rimoldi HJA, Raimondo R, Erdmann JB, Hojat M.* . . . . . 158

Income Expectations of First-year Students at Jefferson Medical College as a Predictor of Family Practice Specialty Choice  
*Rosenthal MP, Turner TN, Diamond JJ, Rabinowitz HK* . . . . . 159

Mindfulness-Based Stress Reduction Lowers Psychological Distress in Medical Students  
*Rosenzweig S, Reibel DK, Greeson JM, Brainard GC, Hojat M.* . . . . . 160

The Income Expectations of Medical Students in the Time Period 1970 to 1980  
*Veloski JJ, Zeleznik C, Hojat M.* . . . . . 161

Students' Certainty During Course Test-Taking and Performance on Clerkships and Board Exams  
*Zeleznik C, Hojat M, Goepf CE, Amadio P, Kowlessar D, Borenstein BD* . . . . . 162

## 6 PROFESSIONALISM

### (EMPATHY, INTERPROFESSIONAL COLLABORATION, LIFELONG LEARNING)

Comparisons of Nurses and Physicians on an Operational Measure of Empathy  
*Fields SK, Hojat M, Gonnella JS, Mangione S, Kane G, Magee M* . . . . . 164

Comparisons of Nurse Practitioners with Physicians on the Jefferson Scale of Physician Empathy  
*Hojat M, Fields SK, Gonnella JS* . . . . . 165

Attitudes Toward Physician-Nurse Alliance: Comparisons of Medical and Nursing Students  
*Hojat M, Fields SK, Rattner SL, Griffiths M, Cohen MJM, Plumb JD.* . . . . . 166

Psychometric Properties of an Attitude Scale Measuring Physician-Nurse Collaboration  
*Hojat M, Fields SK, Veloski JJ, Griffiths M, Cohen MJM, Plumb JD.* . . . . . 167

Empathy Scores in Medical School and Ratings of Empathic Behavior in Residency Training Three Years Later  
*Hojat M, Gonnella JS, Mangione S, Nasca TJ, Magee M.* . . . . . 168

Physician Empathy in Medical Education and Practice: Experience with the Jefferson Scale of Physician Empathy  
*Hojat M, Gonnella JS, Mangione S, Nasca TJ, Magee M.* . . . . . 169

Empathy in Medical Students as Related to Academic Performance, Clinical Competence, and Gender  
*Hojat M, Gonnella JS, Mangione S, Nasca TJ, Veloski JJ, Erdmann JB, Callahan CA, Magee M* . . . . . 170

Comparisons of American, Israeli, Italian and Mexican Physicians and Nurses on the Total and Factor Scores of the Jefferson Scale of Attitudes Toward Physician-Nurse Collaborative Relationships  
*Hojat M, Gonnella JS, Nasca TJ, Fields SK, Cicchetti A, Lo Scalzo A, Taroni F, Amicosante AMV, Macinati M, Tangucci M, Liva C, Ricciardi G, Eidelman S, Admi H, Geva H, Mashiach T, Alroy G, Alcorta-Gonzalez A, Ibarra D, Torres-Ruiz A.* . . . . . 171

The Jefferson Scale of Physician Empathy: Further Psychometric Data and Differences by Gender and Specialty at Item Level  
*Hojat M, Gonnella JS, Nasca TJ, Mangione S, Veloski JJ, Magee M.* . . . . . 172

## TABLE OF CONTENTS

---

Physician Empathy: Definition, Components, Measurement, and Relationship to Gender and Specialty <i>Hojat M, Gonnella JS, Nasca TJ, Mangione S, Vergare MJ, Magee M.</i> . . . . .	173
Developing an Instrument to Measure Attitudes Toward Nurses: Preliminary Psychometric Findings <i>Hojat M, Herman MW.</i> . . . . .	174
Relationships Between Scores of the Jefferson Scale of Physician Empathy (JSPE) and the Interpersonal Reactivity Index (IRI) <i>Hojat M, Mangione S, Kane GC, Gonnella JS.</i> . . . . .	175
The Jefferson Scale of Physician Empathy: Development and Preliminary Psychometric Data <i>Hojat M, Mangione S, Nasca TJ, Cohen MJM, Gonnella JS, Erdmann JB, Veloski JJ, Magee M.</i> . . . . .	176
An Empirical Study of Decline in Empathy in Medical School <i>Hojat M, Mangione S, Nasca TJ, Rattner SL, Erdmann JB, Gonnella JS, Magee M.</i> . . . . .	177
Attitudes Toward Physician-Nurse Collaboration: A Cross-Cultural Study of Male and Female Physicians and Nurses in the United States and Mexico <i>Hojat M, Nasca TJ, Cohen MJM, Fields SK, Rattner SL, Griffiths M, Ibarra D, Alcorta-Gonzalez A, Torres-Ruiz A, Ibarra G, Garcia A</i> . . . . .	178
An Operational Measure of Physician Lifelong Learning: Its Development, Components and Preliminary Psychometric Data <i>Hojat M, Nasca TJ, Erdmann JB, Frisby AJ, Veloski JJ, Gonnella JS</i> . . . . .	179
Empathy in Medical Students as Related to Specialty Interest, Personality, and Perceptions of Mother and Father <i>Hojat M, Zuckerman M, Gonnella JS, Mangione S, Nasca TJ, Vergare MJ, Magee M.</i> . . . . .	180
Assessment of Empathy in Different Years of Internal Medicine Training <i>Mangione S, Kane GC, Caruso JW, Gonnella JS, Nasca TJ, Hojat M</i> . . . . .	181
Measuring Professionalism: A Review of Studies with Instruments Reported in the Literature Between 1982 and 2002 <i>Veloski JJ, Fields SK, Boex JR, Blank LL.</i> . . . . .	182
<b>LIST OF PUBLICATIONS</b> . . . . .	184

## **INTRODUCTION**

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# INTRODUCTION

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## History and Purpose of the Jefferson Longitudinal Study of Medical Education

Medical schools have a social responsibility to monitor the quality of their educational product. In particular, they are obligated to evaluate the effect of any change in the system of medical education (e.g., admissions policies, curriculum, evaluation standards). Assessment of educational outcomes must use empirical data based on a scientific methodology rather than anecdotal observations and personal opinion. Thus, outcome assessment of programs calls for a longitudinal study design that allows for the examination of changes from the beginning of undergraduate medical education, through completion of graduate medical education, and throughout the professional career. This was the spirit in which the Jefferson Longitudinal Study of Medical Education was initiated.

When the Jefferson Longitudinal Study of Medical Education was implemented in 1970, it was envisioned that a comprehensive longitudinal database of medical students and graduates could serve as a valuable source of information. Development of the plan was based on the notion that medical schools have a responsibility to evaluate their own graduates to assure the quality and effectiveness of their educational programs. The Study was implemented at a time when medical education research was still in its infancy and when most other medical schools were not eager to invest resources in such a huge undertaking, which promised few immediate rewards. The title of “longitudinal study” was chosen because of the intention to follow every student from medical school throughout one’s entire professional career.

Throughout the early 1970s, data on demographics, premedical academic performance, and performance measures in medical school were retrospectively collected for students who entered Jefferson Medical College beginning in 1964. The database expanded beginning with the entering class of 1966 (graduating class of 1970) to include measures of clinical competence at Jefferson and after graduation at the end of the first residency year. During the early phases, both retrospective data (for graduates prior to 1970) and prospective data (for students and graduates enrolled in 1970 and thereafter) were maintained in one comprehensive database. This database at the present time contains over 4 million pieces of data on more than 9,000 students and graduates. We believe it to be the most comprehensive, extensive, and uninterrupted database of medical students and graduates that is routinely updated and maintained in a single medical school. The Center for Research in Medical Education and Health Care at Jefferson is the headquarters of the Jefferson Longitudinal Study. Only authorized members of the professional staff of the Center have access to the longitudinal database. Recently, more medical schools than ever before have inquired about our Longitudinal Study, requesting copies of the questionnaires and information about how to set up a longitudinal study. Such outside interest indicates that the Jefferson longitudinal study can serve as a prototype for other medical schools’ longitudinal studies.

Recently the Accreditation Team that reviewed Thomas Jefferson University for the Middle States Commission on Higher Education for the University praised the Jefferson Longitudinal Study and made the following comment: “The Center for Research in Medical Education and Health Care and the Jefferson Medical College are to be commended for their academic interest in outcome data, responsiveness to faculty and department needs and the clear use of data to modify the curriculum and teaching environment...The Center for Research in Medical



Education and Health Care continues to track data from a large number of sources before, during and after student's tenure at the College. Their use of this data has impacted many components of the curriculum, the learning environment, individual student development, and program planning..."

The goals of the longitudinal study can be described in two words: service and research. Service is rendered to the college's administration, faculty, and academic committees by providing them with information to assist their decision making. Service is also provided to students and graduates by identifying those who may need remedial assistance to perform at their fullest potential. Information from the database is also used in conducting research. The four specific goals can be stated as follows:

1. To provide information to the College's administration, for example, by preparing statistics for the College's annual report; by retrieving information on individual student's performance compared to class performance for inclusion in the Dean's letter of recommendation; by assessing the College's educational programs and policies; by preparing self-evaluation information as requested by the Liaison Committee on Medical Education for accreditation; and by responding to inquiries on academic departments and students' performance.
2. To provide objective information to the College's academic committees (e.g., Admissions, Student Promotion, Curriculum) .
3. To provide up-to-date information to faculty advisors and to prepare predictions about students who may be in need of supplementary education, in order to better prepare them for licensure examinations and the challenges of medical school.
4. To address empirically and systematically a variety of complex and contemporary issues raised by educators in general and by medical educators in particular.

### **The Scope of the Database**

The information encoded in the database has been routinely updated. Depending upon whether an issue in medical education becomes contemporary or obsolete, variables have been added or deleted. Despite this dynamic nature, there are some central constructs (e.g., performance measures prior to, during, and beyond medical school) and corresponding variables that have remained relatively unaltered. Examples of such variables are performance scores on the nationally administered standardized tests or examinations taken before medical school (e.g., the Scholastic Aptitude Test [SAT], the Medical College Admission Test [MCAT]), during medical school (e.g., licensing examinations), and after medical school (e.g., licensing and board certification). An important feature is the clinical competence ratings made at the end of the first year of residency training. This point in time was chosen to minimize the inevitable effect of the residency experience on performance when studying the impact of the medical school experience. Furthermore, at this point, the directors of residency programs, or the raters, would have had sufficient opportunities to observe a resident's professional behavior in a variety of clinical situations to make an informed judgment.

## INTRODUCTION

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All the variables in the longitudinal database can be grouped into three categories:

1. Data before education at Jefferson, which include demographic, academic, and other admissions data.
2. Data during education at Jefferson, which include course grades, yearly grade point averages, ratings of clinical competence in the third-year clerkships, hospitals of clerkships, performance on Steps 1 and 2 of the United States Medical Licensing Examinations (USMLE, formerly the National Board of Medical Examiners' examinations), coded reasons for any change in academic status (transfer, dismissal, delayed graduation), and responses to the entrance and exit questionnaires on attitudes, personal characteristics, future plans, and preferences.
3. Data after graduation from Jefferson, which include geographic areas and hospitals of residency, specialties pursued in residency, ratings of postgraduate clinical competence, performance on Step 3 of the USMLE (formerly Part III of the National Board of Medical Examiners' examination), geographic and specialty areas of practice after residency, board certification status, types of professional activities, faculty appointments, changes of practice and location, etc. In addition, the graduates' evaluation of their education at Jefferson, their professional concerns, perceived problems, types of activities, types of patients, and research productivities are solicited through questionnaires mailed to graduates five to ten years after medical school graduation. The scope of the longitudinal database is depicted in Figure 1.

### **Key Investigators and Contributors to the Jefferson Longitudinal Study**

The idea of a longitudinal study of medical students and graduates was initiated by Joseph S. Gonnella, M.D. in the late sixties based on a belief that medical schools should be obligated to evaluate their educational program and to assure that the competence, performance, and professional activities of the graduates meet the expected goals of medical schools. The idea was implemented in 1970, and since then Dr. Gonnella has been serving as the principal guardian of the Jefferson Longitudinal Study.

From 1969 to 1972, Elinor Prockop, Ph.D., helped to develop the study and the early versions of the student and graduate questionnaires. Between 1972 and 1983, Jon Veloski, M.S., as the director of the study, automated the study and at the same time broadened its scope by including more complete data on the academic performance of the medical students. In addition to technical improvement in data automation and instrumentation, he started to disseminate information from the longitudinal study through professional journals and meetings. From 1984 to the present, Mohammadreza Hojat, Ph.D., as the director of the study, has continued to refine the study's instruments and to expand the study to include information about students' psychosocial attributes and graduates' professional activities and patterns of practice. Dr. Hojat has served as a catalyst in the preparation of many peer-reviewed publications based on the Longitudinal Study.

Carter Zeleznik, Ph.D., and Mary Herman, Ph.D., both now retired, made substantial contributions to the design of the study's instrumentation and dissemination of the results. Maynard Reinke, M.S., started developing the state-of-the-art computer programs for data

entry, management, and maintenance, and Carol Rabinowitz, B.A., has continued to refine these programs and modify them when needed. Mary Robeson, M.S., has been active in many aspects of the longitudinal study. Gang Xu, Ph.D. (currently residing in China), when working with the Center, made significant contributions in the dissemination of studies using the longitudinal database.

The Longitudinal Study would have been impossible without the willingness of those who shared information with us. First and foremost, we gratefully appreciate the cooperation of thousands of our students and graduates who have participated in the study by completing our questionnaires. The offices of Admissions (current director, Clara A. Callahan, M.D.), Registrar (current director, David Clawson), and Alumni (current director, Phillip Marone, M.D.) have always been helpful in providing us with data. Professional organizations such as the Association of American Medical Colleges (AAMC) and the American Medical Association (AMA) have routinely and continuously provided us with information about our graduates. Finally, we would like to express our sincere appreciation to all the directors of residency programs in more than 570 hospitals and residency training institutions all over the United States who have completed our postgraduate rating form for our graduates.

### **Themes and Purposes of This Document**

The Jefferson Longitudinal Study has been used to address a variety of issues in medical education. Because of this variety, the grouping of the studies into homogeneous themes was not an easy task. After considering several options, we decided to classify them into six themes: 1. admissions (including subsections of standardized tests and academic preparation for medical school); 2. Jefferson evaluations (including subsections of preclinical and clinical components); 3. Postgraduate and career data (including subsections of clinical competence and career specialization); 4. Demographics (including sex, age, and ethnicity); 5. Psychosocial attributes (including personality and other personal qualities); and 6. Professionalism (including empathy, interprofessional collaboration, and lifelong learning).

The themes and their subsections are not mutually exclusive. Therefore, some of the abstracts could be included in more than one theme or subsection. Despite this overlap, each abstract appears only once, based on the focus of the study. Abstracts of the studies that have been published in professional journals are presented by alphabetic order of the authors' names in each subsection.

### **Productivity of the Jefferson Longitudinal Study of Medical Education**

The Jefferson Longitudinal Study of Medical Education has been the most productive longitudinal study of medical students and graduates of a single medical school. This longitudinal study has resulted in 155 publications in peer review journals that are listed in bibliography section at the end of this book. Many of those studies were presented before national or international professional meetings prior to their publication. Also, data from our longitudinal study were also used in a doctoral dissertation, completed by Dr. Mitra Farzaneh at Purdue University in 1985.

## INTRODUCTION

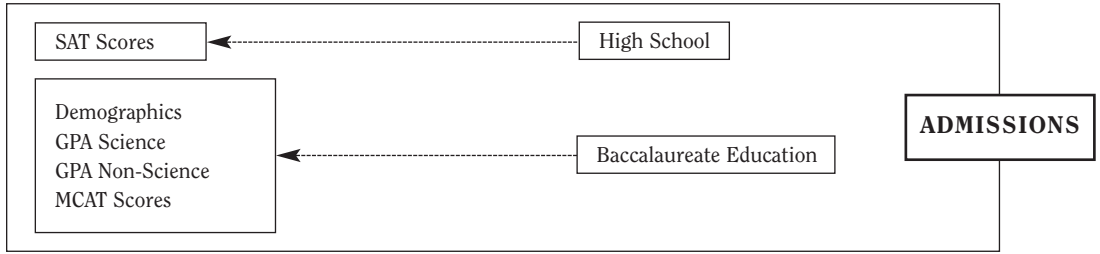
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We and a colleague (James B. Erdmann, Ph.D.) in 1993 served as the invited editors for a thematic issue of *Academic Medicine* on “*Assessment Measures in Medical School, Residency, and Beyond: The Connections*” (*Academic Medicine*, Supplement No. 2, Volume 68, February 1993). In addition to Jefferson, four other medical schools and the National Board of Medical Examiners used their longitudinal data to address the significant link between performance measures in the first two years of medical school and indicators of clinical competence after completing medical school. This supplement subsequently was published as an independent book by Springer Publishing. Also, in 1999 we served as the guest editors of a special section of the *Evaluation & the Health Professions* on the topic of “*Medical Education and the Changes in Health Care:*” (Volume 22, No. 2, June 1999). We were also invited to write a chapter on *Measuring Medical Professionalism* (Oxford University Press, 2005), edited by David Stern, M.D., Ph.D., of the University of Michigan, in which we describe the three scales we developed in our center (*Jefferson Scale of Physician-Nurse Collaboration, Jefferson Scale of Physician Empathy, and Jefferson Scale of Physician Lifelong Learning*) as measures of elements of professionalism. These three instruments for measuring aspects of professionalism in medicine have attracted the attention of many researchers, evident by the number of requests we have been receiving to use the scales in the United States and abroad.

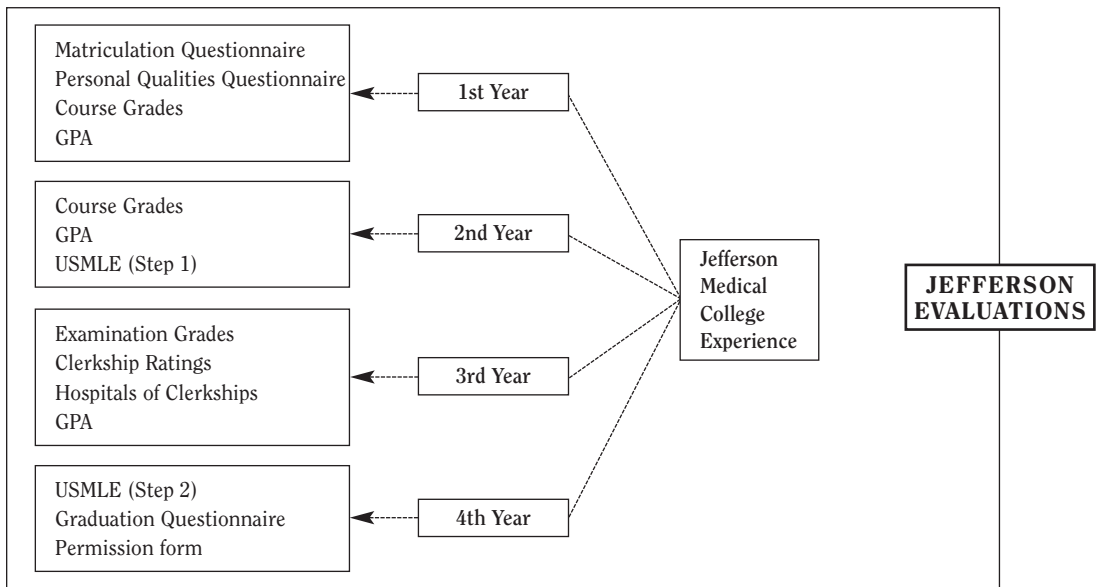
We frequently receive requests for information on our longitudinal study and its findings from other medical schools, residency program directors, our graduates, and other physicians in the United States and abroad. This report was prepared in response to those requests. Also, it will serve as feedback to our graduates who have cooperated with us in completing our questionnaires and forms during medical school and beyond. Abstracts of these studies are presented to help others asking questions similar to those addressed in these studies. We hope this report will, first, provide readers with an appreciation of the value of longitudinal studies in tracking students and graduates and, second, answer some of their questions and raise further questions regarding medical education, leading to further research. After all, there can be no end to scientific inquiry.

**FIGURE 1: SCOPE OF THE DATABASE OF THE JEFFERSON LONGITUDINAL STUDY**

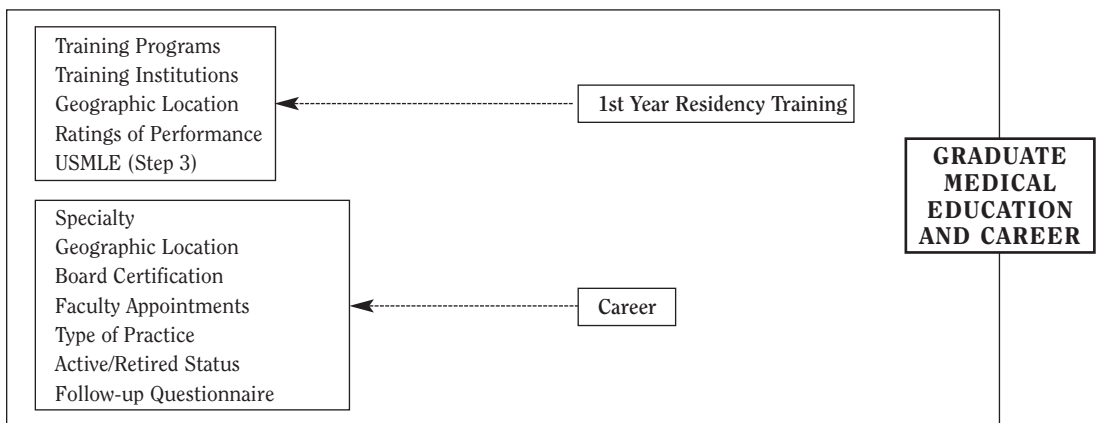
**Data Before Medical School**



**Data During Medical School**



**Data After Medical School**



# **ADMISSIONS**

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STANDARDIZED TESTS

**SCIENCE, VERBAL, OR QUANTITATIVE SKILLS: WHICH IS THE MOST IMPORTANT PREDICTOR OF PHYSICIAN COMPETENCE?**

*Karen Glaser, Mohammadreza Hojat, J. Jon Veloski, Robert S. Blacklow, Carla E. Goepf*

The relative importance of medical school applicants' science problem solving, reading, and quantitative skills as measured by the Medical College Admission Test (MCAT) was studied in predicting competence measured by the three parts of the National Board Examinations (NBE). Subjects were 1,628 physicians graduated from Jefferson Medical College between 1978 and 1985. The results of bivariate and multiple correlations indicated that scores on the science problems subtest were better predictors of the basic science component of physician education (Part I scores of the NBE) than were the reading scores. Both the science problems and reading skills predicted clinical science scores equally well (Part II scores of the NBE). Reading skills scores contributed more than the science problems subtest in predicting scores on an examination of patient management skills (Part III of the NBE). Scores of the quantitative skills subtest did not contribute to any prediction. These findings suggest that the great emphasis placed by medical school admissions committees on science problem solving scores of the MCAT is justifiable if performance in the basic science component of medical education is taken as the target outcome measure. However, if clinical skills in medical practice are taken as a target criterion, then at least equal emphasis should be placed on reading skills scores of the MCAT. It is discussed that there may be a potential value in improving the reading skills of medical school students in order to enhance their clinical and patient management competence. Implications of these findings in support of the new MCAT are discussed.

*Educational and Psychological Measurement. 1992; 52(2):395-405.*

**A VALIDITY STUDY OF THE WRITING SAMPLE SECTION OF  
THE MEDICAL COLLEGE ADMISSION TEST**

*Mohammadreza Hojat, James B. Erdmann, J. Jon Veloski, Thomas J. Nasca,  
Clara A. Callahan, Ellen Julian, Jeremy Peck*

**Problem Statement and Background:** This study examined the validity of the Writing Sample section of the current Medical College Admission Test (MCAT) and tested the hypothesis that the Writing Sample scores would be more closely associated with indicators of clinical competence than with basic sciences achievement measures.

**Method:** In a longitudinal design, 1,776 matriculants at Jefferson Medical College between 1992 and 1999 were studied. Top, middle, and bottom scorers on the Writing Sample were compared on measures of performance in the basic and clinical sciences during medical school and beyond.

**Results:** The research hypothesis was supported. Scores on the Writing Sample were significantly associated with indicators of clinical competence, even when statistical adjustments were made for scores differences in other sections of the MCAT.

**Conclusions:** Findings support the validity of the Writing Sample from a number of perspectives.

*Academic Medicine. 2000; 75(October Supplement):S25-S27.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200010001-00008.pdf>



**PREDICTIVE VALIDITY OF THE MCAT FOR STUDENTS WITH TWO SETS OF SCORES**

*Mohammadreza Hojat, J. Jon Veloski, Carter Zeleznik*

This study addresses the question of which set of scores for those students who retake the Medical College Admission Test (MCAT) yields a better predictive validity. The sample was comprised of 304 students who retook the MCAT prior to entering Jefferson Medical College between 1978 and 1981. Five sets of MCAT scores were considered as predictors in the study: earlier, later, higher, and lower sets of MCAT scores and the average of the earlier and later scores for each MCAT subtest. Twenty-five criteria were used, including grades earned in the freshman and sophomore years and scores on the subtests of Part I and Part II of the examinations of the National Board of Medical Examiners. Correlational techniques, such as bivariate and multiple correlation analyses and canonical correlation followed by redundancy analysis, were utilized. The magnitude of redundancy indices indicated that the set of MCAT scores in which the earlier and later scores were averaged was the best predictor, followed by the earlier, lower, higher, and later sets of MCAT scores. The implications of these findings for the admissions process and for validity studies are discussed.

*Journal of Medical Education. 1985; 60:911-918.*

**DELAYS IN COMPLETING MEDICAL SCHOOL:  
PREDICTORS AND OUTCOMES**

*Leonard M. Rosenfeld, Mohammadreza Hojat, J. Jon Veloski, Robert S. Blacklow, Carla E. Goepf*

This study addresses whether delayed graduation due to academic difficulties in the early years of medical school can be predicted early and whether such difficulties are likely to be manifested in later clinical clerkships and residency. A group of 103 graduates who entered Jefferson Medical College between 1970 and 1984 and who required more than four years to complete their studies due to academic difficulties were compared with a random sample of 120 on-time graduates. Statistically significant differences were observed between delayed and on-time graduates on measures of performance before, during and after medical school in the favor of on-time graduates. Scores of 8 on the Medical College Admissions Test (MCAT) and an undergraduate science grade-point average of 3.25 were found to be pivotal points below which the likelihood of delayed graduation was higher than the likelihood of on-time graduation. Discriminant analysis indicated that 76% of delayed and on-time graduates could correctly be classified into their respective groups by using admissions variables. These findings suggest that predictors of delayed graduation can be detected early in medical school and that the academic difficulties that resulted in delayed graduation are likely to continue through postgraduate training. Recognition of the chronic nature of these differences should alert medical schools to monitor carefully the performance of students who are delayed because of academic difficulties and provide appropriate support on a continuing basis to enhance performance.

*Teaching and Learning in Medicine. 1992; 4(3):162-167.*

## THE OVERALL VALIDITY OF THE NEW MCAT

*J. Jon Veloski, Mohammadreza Hojat, Carter Zeleznik*

This study was designed to provide information about the overall relationship(s) between the new MCAT scales and selected measures of academic performance. The study sample was comprised of data on 213 students who matriculated at Jefferson Medical College in 1978. The data included, in addition to the new MCAT scales, course grades obtained in the freshman and sophomore years and scores achieved on Part I of the National Board Examinations. Three statistical correlation techniques were used in analyzing the data: simple, multiple and canonical correlation.

Approximately 46% of the variance in the new MCAT linear composites and Part I of the NBME were accounted for in the canonical correlations of  $R_{c1}=.61$  and  $R_{c2}=.38$ . Loadings of the canonical components indicated that the new MCAT scales measure performance in the science problems, chemistry, and physics as well as a verbally related dimension. Excluding the science problems, biology, chemistry, and physics from the global analysis did not change significantly the overall indices of relationships. The findings of this study support the validity of the new MCAT as an overall predictive measure of performance in the freshman and sophomore years of medical school.

*Proceedings of the Twentieth Annual Conference on Research in Medical Education, Washington, DC, November 1981; 129-134.*

**PREDICTIVE VALIDITY OF THE MCAT AS A FUNCTION  
OF UNDERGRADUATE INSTITUTIONS**

*Carter Zeleznik, Mohammadreza Hojat, J. Jon Veloski*

The question of whether the predictive ability of the Medical College Admission Test (MCAT) differed for students from different undergraduate institutions was addressed in this study. Two groups of students were studied: group 1 comprised 1,859 students who entered Jefferson Medical College between 1964 and 1977, and group 2 consisted of 999 students who entered the college between 1978 and 1982. Ten undergraduate institutions with at least 20 matriculants in each group were selected for analysis. Group 1 students had taken the old version and group 2 the new version of the MCAT. Scores on the Science subtest of the old MCAT were used as the predictor for group 1, and scores on the Science Problems subtest of the new MCAT were used as the predictor for group 2. First-year and second-year medical school grade-point averages and total scores on the Part I and Part II examinations of the National Board of Medical Examiners were the performance measures used. Validity coefficients were derived of the predictive value of the MCAT scores at each of the 10 undergraduate institutions. Striking differences were found in validity coefficients among these institutions. These differences raise questions about the predictive validity of the MCAT when scores for different undergraduate institutions are combined in deriving the coefficients. Possible explanations, implications for admissions decisions and validity studies, and limitations of these findings are discussed.

*Journal of Medical Education. 1987 ;62:163-169.*  
Reprinted in *The Advisor, 1987; 7(3):1-4.*

**LONG-RANGE PREDICTIVE AND DIFFERENTIAL VALIDITIES OF THE  
SCHOLASTIC APTITUDE TEST IN MEDICAL SCHOOL**

*Carter Zeleznik, Mohammadreza Hojat, J. Jon Veloski*

This study was designed to determine the predictive and differential validity of the Scholastic Aptitude Test (SAT). Data derived from a longitudinal study of 1,284 students who entered Jefferson Medical College in the years 1965 through 1974 were analyzed. The students were divided into four groups according to their earned scores on the verbal and quantitative scales of the SAT.

When analysis of variance was applied to the data, a significant relationship was found between SAT scores and academic achievement levels in medical school. Those students who scored high on the SAT achieved higher grades (scores) on the standardized measures of achievement and those who scored low on the SAT scored lower on the standardized measures. The validity of the SAT as a predictor of future academic performance was supported by our findings.

*Educational and Psychological Measurement. 1983; 43:223-232.*

**THE RELATIONSHIP BETWEEN MCAT SCIENCE SUBTEST SCORES  
AND PERFORMANCE IN MEDICAL SCHOOL: THE IMPACT  
OF THE UNDERGRADUATE INSTITUTION**

*Carter Zeleznik, J. Jon Veloski, Samuel Conly, Jr., Mohammadreza Hojat*

This study was designed to examine the validity of the Medical College Admission Test (MCAT) Science subtest as a predictor of student performance in medical school. Consideration was given to the undergraduate college attended by each student. Jefferson Medical College, in association with eight undergraduate institutions from which it accepts a large number of students, established a cooperative Longitudinal Study. Summary statistics were computed on mean MCAT scores, National Board Examination scores, and other performance measures. Data were collected on the students entering medical schools in the years 1965 through 1977, using the "old MCAT." Results obtained in this study indicated considerable variations in correlations between MCAT science scores and measures of medical school performances. The findings suggested that, based on the MCAT science scores and the undergraduate institution attended by the individual, it is possible to predict the degree of a student's success in some areas of medical school. It was concluded that the MCAT could be considered not a "nationally standardized" test but one requiring standardization in relation to many factors.

*Proceedings of the Nineteenth Annual Conference on Research in Medical Education, Washington, DC, October 1980; 257-262.*

# **ADMISSIONS**

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ACADEMIC PREPARATION

**REEXAMINATION OF RELATIONSHIPS BETWEEN STUDENTS'  
UNDERGRADUATE MAJORS, MEDICAL SCHOOL PERFORMANCES,  
AND CAREER PLANS AT JEFFERSON MEDICAL COLLEGE**

*Hidemichi Ashikawa, Mohammadreza Hojat, Carter Zeleznik, Joseph S. Gonnella*

A reexamination of the possible relationships between medical students' undergraduate academic majors and their medical school performances and career plans seems appropriate, given the continuing changes in the characteristics of the medical school applicant pool in the last several years. This study investigated these relationships by comparing cognitive and noncognitive characteristics of medical students who had different undergraduate majors. The study sample consisted of 812 students who entered Jefferson Medical College between 1985 and 1988. They were classified into six categories based on their undergraduate majors: biological, chemical and physical, social and behavioral, other sciences, humanities and arts, and indeterminate majors. Results indicated that performances in the basic science component of medical education were about the same for students with different undergraduate majors. The groups had similar rates of delayed graduation, but the attrition rate was highest for students who had majored in humanities and arts. The students in undergraduate disciplines traditionally oriented toward medicine (biological, physical, and chemical sciences) were younger and had made the decision to become a physician at earlier ages than had their counterparts with undergraduate majors in social sciences and humanities. Also, the groups differed with regard to their estimates of their future incomes and plans for professional activities after graduation. Similarities concerning the students' preferred professional activities were also noticed among the groups.

*Academic Medicine. 1991; 66:458-464.*



**THE JEFFERSON-PENN STATE B.S. - M.D. PROGRAM:  
A 26-YEAR EXPERIENCE**

*Clara A. Callahan, J. Jon Veloski, Gang Xu, Mohammadreza Hojat, Carter Zeleznik,  
Joseph S. Gonnella*

Since the 1960's a number of physicians have completed both their baccalaureate and their M.D. degrees in six or fewer years. In this longitudinal study the authors track the academic performances, clinical ratings, and career follow-up data of 659 students in one of these accelerated programs, the Jefferson Medical College—Pennsylvania State University B.S.–M.D. program, from entering years 1964 through 1989. The medical school performances, clinical performances in residencies, and rates of board certification and faculty appointment of the accelerated students compared favorably with those of a control group of medical students with similar high school credentials who had followed a four-year baccalaureate program. The authors conclude that a carefully chosen group of students can achieve high academic standards in an accelerated medical school program, graduate as younger physicians able to perform well in postgraduate training, and go on to highly productive careers in medicine.

*Academic Medicine. 1992; 67(11):792-797.*

*Reprinted (in Chinese) International Medicine. 1993; 3:137-183.*

**EVALUATION OF AN ENRICHMENT PROGRAMME FOR ENTERING MEDICAL STUDENTS PREDICTED TO BE IN NEED OF ACADEMIC PREPARATION**

*Karen Glaser, Mohammadreza Hojat, Clara A. Callahan*

**Purpose:** To evaluate a prematriculation enrichment programme offered to entering medical school students who were predicted to be in need of academic preparations.

**Methods:** A total of 585 students who entered Jefferson Medical College between 1988 and 1990 were divided into three groups: 70 were invited and completed the programme, 27 declined the invitation and 488 were not invited. Invitation was based on regression models predicting performance in medical school based on prior undergraduate grade point averages and medical college admission test scores.

**Results:** No significant differences were observed in the academic performance of students who completed the programme and those who declined to participate. The lack of such differences could be attributed to the greater age of those who participated. Participants expressed satisfaction with the programme.

**Conclusions:** A predicted risk model to identify students who are in need of additional academic preparation is an effective approach. There might be a 'sleeper effect' of the prematriculation programme, and therefore long-term evaluation of the programme was suggested.

*Education for Health. 1996; 9: 221-228.*

**PREMEDICAL TRAINING, PERSONAL CHARACTERISTICS  
AND PERFORMANCE IN MEDICAL SCHOOL**

*Mary W. Herman, J. Jon Veloski*

The study compares attrition rates and clinical competence levels of medical students with variations in premedical training, age, and sex to determine the risks attached. No differences were found in levels of clinical competence, although groups varied in average science scores on the Medical College Admission Test (MCAT). Students with non-science undergraduate majors scored lower on this test than did science majors. Younger women had relatively high attrition rates but high performance on the MCAT science subtest and medical school science courses. While the study shows that students who are older or younger than average may have more problems that are not strictly academic, no relationships were found between premedical training and clinical competence. It was concluded that all groups in the study were adequately prepared in the basic sciences for medical school. The risk of producing physicians who are not clinically competent would not be increased by accepting students with lower science scores.

*Medical Education. 1981; 15: 363-367.*

**POSTBACCALAUREATE PREPARATION AND PERFORMANCE  
IN MEDICAL SCHOOL**

*Mohammadreza Hojat, Robert S. Blacklow, Mary R. Robeson, J. Jon Veloski, Bette D. Borenstein*

The question whether postbaccalaureate preparation before matriculation in medical school contributes to medical students' performance was addressed by this study. A total of 610 (91%) of the students who entered Jefferson Medical College between 1985 and 1987 were the study sample. Fifty-eight of these students had taken nondegree undergraduate premedical courses and 15 had taken nondegree graduate courses. Fourteen students held graduate degrees and 60 students had some combination of the aforementioned types of postbaccalaureate preparations. The other 463 students had not taken postbaccalaureate courses. Grades received in medical school courses such as anatomy, biochemistry, mechanisms of disease, physiology, microbiology, pathology and pharmacology, as well as total scores on Part I of the National Board of Medical Examiners examination, were selected as performance variables.

Statistical analyses showed that the students who had taken nondegree postbaccalaureate courses had lower undergraduate grade-point averages than those without such courses and received lower grades on some measures of performance in medical school. The students with such additional academic backgrounds were also older than the average medical student. When adjustments were made for undergraduate grade-point averages by applying analysis of covariance, the observed differences that favored the group without postbaccalaureate preparation either became nonsignificant or favored those with such preparation. The differences favoring those without postbaccalaureate preparation could be accounted for mostly by these students' higher undergraduate grade-point averages and younger ages. Implications for admission decisions with regard to the changing applicant pool are discussed.

*Academic Medicine. 1990; 65:388-391.*

*Also in Proceedings of the Twenty-seventh Annual Conference on Research in Medical Education, Chicago, IL, November 1988; 310-315.*

**EVALUATION OF A SELECTIVE MEDICAL SCHOOL ADMISSIONS  
POLICY TO INCREASE THE NUMBER OF FAMILY PHYSICIANS IN  
RURAL AND UNDERSERVED AREAS**

Howard K. Rabinowitz

Jefferson Medical College initiated the Physician Shortage Area Program (PSAP) in 1974; this program preferentially admits medical school applicants from rural backgrounds who intend to practice family medicine in rural and underserved areas.

Evaluation of the program has shown that PSAP graduates from the classes of 1978 to 1985 have performed slightly less well than their peers (non-PSAP) during medical school, although there was no difference in attrition between the two groups. Nor did the performance of PSAP and non-PSAP graduates differ during their postgraduate training.

PSAP graduates from the classes of 1978 to 1981 were almost five times as likely as non-PSAP graduates to practice family medicine (59.6 vs 12.6 percent,  $P<0.001$ ), three times as likely to practice in rural areas (37.8 to 42.2 percent vs. 10.0 to 11.8 percent,  $P<0.001$ ), and two to four times as likely to practice in areas where there is a physician shortage (26.7 to 40.0 percent vs. 9.2 to 11.2 percent,  $P<0.01$ ). They were 7 to 10 times as likely as their peers to combine a career in family medicine with practice in a rural or underserved area (24.4 to 31.1 percent vs. 3.1 to 3.9 percent,  $P<0.001$ ), thereby fulfilling the goals of the PSAP.

This study concludes that the medical school admissions process can have a major influence on the specialty choice and geographic practice location of physicians, and suggests one mechanism for increasing the number of family physicians in rural and underserved areas.

*The New England Journal of Medicine.* 1988; 319:480-486.

*Also in Proceedings of the Twenty-sixth Annual Conference on Research in Medical Education, Washington, DC, November 1987; 157-162.*

**A PROGRAM TO RECRUIT AND EDUCATE MEDICAL STUDENTS TO  
PRACTICE FAMILY MEDICINE IN UNDERSERVED AREAS**

*Howard K. Rabinowitz*

In an attempt to address the problem of physician maldistribution, Jefferson Medical College initiated the Physician Shortage Area Program (PSAP) in 1974, a special admissions program that preferentially selects applicants who intend to practice family medicine in physician shortage areas in Pennsylvania. Forty-seven students in four classes have been graduated from the program. Evaluation of these students during medical school shows that their academic performance has been similar to their classmates. Follow-up evaluation indicates that PSAP graduates are five times as likely as their peers (non-PSAP) to enter a family medicine residency program during the first postgraduate year (62 percent versus 12 percent), and almost twice as likely to enter family medicine as a comparable group of non-PSAP students who originally entered Jefferson with plans of becoming a family physician (62 percent versus 33 percent).

*The Journal of the American Medical Association. 1983; 249(8):1038-1041.*

**DEMOGRAPHIC, EDUCATIONAL AND ECONOMIC FACTORS RELATED TO RECRUITMENT AND RETENTION OF PHYSICIANS IN RURAL PENNSYLVANIA**

*Howard K. Rabinowitz, James J. Diamond, Mohammadreza Hojat, Christina E. Hazelwood*

While prior studies have identified a number of factors individually related to physician practice in rural areas, little information is available regarding the relative importance of these factors or their relationship to rural retention. Extensive data previously collected from the Jefferson Longitudinal Study were analyzed for 1972-1992 graduates of Jefferson Medical College (JMC) practicing in Pennsylvania in 1996, as were recent self-reported perceptions of JMC graduates in rural practice. Rural background was overwhelmingly the most important independent predictor of rural practice, and freshman plans to enter family practice was the only other independent predictor. No other variable, including curriculum or debt, added significantly to the likelihood of rural practice. None of these variables, however, including rural background, were predictive of retention, which appeared to be more related to practice issues such as income and workload. The results suggest not only that increasing the number of physicians who grew up in rural areas is the most effective way to increase the number of rural physicians, but that any policy that does not include this may be unsuccessful.

*The Journal of Rural Health. 1999; 15:212-218.*

**USING POSTGRADUATE CLINICAL PERFORMANCE TO MONITOR  
CHANGE IN THE MEDICAL SCHOOL**

*J. Jon Veloski*

To study the impact of curricular changes and changes in admission policy upon the performance of Jefferson graduates, three stages of analysis were used to address each issue. The first stage was the multivariate analysis of variance comparing the appropriate groups simultaneously on four areas of competence, followed by one-way analysis of variance and post-hoc tests.

To determine the effect of an increase in the number of female medical school graduates, data were analyzed on all women entering Jefferson between 1966 and 1973. This group of female students was compared with a random sample of men matched with the year of entry, type of premedical program and ethnicity. Analysis of variance identified a difference between men and women only in the areas of professional attitudes. Twice as many female residents as male residents were rated in the top quarter on general effectiveness in dealing with people and nearly twice as many female residents were rated in the top quarter on being able to deal with patient and family tensions.

The accelerated premedical curriculum was examined to see whether or not there were deleterious effects resulting from a considerably shortened premedical education. The accelerated student group did not score as high as the control groups on general effectiveness in dealing with people or on the ability to handle patient/family tensions. The accelerated group did not rate in the top quarter on an item dealing with a sense of humor. Overall, the students entering medical school on an accelerated program showed no significant deficits in clinical effectiveness.

*Proceedings of the Eighteenth Annual Conference on Research in Medical Education,  
Washington, DC, 1979; 425.*



**BACCALAUREATE PREPARATION FOR MEDICAL SCHOOL: DOES TYPE OF DEGREE MAKE A DIFFERENCE?**

*Carter Zeleznik, Mohammadreza Hojat, J. Jon Veloski*

Four groups of medical school matriculants (43 with a B.A. degree in social science, 68 with a B.A. degree in the humanities, 49 with a B.A. degree in science, and 40 with a B.S. degree in science) were studied. No significant difference was found among the four groups on yearly grade point averages in medical school or on Parts I, II, and III of the Examinations of the National Board of Medical Examiners. Those with an undergraduate degree in the humanities considered leaving medical school more frequently than the others. A substantial proportion of medical students with an undergraduate major in the sciences and social sciences reported they would choose the humanities if they were once again high school seniors. Those with a science background were disproportionately more likely than the others to choose residencies in internal medicine and surgery, and those with undergraduate degrees in the humanities and social sciences were more likely to choose psychiatry residencies.

*Journal of Medical Education. 1983; 58:26-33.*

**LEVELS OF RECOMMENDATION FOR STUDENTS AND ACADEMIC  
PERFORMANCE IN MEDICAL SCHOOL**

*Carter Zeleznik, Mohammadreza Hojat, J. Jon Veloski*

Traditionally, letters of recommendation from undergraduate institutions have been considered a major criterion for admission to medical school. Little attention, however, has been directed to the relationship between the content of their recommendation and measures of performance in medical school. This study was designed to determine whether or not such a relationship exists.

Letters of recommendation for 236 students who came to Jefferson from five different undergraduate institutions were reviewed and the level of recommendation contained in each letter was identified. These were compared with the yearly GPA's, scores on three parts of the National Board Medical Examinations, and ratings of performance in the first year of residency training. Simple correlational, multiple regression, and factor analysis all indicated that the level of the recommendation did not contribute significantly to the ability to predict the medical student's academic performance.

*Psychological Reports. 1983; 52(3):851-858.*

# **JEFFERSON EVALUATIONS**

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PRECLINICAL

## CURRICULAR REFORM MAY IMPROVE STUDENTS' PERFORMANCE ON EXTERNALLY ADMINISTERED COMPREHENSIVE EXAMINATIONS

*Ivan Damjanov, Bruce A. Fenderson, Mohammadreza Hojat, Emanuel Rubin*

**Aim:** To determine whether changes in the format of teaching pathology and the introduction of active learning principles can improve medical students' performance on external examinations and enhance clinical skills.

**Method:** The sophomore Pathology Course at Jefferson Medical College (JMC) in Philadelphia, Pennsylvania, U.S.A., was completely restructured in 1986, with greater emphasis placed on independent study, small group teaching, and case study discussion. We used the scores of JMC medical students on the National Board of Medical Examiners (NBME) Part 1 Examination to compare the performance of JMC students who completed their medical education before curricular change (entering classes 1982-1984) with the performance of subsequent generations of students who were taught according to the reformed curriculum (entering classes 1985-1988).

**Results:** The two groups of students were comparable in terms of standard social and psychometric parameters, such as mean age at matriculation, female/male ratio, ratio of minority students in the class, premedical college grade point averages, and mean scores on the preadmission Medical College Admissions Test. JMC students who studied pathology prior to the curricular reform received on the pathology subsection of the NBME Part 1 Examination reform scores that were close to the national average. In contrast, mean scores for students who studied pathology after curricular changes were significantly higher than the national average ( $P < 0.001$ ). Based on their pathology subscores, the number of JMC students scoring below the cutoff line for passing (380 points) decreased significantly after the curricular reform, whereas the number of high-scoring students whose scores ranked them in the 90th percentile nationally increased. Curricular reform was also associated with an increase in overall student satisfaction.

**Conclusion:** Curricular changes that include an emphasis on active learning can improve the performance of medical students on externally administered, objective examinations. We have shown that the means of the medical school class can be improved, the number of failing students reduced, and the number of high-scoring students increased. The improvement of students' scores was not limited to the first class after curricular reform, but persisted throughout the entire observation period of four years.

*Pathology Education. 2005; 46(3): 443-448.*

## AN EMPIRICAL STUDY OF THE PREDICTIVE VALIDITY OF NUMBER GRADES IN MEDICAL SCHOOL USING 3 DECADES OF LONGITUDINAL DATA: IMPLICATIONS FOR A GRADING SYSTEM

*Joseph S. Gonnella, James B. Erdmann, Mohammadreza Hojat*

**Context:** It is important to establish the predictive validity of medical school grades. The strength of predictive validity and the ability to identify at-risk students in medical schools depend upon assessment systems such as number grades, pass/fair (P/F) or honors/pass/fail (H/P/F) systems.

**Objective:** This study was designed to examine the predictive validity of number grades in medical school, and to determine whether any important information is lost in a shift from number to P/F and H/P/F grading systems.

**Subjects:** The participants in this prospective, longitudinal study were 6,656 medical students who studied at Jefferson Medical College over 3 decades. They were grouped into 10 deciles based on their number grades in Year 1 of medical school.

**Methods:** Participants were compared on academic accomplishments in Years 2 and 3 of medical school, medical school class rank, delayed graduation and attrition, performance on medical licensing examinations and clinical competence ratings in the first postgraduate year.

**Results:** Results supported the short- and long-term predictive validity of the number grades. Ratings of clinical competence beyond medical school were predicted by number grades in medical school. We demonstrated that small differences in number grades are statistically meaningful, and that important information for identifying students in need of remedial education is lost when students who narrowly meet faculty's expectations are included with the rest of the class in a broad 'pass' category.

**Conclusions:** The findings refute the argument that knowledge of sciences basic to medicine is not critical to subsequent performance in medical school and beyond if an appropriate evaluation system is used. Furthermore, the results of this study raise questions about abandoning number grades in favour of a pass/fail system. Consideration of these findings in policy decisions regarding assessment system of medical students is recommended.

*Medical Education. 2004; 38(4): 425-434.*

Available online at publisher's site:

<http://www.ingentaconnect.com/content/bsc/meded/2004/00000038/00000004/art00013>

**THE FATE OF MEDICAL STUDENTS WITH DIFFERENT LEVELS  
OF KNOWLEDGE: ARE THE BASIC MEDICAL SCIENCES RELEVANT  
TO PHYSICIAN COMPETENCE?**

*Mohammadreza Hojat, Joseph S. Gonnella, James B. Erdmann, J. Jon Veloski*

**Purpose:** This study was designed to test the hypothesis that an early gap in knowledge of sciences basic to medicine could have a sustained negative effect throughout medical school and beyond.

**Method:** A longitudinal prospective study of 4,437 students who entered Jefferson Medical College between 1972 and 1991 was conducted in which the students were divided into three groups. Group 1 consisted of 392 who failed at least one of the three basic sciences courses in the first year of medical school. Group II was comprised of 398 who did not fail but had low first-year grade point averages; and 3,647 of the remaining sample were included in Group III. The groups were compared on retention and dismissal rates, medical school assessment measures, scores on medical licensing examinations, ratings of clinical competency in residency, board certification rates, and faculty appointments.

**Results:** Significant differences were observed among the three groups confirming the hypothesis that students' level knowledge in sciences basic to medicine early in medical school could predict later performance during medical school and beyond. Implications for early diagnosis of academic deficiencies, for better preparation of medical students, and for the assessment of clinical competency are discussed.

*Advances in Health Sciences Education. 1996; 1: 179-196.*

Available online at publisher's site:

<http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/BF00162915>

**SOONER OR LATER? USMLE STEP 1 PERFORMANCE AND TEST ADMINISTRATION DATE AT THE END OF THE SECOND YEAR**

*Charles A. Pohl, Mary R. Robeson, Mohammadreza Hojat, Susan L. Rattner, J. Jon Veloski*

**Purpose:** To determine whether the elapsed time between completion of the second-year curriculum and test date alters a student's outcome on USMLE Step 1.

**Methods:** Total scores for 601 students who completed Step 1 in 1999-2001 were classified into six, one-week time periods between June 1 and mid-July depending on test date. Analysis of variance and covariance was used to explore differences across time with adjustment for previous academic performance.

**Results:** Mean weekly scores decreased from a high of 221 in early June to a low of 208 in July. However, analysis of covariance confirmed that differences across time were not significant ( $p < .30$ ). Weekly differences were explained by predicted performance based on gender, MCAT science and medical school test scores.

**Conclusions:** Performance on Step 1 is unaffected by the time interval between completing the curriculum and taking the examination within the first two months after completing the pre-clinical curriculum.

*Academic Medicine. 2002; 77: S17-S-19.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200210001-00006.pdf>

**USING RATINGS OF RESIDENT COMPETENCE TO EVALUATE NBME  
PASSING STANDARDS**

*Barbara J. Turner, Mohammadreza Hojat, Joseph S. Gonnella*

The passing standards of the NBME examinations were empirically evaluated by analyzing the distribution of scores received by 1,994 graduates of one medical school and the clinical competence ratings given the graduates by their first-year residency directors. A significant association was found between NBME scores and postgraduate ratings in the cognitive areas of clinical competence. Graduates scoring 420 or less on NBME Part I or II received significantly lower medical knowledge ratings than did the total group of graduates. A similar analysis of NBME Part III scores was less clear-cut but also suggested a score of 420 or less could identify those graduates at significant risk of receiving lower knowledge ratings. Using low cognitive ratings as an outcome measure, NBME Part II was not sensitive in detecting such graduates. Based on these data, changes in passing standards could not be proposed, but rather the authors recommended that these standards continue to be reassessed and further measures be taken to strengthen the internal evaluation methods in medical schools.

*Journal of Medical Education. 1987; 62(7): 572-581.*



# JEFFERSON EVALUATIONS

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CLINICAL

**STUDENTS' RATINGS OF OTOLARYNGOLOGY CLERKSHIP ACTIVITIES:  
THE ROLE OF RESIDENTS**

*Hidemichi Ashikawa, Gang Xu, J. Jon Veloski*

The present study was conducted with a sample of junior medical students at Jefferson Medical College to investigate the factors that influence students' overall satisfaction with the otolaryngology clerkship. The most important factor related to their overall satisfaction in the clerkship was their experience with residents, followed by experience with attending physicians, quality of rounds, and of lectures. The number of patients the students encountered and the number of rounds and lectures were deemed less important. Based on these findings, the authors of this paper concluded that the residents' role in teaching should be emphasized and students' satisfaction with the otolaryngology clerkship may be enhanced by developing residents' skills in teaching students.

*Medical Teacher. 1992; 14: 77-81.*

**VALIDITY OF FACULTY RATINGS OF STUDENTS' CLINICAL COMPETENCE  
IN CORE CLERKSHIPS IN RELATION TO SCORES ON LICENSING  
EXAMINATIONS AND SUPERVISORS' RATINGS IN RESIDENCY**

*Clara A. Callahan, James B. Erdmann, Mohammadreza Hojat, J. Jon Veloski, Susan L. Rattner,  
Thomas J. Nasca, Joseph S. Gonnella*

**Problem Statement and Background:** The validity of the clinical evaluations in medical school, a major component of the Dean's letter, as independent predictors of postgraduate clinical competence, has not been well documented.

**Method:** In a cohort study, 2,156 medical students at Jefferson Medical College who graduated from 1989 to 1998 were studied. Bivariate and multivariate relationships between competence ratings in third-year core clerkships, performance on licensing examinations and residency program directors' ratings of clinical competence were examined.

**Results:** Significant correlations were found between clerkship ratings and the criterion measures. Clerkship ratings in Internal Medicine, Family Medicine, Pediatrics and Obstetrics/Gynecology yielded higher correlations than Psychiatry and Surgery.

**Conclusions:** These results should not only increase the confidence of the faculty about their evaluations, but also assure residency selection committees about the validity of such evaluations in predicting clinical competence beyond medical school.

*Academic Medicine. 2000; 75(October Supplement): S71-S73.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200010001-00023.pdf>

**SUBTEST SCORES OF A COMPREHENSIVE EXAMINATION OF MEDICAL KNOWLEDGE AS A FUNCTION OF RETENTION INTERVAL**

*Mohammadreza Hojat, J. Jon Veloski*

It was hypothesized that performance on particular subtests of a comprehensive examination would be a function of the length of time between the completion of medical training and administration of the comprehensive examination. Two samples of graduates of the Jefferson Medical College were studied: one group of 1,086 students who graduated between 1975 and 1979, and another group of 877 who graduated between 1980 and 1983. Each medical student in the junior year was assigned to one of four clerkship groups. Each group took the assigned clerkship training in internal medicine, obstetrics/gynecology, pediatrics, psychiatry and surgery in a different rotational sequence. Statistical analyses indicated that there were no significant differences among the four groups of the two samples on total comprehensive medical examination scores either before or after the junior year. There was, however, a linear trend found in the scores on subtests in psychiatry, obstetrics/gynecology, and surgery in both samples. The trend indicated that the shorter the interval between clerkship training and the examination, the higher the score on that particular examination. Data were analyzed in terms of some hypotheses from learning theories, and the implications of the results on medical education were discussed.

*Psychological Reports. 1984; 55: 579-585.*

*Also in Proceedings of the Twenty-second Annual Conference on Research in Medical Education, Washington, DC, November 1983; 19-24.*

**STUDENTS' GENDER AND EXAMINATION OF PATIENTS IN A THIRD-YEAR FAMILY MEDICINE CLERKSHIP**

*Daniel Z. Louis, Jonathan Gottlieb, Fred W. Markham, Mohammadreza Hojat, Carol Rabinowitz, Joseph S. Gonnella*

The present study investigated gender differences in clinical experiences measured by the number of times a specific set of diagnostic, therapeutic, and preventive tasks was performed as part of a required clerkship in medical school. Participants were 194 third-year medical students at Jefferson Medical College who were taking their required six-week family medicine clerkship during the 1994-95 academic year. There were 117 men (60%) and 77 women (40%) in this group. We used specially designed computer-scannable patient-encounter cards to document students' clinical experiences. The patient-encounter cards were designed as part of a broad study to monitor students' clinical experiences in required clerkships and to ensure that all students are sufficiently exposed to diverse clinical situations and perform the diagnostic, therapeutic, and preventive tasks relevant to each clerkship. A total of 16,570 patient encounters (60% female patients) were reported by 194 students. A total of 9,425 patient-encounter cards were completed by male students. A total of 7,185 patient-encounter cards were completed by female students. There was no difference between male and female students with respect to the proportion of male and female patients encountered, but female students encountered significantly more patients overall than did the male students. The mean number of patient encounters reported per student was 85 (81 for male students, 93 for female students) over a six-week period. A significantly larger percentage of women than men (91% vs. 65%) performed at least one breast examination in their family medicine clerkship ( $p < .01$ ). However, men were more likely than women to perform a testicular examination (71% of the men and 58% of the women,  $p < .05$ ). The women also performed the Denver developmental screening test for children more often than the men did (58% of the women and 43% of the men,  $p < .05$ ). Women were more likely than men to perform pelvic examinations (84% of the women vs. 73% of the men,  $p < .10$ ), but the difference fell short of statistical significance at the conventional level. The results of this study show that while men and women in a family medicine clerkship are exposed to a patient base with comparable gender composition, certain diagnostic tasks are not performed as often by male and female students.

*Academic Medicine. 1996; 71(Supplement): S19-S21.*

**EVALUATIONS OF MEDICAL STUDENTS' CLINICAL EXPERIENCES IN A FAMILY MEDICINE CLERKSHIP: DIFFERENCES IN PATIENT ENCOUNTERS BY DISEASE SEVERITY IN DIFFERENT CLERKSHIP SITES**

*Fred W. Markham, Susan L. Rattner, Mohammadreza Hojat, Daniel Z. Louis, Carol Rabinowitz, Joseph S. Gonnella*

**Background and Objectives:** Evaluation of medical students' clinical encounters is an essential component of optimizing their educational experience. In this study, we collected data on the diagnoses and disease severity in student-patient encounters at different family medicine clerkship sites.

**Methods:** Participants were 582 third-year medical students who completed a total of 7,515 specially designed patient encounter cards in a 6-week family medicine clerkship at five training sites over 3 years.

**Results:** Variation was found in the average number of encounters in different clerkship sites. The findings for three frequently encountered diseases (essential hypertension, diabetes mellitus, and upper respiratory infection) showed significant differences in the proportions of patients at different stages of the disease in different clerkship sites.

**Conclusions:** Students at different clerkship sites experience different numbers of encounters with patients and significant variation in the illness severity of patients seen in those encounters.

*Family Medicine. 2002; 34(6): 451-454.*

Available online at publisher's site:

<http://www.stfm.org/fmhub/fm2002/june02/mse.pdf>

**USMLE STEP 2 PERFORMANCE AND TEST ADMINISTRATION DATE IN THE FOURTH YEAR OF MEDICAL SCHOOL**

*Charles A. Pohl, Mary R. Robeson, J. Jon Veloski*

**Purpose:** To determine whether the time interval between completing the third-year curriculum and test administration affects a student's USMLE Step 2 score.

**Method:** Scores for 846 students in the classes of 2000-2004 were grouped in 10 time periods depending on test date. A linear regression model to predict performance on Step 2 using gender, Step 1, and grades in medicine, pediatrics, and obstetrics-gynecology was developed based on the class of 1999. Analysis of covariance was used to test the effect of time on scores, adjusting for predicted performance.

**Results:** Step 2 scores decreased significantly ( $p < .001$ ) across time. Students' mean scores were four points higher than predicted in the early months and five to eight points lower near the end of the senior year.

**Conclusions:** Students who scheduled Step 2 early in the senior year achieved higher scores, on average, than those who waited until later in the year.

*Academic Medicine. 2004; 79(10): S49-S51.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200410001-00015.pdf>

**A COMPARISON OF THE MODIFIED ESSAY QUESTION AND  
MULTIPLE CHOICE QUESTION FORMATS: THEIR RELATIONSHIPS  
TO CLINICAL PERFORMANCE**

*Howard K. Rabinowitz, Mohammadreza Hojat*

The Department of Family Medicine at Jefferson Medical College has used the modified essay question as the final examination format for its required third-year clerkship since 1976. To compare the family medicine modified essay question format with the multiple choice question format used in the other five required junior clerkships, examination scores from 2,174 Jefferson graduates (1976-1985) were correlated with scores on the examination of the National Board of Medical Examiners (NBME), ratings of clinical performance in the required third-year clerkships, and ratings on four global areas of postgraduate competence. Grades of the multiple choice examination in internal medicine consistently yielded the highest correlations with NBME scores and with postgraduate ratings of medical knowledge. Performance on the modified essay examination in family medicine had the lowest correlations in these areas. The family medicine scores, however, consistently yielded the highest correlations with overall third-year clinical performance and with postgraduate performance in the areas of data-gathering skills, clinical judgment, and professional attitudes. These results indicate that the modified essay question format may provide a different and important parameter in the evaluation of medical trainees.

*Family Medicine. 1989; 21: 364-367.*



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## DOCUMENTING AND COMPARING MEDICAL STUDENTS' CLINICAL EXPERIENCES

*Susan L. Rattner, Daniel Z. Louis, Carol Rabinowitz, Jonathan E. Gottlieb, Thomas J. Nasca,  
Fred W. Markham, Ruth P. Gottlieb, John W. Caruso, J. Lindsey Lane, J. Jon Veloski,  
Mohammadreza Hojat, Joseph S. Gonnella*

**Context:** The decentralization of clinical teaching networks over the past decade calls for a systematic way to record the case-mix of patients, the severity of diseases, and the diagnostic procedures that medical students encounter in clinical clerkships.

**Objective:** To demonstrate a system that documents medical students' clinical experiences across clerkships.

**Design and Settings:** Evaluation of a method for recording student-patient clinical encounters using a pocket-sized computer-read patient encounter card at a US university hospital and its 16 teaching affiliates during academic years 1997-1998 through 1999-2000.

**Participants:** A total of 647 third-year medical students who completed patient encounter cards in 3 clerkships: family medicine, pediatrics, and internal medicine.

**Main Outcome Measures:** Number of patient encounters, principal and secondary diagnoses, severity of diseases, and diagnostic procedures as recorded on patient encounter cards; concordance of patient encounter card data with medical records.

**Results:** Students completed 86,011 patient encounter cards: 48,367 cards by 582 students in family medicine, 22,604 cards by 469 students in pediatrics, and 15,040 cards by 531 students in internal medicine. Significant differences were found in students' case-mix of patients, the level of disease severity, and the number of diagnostic procedures performed across the 3 clerkships. Stability of the findings within each clerkship across 3 academic years and the 77% concordance of students' reports of principal diagnosis with faculty's confirmation of diagnosis support the reliability and validity of the findings.

**Conclusions:** An instrument that facilitates students' documentation of clinical experiences can provide data on important differences among students' clerkship experiences. Data from this instrument can be used to assess the nature of students' clinical education.

*Journal of the American Medical Association. 2001; 286(9): 1035-1040.*

Available online at publisher's site:

<http://jama.ama-assn.org/cgi/content/abstract/286/9/1035>

**STUDENT RATINGS OF CLERKSHIP ACTIVITIES AS A BASIS  
FOR CURRICULUM MODIFICATION: A FOUR-YEAR COMPARISON  
OF SIX DEPARTMENTS**

*Joseph S. Rodgers, J. Jon Veloski, Shelley L. Moses*

This study was undertaken to determine which activities and learning experiences have the greatest positive influence on students' overall ratings of the educational values of clinical clerkships. Such results could provide guidance to curriculum committees, faculty of individual departments, and to those responsible for clinical education in hospitals who must set priorities and plan changes in clerkships.

The self-reports of students expressed on 3,634 forms collected over a four-year period provide an opportunity to investigate the relative importance of different learning experiences in required clinical clerkships. Most significant across the clerkships is the learning value placed on patient rounds. In five of the six clerkships, students who gave high overall ratings to the clerkship also reported frequently that patient rounds were valuable. Such data do support the learning value of rounds and probably also the concept that student learning is enhanced when the entire time of rounds is devoted to teaching medical students. On the other hand, certain variables did not appear to influence students' overall rating of the clerkship experience. The value of conferences, whether or not a student was given time off to study prior to the final examination, the number of hours on call, and the number of new patients per week showed little or no relationship to the students' overall ratings of clerkships. The results also suggest that more emphasis should be placed on the role of the attending physician. The program should be so constructed as to enable attending physicians to spend more time with students, especially discussing their assigned patients. Feedback to students, which they have perceived as important but lacking in other studies, should be included.

*Proceedings of the Twenty-Sixth Annual Conference on Research in Medical Education,  
Washington, DC, November 1987; 179-184.*

**EVALUATION OF THE SURGICAL CLERKSHIP EXPERIENCE IN AFFILIATED HOSPITALS: PERFORMANCE ON OBJECTIVE EXAMINATIONS**

*Gordon F. Schwartz, J. Jon Veloski, Joseph S. Gonnella*

This study was designed to measure the knowledge acquired during the surgical clerkship required in the third-year curriculum at Jefferson Medical College and to determine whether or not that knowledge varied according to the institution in which it was acquired. Student grades were derived from scores of 0-100 in each of four subtests: surgery, orthopaedics, urology and anesthesiology. Grades were grouped by hospital, and means and variances were computed for each institution. Significant differences for the entire group of hospitals were observed in three of the subtests. It can be inferred that, based on the apparent differences in knowledge among students assigned to several hospitals, differences may occur in clinical competence and attitudes.

*The Journal of Surgical Research. 1976; 20: 179-182.*

Available online at publisher's site:

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## DO GLOBAL RATING FORMS ENABLE PROGRAM DIRECTORS TO ASSESS THE ACGME COMPETENCIES?

*Cynthia G. Silber, Thomas J. Nasca, David L. Paskin, Glenn Eiger, Mary R. Robeson, J. Jon Veloski*

**Purpose:** In 1999 the Accreditation Council for Graduate Medical Education (ACGME) mandated that GME programs require their residents to be proficient in six general competencies. The purpose of this study was to ascertain whether an existing global rating form could be modified to assess these competencies.

**Method:** A rating form covering 23 skills described in the ACGME competencies was developed. The directors of 92 specialty and subspecialty programs at Thomas Jefferson University Hospital and the Albert Einstein Medical Center in Philadelphia were asked to rate residents at the end of the 2001-02 and 2002-03 academic years.

**Results:** Ratings for 1,295 of 1,367 (95%) residents were available. Residents were awarded the highest mean ratings on items tied to professionalism, compassion, and empathy. The lowest mean ratings were assigned for items related to consideration of costs in care and management of resources. Factor analysis indicated that the program directors viewed overall competence in two dimensions of medical knowledge and interpersonal skills. This factor structure was stable for groups of specialties and residents' gender and training level. Mean ratings in each dimension were progressively higher for residents at advanced levels of training.

**Conclusion:** Global rating forms, the tool that program directors use most frequently to document residents' competence, may not be adequate to assess the six general competencies. The results are consistent with earlier published research indicating that physicians view competence in just two broad dimensions, which questions the premise of the six ACGME competencies. Further research is needed to validate and measure six distinct dimensions of clinical competence.

*Academic Medicine. 2004; 79(6): 549-556.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200406000-00010.pdf>

**A PRELIMINARY STUDY OF THE VALIDITY OF SCORES AND PASS/FAIL STANDARDS FOR USMLE STEPS 1 AND 2**

*David B. Swanson, Susan M. Case, Donna Waechter, J. Jon Veloski, Carol Hasbrouck, Miriam Friedman, Jan Carline, Carol Maclaren*

Medical licensure in the United States is in a period of transition. In 1991, the National Board of Medical Examiners (NBME) introduced major modifications in the content, format, pass/fail standards, and score reports for the NBME Part I and Part II examinations. In 1992, the modified Part I and Part II examinations were renamed Step 1 and Step 2 and became the first two components of the three-step United States Medical Licensing Examination (USMLE). When the Part Examinations and the Federation Licensing Examination (FLEX), developed by the Federation of State Medical Boards (FSMB), are completely phased out in 1994, the USMLE will become the sole examination pathway to initial licensure for allopathic physicians.

As a part of the phase-in of the revised examinations in 1991, new pass/fail standards for Part I and Part II were instituted. These standards were predominantly content-based: the score required to pass was determined primarily by reviewing test items and identifying a level of performance reflecting mastery of the materials. In 1992, these new standards were adopted for administrations of USMLE Steps 1 and 2. The purpose of this project was to initiate systematic study of the correspondence between performance on the examinations and academic achievement in basic science coursework and clinical clerkships during medical school. In this preliminary study, examinees' scores and pass/fail results from the first administrations of the newly designed Part I and Part II were compared with ratings of academic achievement provided by five collaborating medical schools.

*Academic Medicine. 1993; 68: S19-S21.*

**ATTENDINGS' AND RESIDENTS' TEACHING ROLE AND STUDENTS'  
OVERALL RATING OF CLINICAL CLERKSHIPS**

*Gang Xu, Timothy P. Brigham, J. Jon Veloski, Joseph F. Rodgers*

The study was conducted with a sample of third-year students (n = 584) at Jefferson Medical College to explore students' perception of patterns of differences between attending physicians and residents in their teaching behaviors during clinical clerkships. Attending physicians' teaching behaviors were perceived more in a mentorship mode whereas residents' teaching behaviors were equally divided between mentorship and preceptorship modes. Attending physicians and residents' teaching behaviors varied among clerkships. Results were discussed in terms of difference of teaching roles played by attending physicians and residents and relationship of the teaching behaviors to students' overall rating of clerkship.

*Medical Teacher. 1993; 15: 217-222.*

**INFLUENCE OF PREVIOUS CLERKSHIP EXPERIENCES ON STUDENTS' SATISFACTION WITH THEIR CURRENT CLERKSHIP**

*Gang Xu, J. Jon Veloski*

This study examined the influence of previous clerkship experiences on students' satisfaction with their current clerkship. We hypothesized that when students are asked to rate their current clerkship, their ratings are influenced by their comparisons of current experiences with previous ones, whether or not they are asked to make such comparisons.

We surveyed the 225 third-year students at our school at the end of the last block in 1991-92. The students were asked to give (1) their overall ratings of the clerkship; (2) their ratings of experiences in 19 activities, such as experiences with attending physicians, with residents, on rounds, in conferences, etc.; and (3) their ratings of the clerkship in comparison with previous clerkships.

Experiences in previous clerkships influence students' satisfaction with their experiences in subsequent clerkships.

Medical educators, in order to gain a better understanding of their students' experiences in the clerkships of their own departments, should look into the students' experiences in the clerkships of other departments.

*Academic Medicine. 1993; 68: 230.*

**A CORRELATION STUDY OF STUDENTS' PERCEPTION OF THEIR ACTIVE  
ROLE AS RELATED TO THEIR CLERKSHIP EXPERIENCES**

*Gang Xu, J. Jon Veloski, Timothy P. Brigham*

Previous studies have indicated the importance of students' active involvement in clinical learning. The present study examined medical students' active participation in clinical clerkships as related to their ratings of clerkship experiences. The general hypothesis is that students' perception of being active in the clerkship will be positively related to their experience with attendings and residents and to their overall satisfaction with their clerkship experience. This hypothesis was examined in teaching rounds, work rounds, and in conferences and was confirmed in the study. Future study may be needed to explore specific approaches to bring students into an active process in different clinical learning settings.

*Medical Teacher. 1995; (17): 199-203.*



# **POSTGRADUATE AND CAREER**

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CLINICAL COMPETENCE

## CLASS RANKING MODELS FOR DEANS' LETTERS AND THEIR PSYCHOMETRIC EVALUATION

*Robert S. Blacklow, Carla E. Goepf, Mohammadreza Hojat*

The dean's letter of evaluation written on behalf of graduating medical students is considered an important document in evaluating applicants to postgraduate residency programs. A recurrent complaint of those who must interpret deans' letters is that too often it is impossible to estimate how a candidate performed in comparison with his or her peers. One approach to providing such comparative information is to report the class rank in the body of the letter.

Despite the importance of comparative performance information, no serious attention has been directed towards developing a model to incorporate performance data in basic science as well as clinical science components of medical education in determining the class rank and to relate this to actual performance as a resident. The purpose of the present study was to develop class ranking models in which performance data from both basic and clinical sciences could be used and to study the predictive validity of the models.

The total study sample consisted of 1,283 graduates from Jefferson Medical College between 1986 and 1991. Five models were developed in determining the class rank. Different weights for basic and clinical science performance measures were employed in each model. Performance data from the first and second years (basic sciences component of medical education) and the third year (clinical sciences) were utilized in each model. Average ratings on each of three areas of postgraduate competence—data gathering and processing skills, interpersonal skills, and the socioeconomic aspects of patient care—were used as criterion measures for the validity study.

Validity of the models was studied by examining the true-positive and true-negative rates based on distribution of ranking models and ratings on the postgraduate competence areas. In this approach, for each ranking model, the top 25% and bottom 25% of the graduates were chosen. Also, the top and bottom 25% of the graduates, based on the distribution of each postgraduate competence area, were chosen. A model in which a weight of one-third was assigned to basic science grades and a weight of two-thirds to the clinical ratings in medical school showed more satisfactory true-positive and true-negative rates. This model represented a more acceptable balance between weights assigned to performance measures in basic and clinical sciences.

*Academic Medicine. 1991; 66(Supplement): S10-S12.*

*Also in Proceedings of the Thirtieth Annual Conference on Research in Medical Education, Washington, DC, November 1991.*

**FURTHER PSYCHOMETRIC EVALUATIONS OF A CLASS RANKING  
MODEL AS A PREDICTOR OF GRADUATES' CLINICAL COMPETENCE  
IN THE FIRST YEAR OF RESIDENCY**

*Robert S. Blacklow, Carla E. Goepf, Mohammadreza Hojat*

This study was designed to investigate further the psychometrics of a class-ranking model in which a weight of one-third was assigned to performance measures in basic sciences and a weight of two-thirds to ratings on six core clerkships. The first part of the study involved 215 graduates of Jefferson Medical College who, based on the ranking model, had been in the top and bottom quarters of the classes of 1991 and 1992. Six faculty, who did not know the graduates' ranks but were familiar with their performances and characteristics, were asked to judge the graduates' potentials to become competent physicians. The graduates' ranks according to the model were then compared with the ratings they received from the faculty. The second part of the study investigated whether there was a linear relationship between class ranks and ratings of postgraduate competence, by using directors' ratings of the data-gathering skills of 598 graduates (1986-1990) at the end of their first year of residency. A concordance rate of 85% was obtained between the graduates' ranks and the ratings they received from the medical school faculty, which supports the criterion-related validity of the ranking model. In addition, class ranks were linearly related to ratings of postgraduate competence. However, women and graduates who had been low achievers in medical school were less likely to have given permission for collecting postgraduate ratings, which led to range restriction and a possible under-estimation of the validity of the model. The psychometric evidence supports the class-ranking model, but other schools should exercise caution in employing the model until they accumulate evidence from data obtained from their own students.

*Academic Medicine. 1993; 68: 295-297.*

**RELATIONSHIP BETWEEN PERFORMANCE IN MEDICAL SCHOOL  
AND POSTGRADUATE COMPETENCE**

*Joseph S. Gonnella, Mohammadreza Hojat*

A sample of 441 graduates (between 1971 and 1981) of Jefferson Medical College who pursued their medical training in internal medicine, pediatrics, and obstetrics/gynecology was selected. It was hypothesized that the relationship between measures of academic achievement in medical school and measures of postgraduate performance would vary in different specialty programs. The hypothesis was confirmed by comparing graduates in the three specialties on grades in medical school, scores on the examinations of the National Board of Medical Examiners, and ratings in four areas of competence in the first postgraduate year (that is, medical knowledge, data-gathering skills, clinical judgment, and professional attitudes). It was also hypothesized that the strength of the relationship would vary at different levels of performance within the specialty programs. This was confirmed for some of the variables. The results indicated that inappropriate conclusions may be drawn about the relationship between performance before and after graduation from medical school if specialty differences and levels of performance are ignored.

*Journal of Medical Education. 1983; 58: 697-685.*

## THE ROLE OF RESIDENT PERFORMANCE EVALUATION IN BOARD CERTIFICATION

*Joseph S. Gonnella, Mohammadreza Hojat, James B. Erdmann, J. Jon Veloski*

The essence of graduate medical education involves mentoring, which implies continuous evaluation of a resident's performance accompanied by constructive feedback to enhance its development. The process should begin early in the program with a diagnostic assessment of the relevant competencies followed-up by an educational plan leading to the desired outcome. The fact that residents and fellows are committed to three or more years of graduate medical education in the same organization presents a unique opportunity for program leaders to evaluate performance systematically. The number of years that residents spend in the same program, unlike the weeks that medical students spend rotating among multiple departments, enables more thorough evaluation of residents together with remedial work when necessary.

Evaluation criteria for resident performance must be clearly defined and embraced by the specialty boards and the programs to support formative and summative evaluations. A competent physician fills a triad of roles. An acceptable evaluation must assess the resident's performance in each of three capacities: clinician, patient education, and manager of resources. Not only is it essential that each resident leave the program with the required clinical skills, but it is also important that the resident be able to communicate effectively with patients to clarify their medical programs, develop a management plan devised to improve their health, and achieve the expected outcomes of their care, including any risks. Lately, it has become even more important that the resident also acquire business and managerial skills to use resources efficiently and to understand the economic constraints facing medicine. A model for specifying the competencies of clinician, patient educator and resource manager is proposed.

Certain factors that affect healthcare outcomes but fall outside of the physician's direct control also need to be understood and considered when evaluating performance. These include the contributions of other members of the healthcare team, the availability of technology in different settings, the capacity of the patient and family to collaborate in the care plan, and constraints imposed by insurance coverage or government regulation. A thorough and accurate evaluation of a resident's performance must take these factors into account.

From a methodical perspective, some tightening of the rationale for determining acceptable performance standards is also recommended. Most programs and boards have defensible standards for deciding if a specific competency has been achieved. What may be questioned, however, are evaluation schemes that permit above average performance in one essential competency to offset less than adequate performance in another essential area, with the result that overall performance is judged acceptable.

*Mancall, E.L. and Bashook, P.G. (editors) Evaluating Residents for Board Certification. (pp.3-14) Chicago, IL: American Board of Medical Specialties, 1998.*

**A CASE OF MISTAKEN IDENTITY: SIGNAL AND NOISE  
IN CONNECTING PERFORMANCE ASSESSMENTS BEFORE AND  
AFTER GRADUATION FROM MEDICAL SCHOOL**

*Joseph S. Gonnella, Mohammadreza Hojat, James B. Erdmann, J. Jon Veloski*

The authors examine the assumption that there is continuity from one level of training to another in structured and purposeful professional education. Thus, more advanced levels of training are built upon the foundations laid in the preceding levels. While the connection between performance before and performance after graduation from medical school is theoretically rational, such a connection has not been well documented in empirical studies. The issue has been debated but has not been settled because relevant findings are inconsistent. It is argued that these inconsistencies can stem from contaminating factors and the conceptual and methodological limitations of empirical studies. Such limitations are described in terms of “noise” that obscures the maximal value of a true relationship (the “signal”). Contaminating factors such as the time interval between testings; institutional factors; specialty choices; conceptual dissimilarities between performance measures in medical school and in practice; methodological limitations such as the shapes of rating distributions, nonlinearity, heteroscedasticity, restriction of range, multicollinearity, voluntary participation, psychometrics of assessment instruments and differing methods of assessments; and a lack of assessments of personal qualities can produce “noise” that inhibits the strength of the “signal.” While suggesting solutions for extricating some of the tangled web of methodological and conceptual issues, the authors feel that solutions do not exist for all of the problems. They conclude that researchers should be aware of the limitations if they are to avoid underestimating the “signal,” which may fade because of background “noise.”

*Academic Medicine. 1993; 68(Supplement): S9-S16.*

## WHAT HAVE WE LEARNED AND WHERE DO WE GO FROM HERE?

*Joseph S. Gonnella, Mohammadreza Hojat, James B. Erdmann, J. Jon Veloski*

Longitudinal data from five medical schools—Jefferson Medical College, Medical College of Georgia, Southern Illinois University, University of Missouri at Kansas City, and Wright State University—were combined in a meta analytic study to investigate the global associations between performance measures in medical schools and clinical competence in residency. The total number of physicians from the five schools was 858, and top and bottom scorers in medical schools were divided into top and bottom groups based on their clinical competence ratings given by the directors of residency programs. It was found that 75% of high achievers in medical school were also rated high in clinical competence in their first year of residency. Of the low achievers in medical school, 61% were also rated low in their residency. The sensitivity and specificity of the combined data from the five medical schools were .74 and .63, respectively. An effect size of .36 was obtained. The results supported the proposition that associations between assessment measure during medical school and ratings of clinical competence in residency exist to a significant degree. Important factors in determining physician's competence were discussed and suggestions were made for future studies concerning performance measures in medical school and their connections to clinical competence beyond medical school.

*Academic Medicine. 1993; 68(Supplement): S79-S87.*

*Also in Gonnella, J.S., Hojat, M., Erdmann, J.B., & Veloski, J.J. (Eds.). Assessment measures in medical school, residency and practice: The connections. (chapter 15, pp.155-173) New York: Springer, 1993.*

**MEASURING THE CONTRIBUTION OF MEDICAL EDUCATION  
TO PATIENT CARE: A REVIEW**

*Joseph S. Gonnella, Mohammadreza Hojat, J. Jon Veloski, Carter Zeleznik*

This invited review describes the specific contribution that medical education makes to patient care. Although most studies conducted over the past 30 years have reported that the link between the education of physicians and their professional competence is negligible, limitations in those analyses require investigation. More recent empirical evidence from studies in which the Jefferson longitudinal database was used has indicated that a positive link exists between the levels at which medical students perform and the levels of competence at which they perform as physicians. This link is most evident when observations of the competence levels are made shortly after completing medical school. The reviewers found that many factors affect the ability to demonstrate the relationship between education and professional performance and these factors must be considered when research is undertaken.

*Proceedings of the Twenty-second Annual Conference on Research in Medical Education, Washington, DC, November 1983; 3-16.*



**SOCIAL RESPONSIBILITIES OF MEDICAL SCHOOLS**

*Joseph S. Gonnella, J. Jon Veloski, Gang Xu, Mohammadreza Hojat*

The outcomes produced by academic medical centers are exceedingly complex, difficult to define objectively, and almost limitless in number. Nevertheless, society and the profession look to medical schools to produce certain results within each of the three general categories of education, research, and patient care. In the present analysis, we will review some of these expectations.

Three challenges will be addressed. First will be the decision about which outcomes should be assessed. Second are the processes and many functions of medical education, such as the professional development of the faculty, that need to be considered when outcomes are analyzed. Third, the issue of the interrelationships among the various outcomes will be addressed. This paper will conclude with a case study using representative data to describe some of the educational outcomes of one medical college over the past three decades.

*Educacao Medica. 1994; 5: 86-97.*

**VALIDITY AND IMPORTANCE OF LOW RATINGS GIVEN TO MEDICAL SCHOOL GRADUATES IN NONCOGNITIVE AREAS**

*Mary W. Herman, J. Jon Veloski, Mohammadreza Hojat*

This study showed that the clinical ratings of noncognitive aspects of professional competence are generally valid. The ratings of 672 residents who graduated from Jefferson between 1978 and 1981, representing 76 percent of all graduates in that period, were analyzed. The ratings were made by chiefs of service, directors of medical education or physicians who had the opportunity to closely observe the graduates in their residency setting. The study comprised ratings from 203 hospitals in the United States. Ten items on the rating form were identified as noncognitive, i.e., items dealing with attitudes and the ability to apply acquired knowledge. Overall, only 3 percent of the residents received low ratings on these items, and 40 percent of those received high ratings on at least two items. The validity of the ratings is tested by relating them to the willingness of residency supervisors to offer further postgraduate training to the graduate being evaluated and to the clinical ratings received in the third year of medical school. Substantial relationships are shown between the offers of further training and those ratings.

*Journal of Medical Education. 1983; 58: 837-843.*

**COGNITIVE AND NONCOGNITIVE FACTORS IN PREDICTING THE CLINICAL PERFORMANCE OF MEDICAL SCHOOL GRADUATES**

*Mohammadreza Hojat, Bette D. Borenstein, J. Jon Veloski*

It is widely believed that both cognitive factors (knowledge, skills, and technical abilities) and noncognitive factors (interpersonal skills, attitudes, and personal qualities) contribute to a physician's competence. With concerns about medical costs being expressed by health professionals, insurance carriers, and public media and with the increased awareness of the psychosocial aspects of good health, the noncognitive elements of medical care deserve the serious attention of healthcare evaluators.

The present study was designed to investigate which of these three components of competence (cognitive, noncognitive, or socioeconomic aspects of patient care) contributes most significantly to predicting the performance of residents on an examination of patient management skills (Part III of the National Board Examinations) and to predicting an offer of further residency training by program supervisors. Data were collected on 609 first-year residents who graduated from Jefferson Medical College from 1980 through 1983 and for whom data on postgraduate rating forms were available. The postgraduate rating form consisted of 33 statements that dealt with three aspects of clinical competence: data-gathering and processing skills, interpersonal skills and attitudes, and socioeconomic aspects of patient care. An additional question on the form asked whether the supervisor would be willing to offer further training to the graduate.

The correlations between the Part III examination scores and the scores on factors 1 (data-gathering and processing skills), factor 2 (interpersonal skills and attitudes), and factor 3 (socioeconomic aspects of patient care) were .18 ( $p < .01$ ), .00, and .15 ( $p < .01$ ), respectively. Corresponding correlations between being offered further residency training and the three factors were .24 ( $p < .01$ ), .37 ( $p < .01$ ), and .04, respectively.

Despite the emphasis that has been placed on the cognitive dimensions of clinical competence, the present findings that the noncognitive factor yielded a higher correlation than the cognitive factor with an offer of further residency training indicates that the noncognitive factor was a better predictor than the cognitive. This finding was further supported by obtaining a larger regression weight for the noncognitive factor than the cognitive factor in the multivariate model. The cognitive factor, however, was a statistically significant predictor of the graduates' performance on the Part III examination, which evaluates patient management skills.

*Journal of Medical Education. 1988; 63: 323-325.*

**IS THE GLASS HALF FULL OR HALF EMPTY? A REEXAMINATION OF THE ASSOCIATIONS BETWEEN ASSESSMENT MEASURES DURING MEDICAL SCHOOL AND CLINICAL COMPETENCE AFTER GRADUATION**

*Mohammadreza Hojat, Joseph S. Gonnella, J. Jon Veloski, James B. Erdmann*

The purpose of this study was to investigate the associations between performances during medical school and in the first year of residency. It was hypothesized that the strength of such associations is a function of several variables, including similarities of the measured concepts, the formats of the assessments, the time interval between the assessments, performance levels, and specialty areas. The total sample consisted of 2,368 graduates of Jefferson Medical College between 1980 and 1990. The performance measures in medical school were grades on objective examinations in basic and clinical sciences, global ratings of clinical competence in junior core clerkships, and scores on the Part I and Part II examinations of the National Board of Medical Examiners (NBME). The postgraduate performance measures were scores on the Part III NBME examination, postgraduate competence ratings, and board certification. The ratings of postgraduate clinical competence (available for 73% of graduates) were made by residency directors at the end of the first year of residency in the areas of data-gathering and processing skills, interpersonal skills and attitudes, and socioeconomic aspects of patient care. Results supported the research hypotheses. It was found that the associations varied for difference measures, at different levels of performance, and in different specialties. The authors conclude that the glass is "half full" regarding the associations between assessment measures before and after graduation from medical school.

*Academic Medicine, 1993; 68(Supplement) S69-S76.*

*Also in Gonnella, J.S., Hojat, M., Erdmann, J.B., & Veloski, J.J. (Eds.). Assessment measures in medical school, residency and practice: The connections. (chapter 14, pp.137-152) New York: Springer, 1993.*

**COMPONENTS OF CLINICAL COMPETENCE RATINGS OF PHYSICIANS:  
AN EMPIRICAL APPROACH**

*Mohammadreza Hojat, J. Jon Veloski, Bette D. Borenstein*

The study investigated the underlying structure of ratings of clinical competence. The study sample was comprised of 609 physicians graduating from Jefferson Medical College between 1980 and 1983. The rating instrument consisted of 33 statements on clinical behavior in Likert-type format filled out by directors of medical education programs at postgraduate training institutions. The data were subjected to factor analysis. Three factors emerged involving “data-gathering and processing skills,” “interpersonal and attitudinal,” and “socioeconomic” dimensions. Correlations of factor scores with independent measures of conceptually related and unrelated constructs supported the appropriateness of the assigned factor titles. It was concluded that ratings of clinical competence represent a multidimensional construct involving at least three dimensions.

*Educational and Psychological Measurement. 1986; 46: 761-769.*

**CONCEPTUALIZATION AND MEASUREMENT OF CLINICAL COMPETENCE  
OF RESIDENTS: A BRIEF RATING FORM AND ITS  
PSYCHOMETRIC PROPERTIES**

*Thomas J. Nasca, Joseph S. Gonnella, Mohammadreza Hojat, J. Jon Veloski, James B. Erdmann,  
Mary R. Robeson, Timothy P. Brigham, Clara A. Callahan*

Conceptualization and measurement of clinical competence of residents are of interest to medical educators. Yet there is a scarcity of operational tools with satisfactory psychometric support for measuring clinical competence. In this study, we investigated the underlying structure, criterion-related validity and alpha reliability of a brief rating form (20 items) developed to assess clinical competence of residents. The study sample consisted of 882 physicians (654 men, 228 women) in postgraduate training at Thomas Jefferson University Hospital between 1998 and 2000. Construct validity of the form was supported by factor analysis. Two relevant factors emerged: 'Knowledge, Data-Gathering and Processing Skills', and 'Interpersonal Skills and Attitudes'. Criterion-related validity was supported by significant linear associates between factor scores and performance on the medical licensing examinations. Alpha reliability coefficients for the two factors were 0.98 and 0.97, respectively. This brief rating form can be employed as one measure to evaluate clinical competence of residents with reasonable confidence in its measurement properties.

*Medical Teacher. 2002; 24(3): 299-303.*

Available online at publisher's site:

<http://taylorandfrancis.metapress.com/openurl.asp?genre=article&id=doi:10.1080/01421590220134141>

**RELATIONSHIPS BETWEEN PERFORMANCE IN MEDICAL SCHOOL AND  
FIRST POSTGRADUATE YEAR**

*J. Jon Veloski, Mary W. Herman, Joseph S. Gonnella, Carter Zeleznik, William F. Kellow*

Changes in medical education have been recommended from both within and without the medical profession because of a growing dissatisfaction with the healthcare system and with the performance of physicians. These recommendations have included modifications of the medical school admissions process, the medical curriculum, and the evaluation of prospective medical students.

Data from a longitudinal study of Jefferson Medical College graduates were analyzed to determine levels of clinical competence in the first postgraduate year and the relationships between postgraduate ratings and performance during medical school. Ratings were obtained on knowledge, data-gathering skills, clinical judgment, and professional attitudes from the hospitals in which the graduates were receiving their first year's postgraduate training. Significant relationships were found among three levels of performance in medical school and postgraduate ratings in all four competence areas. Relationships were strongest at the highest and lowest performance levels. It was concluded that, in a substantial number of cases, performance in the first postgraduate year could be predicted on the basis of information available to the medical school faculty. It was also concluded that such a monitoring program could provide medical schools with valuable information and clues to possible weaknesses in their educational programs.

*Journal of Medical Education. 1979; 54: 909-916.*

**A VALIDITY STUDY OF PART III OF THE NATIONAL BOARD EXAMINATION**

*J. Jon Veloski, Mohammadreza Hojat, Joseph S. Gonnella*

The purpose of this study was to investigate the validity of Part III of the National Board Examination, a certifying examination of medical knowledge and patient management abilities. The subjects were 1,866 first-year resident physicians who graduated from Jefferson Medical College between 1970 and 1984. Statistically significant correlations were found between scores on this examination on the one hand and measures of basic and clinical sciences in medical school and Parts I and II of the National Board Examination on the other hand. Also, graduates who were rated high on supervisors' ratings of clinical competence areas in residency obtained higher scores on the examination than those rated low on this scale even when their baseline knowledge (scores on Part II) was controlled by employing analysis of covariance. In addition, assumptions were made that graduates who were offered further residency training and those who pursued broader, less-specialized careers would score higher on this examination. Both assumptions were confirmed. This 15-year study not only provides unique information about the validity of one certifying examination, but it also presents a model that might be used to evaluate other certification tests. Improvements in validity produced by new testing methods, such as computerized administration, could be put into perspective by using similar validity studies.

*Evaluation and the Health Professions. 1990; 13: 227-240.*

*Also in Proceedings of the Twenty-sixth Annual Conference on Research in Medical Education, Washington, DC, November 1987; 54-59.*



## **POSTGRADUATE AND CAREER**

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SPECIALIZATION AND PROFESSIONAL ACTIVITIES

## CORRELATES OF YOUNG PHYSICIANS' SUPPORT FOR UNIONIZATION TO MAINTAIN PROFESSIONAL INFLUENCE

*Virginia U. Collier, Mohammadreza Hojat, Susan L. Rattner, Joseph S. Gonnella, James B. Erdmann, Thomas J. Nasca, J. Jon Veloski*

**Purpose:** Given the recent approval of a resolution in support of physician unionization by the AMA House of Delegates, it is timely to empirically investigate the factors associated with physicians' approval of unionization. This study was designed to investigate correlates of young physicians' support for unionization.

**Method:** A survey was mailed to all 1987-1992 Jefferson Medical College graduates (n=1,272); 835 (66%) responded.

**Results:** Forty-three percent of young physicians supported, 31% did not support unionization, and 26% expressed no opinion. Surgeons, medical subspecialists, pediatricians, and hospital-based specialists were more likely to support unionization than family physicians. Significant predictors of unionization support were: negative views of the changes in the healthcare system, negative perceptions of the quality of care provided by managed care, and beliefs that physicians' independence had been impaired by changes in the healthcare system and that physicians' personal satisfaction should take precedence over societal needs in determining the future of health care. Support for unionization also correlated with physicians' perceptions that mental health patients should be referred to psychiatrists, that physician-assisted suicide should be legalized, and that the involvement of nurse practitioners in diagnosis and treatment could compromise the quality of care. Support for unionization was unrelated to gender, academic achievement, performance on licensing examinations, ratings of clinical competence, and educational debt.

**Conclusions:** Young physician support for unionization is a function of frustration with market-driven policies that compromise the quality of care and negatively affect physician autonomy and personal satisfaction.

*Academic Medicine. 2001; 76(10): 1039-1044.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200110000-00014.pdf>

**STABILITY AND CHANGE OF INTEREST IN OBSTETRICS-GYNECOLOGY  
AMONG MEDICAL STUDENTS: EIGHTEEN YEARS OF LONGITUDINAL DATA**

*Iraj Forouzan, Mohammadreza Hojat*

The purpose was to compare the percentage of students who maintain interest in specializing in obstetrics-gynecology during medical school with the percentages of students maintaining interest in other selected specialties, and to examine changes of interest from obstetrics-gynecology to other specialties and from other specialties to obstetrics-gynecology. A longitudinal cohort study comparing the stability of students' interests in obstetrics-gynecology and in other specialties was performed by using data on 2,889 graduates of 18 classes of Jefferson Medical College of Thomas Jefferson University between 1975 and 1992. The percentage of students who maintained interest in obstetrics-gynecology, as measured at the beginning and end of medical school, was 19%, compared with 40% for internal medicine and surgery, 39% for family medicine, and 22% for pediatrics. By the time they graduated, some students who had planned as freshman to pursue obstetrics-gynecology had changed their interests to internal medicine (19%), surgery (17%), family medicine (8%), or pediatrics (7%). In turn, obstetrics-gynecology attracted students who had initially expressed interest in other specialties: 17% from family medicine, 14% from surgery, 12% from internal medicine, and 8% from pediatrics. Despite the low percentage of students who maintained interest in obstetrics-gynecology, the overall percentage of students interested in obstetrics-gynecology at the time of graduation was somewhat greater than the percentage of students interested at the start of medical school. That only about one-fifth of the students initially interested in obstetrics-gynecology maintained their interest, and that many students' interest changed from one specialty to another, suggests that factors contributing to changes in interest need further investigation.

*Academic Medicine. 1993; 68: 919-922.*

**MEDICAL EDUCATION AND HEALTH SERVICES RESEARCH: THE LINKAGE**

*Joseph S. Gonnella, Clara A. Callahan, Daniel Z. Louis, Mohammadreza Hojat, James B. Erdmann*

The medical community is coming under increased scrutiny. Challenges to the integrity of the healthcare system have been raised due to reports about the prevalence of medical errors. A heightened level of vigilance is required. Equally important is the need to isolate and correct the source of any problem, perceived or real. We are faced with challenging questions: Is the selection of students and residents appropriate? Are their education and evaluation valid? These questions must be answered at least in part by understanding the climate in which the services to the patients are rendered. Otherwise, deficiencies noted in practice may be inappropriately attributed to the educational process. This article addresses the importance, implications and impact of the link between medical education and health services research. The goal of medical education is to prepare physicians to meet the challenges of practice by fulfilling their roles of clinician, educator and resource manager. Health services research can be linked to any of these physician roles. An understanding of health services is necessary to assess how well this goal is being met in the context of the changing healthcare system. A partnership between medical education and health services research is essential for academic health centers and health services institutions in assessing issues of health manpower and for the public good. Academic health centers have an important role in this partnership providing an infrastructure and expertise for both education and health services research.

*Medical Teacher. 2004; 26(1): 7-11.*

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<http://taylorandfrancis.metapress.com/openurl.asp?genre=article&id=doi:10.1080/0142159032000156515>

## THE IMPACT OF EARLY CAREER SPECIALIZATION ON LICENSING REQUIREMENTS AND RELATED EDUCATIONAL IMPLICATIONS

*Joseph S. Gonnella, Mohammadreza Hojat, James B. Erdmann, J. Jon Veloski*

**Purpose:** It was hypothesized that physicians who pursue early career specialization in their first year of graduate medical education after medical school are likely to experience a decline in their scores on the medical licensing examination.

**Method:** A longitudinal prospective design was used in which 1,927 physicians who graduated from Jefferson Medical College between 1980 and 1991 were studied. Type of first-year graduate training program was the independent variable, and performance on a medical licensing examination (Part III examination of the National Board of Medical Examiners [NBME]) was the dependent variable. Scores of Parts I and II of the NBME taken in medical school, medical school class rank, and gender were the control variables.

**Results:** Findings showed significant differences on Part III scores among physicians in 12 different graduate programs despite statistical adjustments for baseline differences. Physicians in family medicine and emergency medicine programs obtained the highest adjusted Part III scores, followed by physicians in internal medicine and transitional programs. The next group consisted of physicians in pediatrics, obstetrics-gynecology, anesthesiology, and general surgery programs. The group with the lowest Part III scores included physicians in pathology, radiology, and psychiatry.

**Implications:** These findings suggest that students who meet only the minimal standards in medical school should be advised to pursue a broad training program in the first year of graduate medical education to strengthen their general clinical competence as a means to increase their chances of passing licensing examinations.

*Advances in Health Sciences Education. 1996; 1(2): 125-139.*

Available online at publisher's site:

<http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/BF00159277>

**THE IMPACT OF EARLY SPECIALIZATION ON THE CLINICAL  
COMPETENCE OF RESIDENTS**

*Joseph S. Gonnella, J. Jon Veloski*

Presented are the results of a study of the relationship between first-year postgraduate training and performance on a written test of general clinical competence. The scores of 1,514 Jefferson graduates achieved on Part III of the National Board Examinations were analyzed. Residents in family medicine, internal medicine, and flexible programs scored higher on Part III of the NBE than did those in surgery, pediatrics, obstetrics/gynecology, psychiatry and pathology. This finding was true even after a correction was made for their performance on Part II of the National Board Examination and suggests that knowledge and skills in the broad aspects of medicine are not adequately emphasized in the first year of some residency training programs. Although the differences in performance among the various training programs could be due to other factors, it is strongly suggested that changes are needed in some programs to strengthen the general capabilities of residents.

*The New England Journal of Medicine. 1982; 306: 275-277.*

*Also in Proceedings of the Nineteenth Annual Conference on Research in Medical Education, Washington, DC, November 1980; 142-147.*

**SHOULD HALF OF ALL MEDICAL SCHOOL GRADUATES ENTER  
PRIMARY CARE? PERCEPTIONS OF FACULTY MEMBERS AT JEFFERSON  
MEDICAL COLLEGE**

*Jonathan Gottlieb, Sylvia K. Fields, Mohammadreza Hojat, J. Jon Veloski*

**Purpose:** This study was undertaken to promote communication among faculty regarding the impact of a proposed goal that 50% of the graduates of Jefferson Medical College enter generalist careers. Since the opinions and attitudes of faculty regarding career decisions may directly or indirectly influence students, the authors investigated faculty's views of the optimal ratio of primary care to non-primary care physicians in the workforce and their perceptions of the effect on medical education, research, and healthcare delivery if the 50% goal were to be mandated.

**Method:** A questionnaire was mailed in January 1994 to all 694 salaried faculty of Jefferson Medical College. Respondents' opinions about the optimal primary care to non-primary care ratio and their perceptions of the effects of implementing the 50% goal on 21 areas related to medical education, research, and healthcare delivery were examined using a Likert-type scale. Obstacles perceived by non-primary care physicians as preventing their practice of primary care were also among the outcome measures.

**Results:** A total of 275 completed questionnaires were received (40% response rate; 72 primary care physicians, 141 non-primary care physicians, and 62 non-physicians). The median and mode of an optimal primary care to non-primary care ratio were both 50/50. Faculty, in general, perceived that implementing the 50% goal would enhance public access to primary care, physician-patient relationships, utilization of non-physicians, and the career satisfaction of generalists. They predicted decreases in costs of care, freedom of career choice, funding, and interest in research. The primary care physicians perceived greater enhancements of the image of physicians, quality of care, and satisfaction of generalists and subspecialists than did the non-primary care physicians. Gender and age did not affect the perceptions. A lack of appropriate training was identified by 45% and a lack of interest by 28% of the non-primary care physicians as major obstacles to their practice of primary care medicine.

**Conclusion:** The faculty members' positive and negative views of the proposed reform can provide useful information to the institution in understanding the potential impediments to increasing the numbers of generalist graduates. The generalists had significantly different views from the subspecialists about the impact of increasing the proportion of primary care physicians on healthcare delivery and research. In general the primary care physicians were more likely to view the proposed changes as beneficial than were the non-primary care physicians.

*Academic Medicine. 1995; 7: 1125-1133.*

**FAMILY MEDICINE AND PRIMARY CARE: TRENDS AND STUDENT CHARACTERISTICS**

*Mary W. Herman, J. Jon Veloski*

Using data from a longitudinal study of medical students at Jefferson Medical College, the authors analyzed trends in senior student interest in primary care specialties between 1971 and 1975 and selected background characteristics and performance levels of students choosing family medicine compared with those in other specialties. The study demonstrated a rising trend in the proportion of Jefferson seniors interested in family practice but not in internal medicine or pediatrics. Unlike the medical graduates entering general practice in earlier years, students interested in family medicine performed as well or better than those in all other specialties except internal medicine. Differences in the academic performance between students interested in internal medicine and family medicine remained even when only those interested primarily in clinical careers were compared. The proportion of students interested in family medicine residencies increased from 6 to 17 percent in the study period. Smaller proportions were interested in teaching and research than those in other specialties, and larger proportions intended to work in communities with populations of 100,000 or less.

*Journal of Medical Education. 1977; 52: 99-106.*



**PRIMARY CARE AND NON-PRIMARY CARE PHYSICIANS: A LONGITUDINAL STUDY OF THEIR SIMILARITIES, DIFFERENCES, AND CORRELATES BEFORE, DURING, AND AFTER MEDICAL SCHOOL**

*Mohammadreza Hojat, Joseph S. Gonnella, James B. Erdmann, J. Jon Veloski, Gang Xu*

**Purpose:** To investigate similarities and differences between physicians in primary care and non-primary care specialties on performance measures prior to, during, and after medical school, and on demographic characteristics, professional plans and preferences in medical school, professional activities, career satisfaction, perceived problems and research activities, and to predict primary - non-primary care career choices from information obtained in medical school.

**Method:** A questionnaire was mailed to 1,076 physicians who graduated from Jefferson Medical College between 1982 and 1986. Of those who responded (62%), 232 were primary care and 406 were non-primary care physicians (29 physicians in mixed specialties were excluded). Data from the questionnaire concerning professional activities, satisfaction, problems, and research productivities were merged with the college's longitudinal study database.

**Results:** Comparisons of primary care - non-primary care physicians indicated no significant difference between them on performance measures before, during, and after medical school, with the exception that non-primary care physicians had higher scores on quantitative tests before medical school, and primary care physicians scored higher on a licensing examination of general clinical skills and patient management taken during residency training. Also, compared with non-primary care physicians, those in primary care were less likely to be employed full-time, were less likely to locate in metropolitan areas, had a lower rate of academic appointment, and had a higher rate of board certification. Other results showed differences between the groups in terms of age at entrance to medical school, proportion of women, estimates during medical school of anticipated income, career plans during medical school, satisfaction with career and income, and research and scientific activities.

A logistic regression model could predict primary care - non-primary care status from specialty interest, professional plans, and interests expressed in medical school.

*Academic Medicine. 1995; 70(Supplement): S17-S28.*

**JEFFERSON MEDICAL COLLEGE LONGITUDINAL STUDY: A PROTOTYPE  
FOR EVALUATION OF CHANGES**

*Mohammadreza Hojat, Joseph S. Gonnella, J. Jon Veloski, James B. Erdmann*

Medical schools have a specific obligation to society to evaluate the effectiveness of their programs and to assess the impact of any changes in the input, processes and output of their institutions. This obligation can be better fulfilled when empirical data are collected and a longitudinal study methodology is used to investigate changes over time. The Jefferson Medical College's longitudinal study is described as a prototype for such evaluations. The goals and scope of the Jefferson longitudinal study of medical students and graduates are described, and samples of outcome studies based on Jefferson's longitudinal database are presented to demonstrate how changes can be evaluated.

*Education for Health. 1996; 9: 99-113.*

**DIFFERENCES IN PROFESSIONAL ACTIVITIES, PERCEPTIONS OF PROFESSIONAL PROBLEMS, AND PRACTICE PATTERNS BETWEEN MEN AND WOMEN GRADUATES OF JEFFERSON MEDICAL COLLEGE**

*Mohammadreza Hojat, Joseph S. Gonnella, J. Jon Veloski, Shelley L. Moses*

Differences between men and women graduates of one medical school in practice patterns, professional activities and problems were investigated. A questionnaire was mailed in 1986 to 600 physicians, randomly selected from 1,102 who had graduated from Jefferson Medical College of Thomas Jefferson University between 1977 and 1981. Four hundred and fifty (364 men and 86 women) responded (75%). The women were less likely than the men to be employed full-time; however, proportionately more women than men held full-time academic appointments, treated patients from low-income families, and served in underserved areas in inner cities. The women reported working fewer hours per week and having fewer patients than did the men. The women published scientific articles as often as did the men but were less likely to serve on professional committees, receive professional awards, or develop medical procedures. The women were less concerned about the oversupply of physicians and malpractice litigation. Implications of the findings for health manpower planning and practice pattern expectations are discussed.

*Academic Medicine. 1990; 65: 755-761.*

*Also in Proceedings of the Twenty-sixth Annual Conference on Research in Medical Education, Washington, DC, November 1987; 23-27.*

## A PROGRAM TO INCREASE THE NUMBER OF FAMILY PHYSICIANS IN RURAL AND UNDERSERVED AREAS: IMPACT AFTER 22 YEARS

*Howard K. Rabinowitz, James J. Diamond, Fred W. Markham, Christina E. Hazelwood*

**Context:** The shortage of physicians in rural areas is a longstanding and serious problem, and national and state policymakers and educators continue to face the challenge of finding effective ways to increase the supply of rural physicians.

**Objective:** To determine the direct and long-term impact of the Physician Shortage Area Program (PSAP) of Jefferson Medical College (JMC) on the rural physician workforce.

**Design:** Retrospective cohort study.

**Participants and Setting:** A total of 206 PSAP graduates from the classes of 1978 to 1991.

**Main Outcome Measures:** The PSAP graduates currently practicing family medicine in rural and underserved areas of Pennsylvania, compared with all allopathic medical school graduates in the state and with all U.S. and international allopathic graduates. All PSAP graduates were also compared with their non-PSAP peers at JMC regarding their U.S. practice location, medical specialty, and retention for the past 5 to 10 years.

**Results:** The PSAP graduates account for 21% (32/150) of family physicians practicing in rural Pennsylvania who graduated from one of the state's 7 medical schools, even though they represent only 1% (206/14710) of graduates from those schools (relative risk [RR], 19.1). Among all U.S. and international medical school graduates, PSAP graduates represent 12% of all family physicians in rural Pennsylvania. Results were similar for PSAP graduates practicing in underserved areas. Overall, PSAP graduates were much more likely than their non-PSAP classmates at JMC to practice in a rural area of the United States (34% vs. 11%; RR, 3.0), to practice in an underserved area (30% vs. 9%; RR, 3.2), to practice family medicine (52% vs. 13%; RR, 4.0) and to have combined a career in family practice with practice in a rural area (21% vs. 2%; RR, 8.5). Of PSAP graduates, 84% were practicing in either a rural or small metropolitan area, or one of the primary care specialties. Program retention has remained high, with the number of PSAP graduates currently practicing rural family medicine equal to 87% of those practicing between 5 and 10 years ago, and the number practicing in underserved areas, 94%.

**Conclusions:** The PSAP, after more than 22 years, has had a disproportionately large impact on the rural physician workforce, and this effect has persisted over time. Based on these program results, policymakers and medical schools can have a substantial impact on the shortage of physicians in rural areas.

*Journal of the American Medical Association. 1999; 281(3): 255-260.*

Available online at publisher's site:

<http://jama.ama-assn.org/cgi/content/abstract/281/3/255>

## CRITICAL FACTORS FOR DESIGNING PROGRAMS TO INCREASE THE SUPPLY AND RETENTION OF RURAL PRIMARY CARE PHYSICIANS

*Howard K. Rabinowitz, James J. Diamond, Fred W. Markham, Nina P. Paynter*

**Context:** The Physician Shortage Area Program (PSAP) of Jefferson Medical College (Philadelphia, PA) is one of a small number of medical school programs that addresses the shortage of rural primary care physicians. However, little is known regarding why these programs work.

**Objectives:** To identify factors independently predictive of rural primary care supply and retention and to determine which components of the PSAP lead to its outcomes.

**Design:** Retrospective cohort study.

**Setting and Participants:** A total of 3,414 Jefferson Medical College graduates from the classes of 1978-1993, including 220 PSAP graduates.

**Main Outcome Measures:** Rural primary care practice and retention in 1999 as predicted by 19 previously collected variables. Twelve variables were available for all classes; 7 variables were collected only for 1978-1982 graduates.

**Results:** Freshman-year plan for family practice, being in the PSAP, having a National Health Service Corps scholarship, male sex, and taking an elective senior family practice rural preceptorship (the only factor not available at entrance to medical school) were independently predictive of physicians practicing rural primary care. For 1978-1982 graduates, growing up in a rural area was the only additionally collected independent predictor of rural primary care (odds ratio [OR], 4.0; 95% CI, 2.1-7.6;  $P < .001$ ). Participation in the PSAP was the only independent predictive factor of retention for all classes (OR, 4.7; 95% CI, 2.0-11.2;  $P < .001$ ). Among PSAP graduates, taking a senior rural preceptorship was independently predictive of rural primary care (OR, 2.5; 95% CI, 1.3-4.7;  $P = .004$ ). However, non-PSAP graduates with 2 key selection characteristics of PSAP students (having grown up in a rural area and freshman-year plans for family practice) were 78% as likely as PSAP graduates to be rural primary care physicians, and 75% as likely to remain, suggesting that the admissions component of the PSAP is the most important reason for its success. In fact, few graduates without either of these factors were rural primary care physicians (1.8%).

**Conclusions:** Medical educators and policy makers can have the greatest impact on the supply and retention of rural primary care physicians by developing programs to increase the number of medical school matriculants with background and career plans that make them most likely to pursue these career goals. Curricular experiences and other factors can further increase these outcomes, especially by supporting those already likely to become rural primary care physicians.

*Journal of The American Medical Association. 2001; 286(9): 1041-1048.*

Available online at publisher's site:

<http://jama.ama-assn.org/cgi/content/abstract/286/9/1041>

**WHO IS A GENERALIST? AN ANALYSIS OF WHETHER PHYSICIANS  
TRAINED AS GENERALISTS PRACTICE AS GENERALISTS**

*Howard K. Rabinowitz, Mohammadreza Hojat, J. Jon Veloski, Susan L. Rattner, Mary R. Robeson,  
Gang Xu, Marilyn H. Appel, Carol Cochran, Robert L. Jones, Steven L. Kanter*

Accurate data on the number of generalist physicians are needed to monitor the physician workforce and to plan for future requirements in the changing healthcare system. This study assessed the relationship between two frequently used definitions of a generalist physician: completion of graduate medical education (GME) in only a generalist discipline and physician's self-report of practicing as a generalist. Data for 4,808 physician graduates from six Pennsylvania medical schools from 1986 to 1991 were analyzed using information from the GME tracking census of the Association of American Medical Colleges and the Physician Masterfile of the American Medical Association. Of 1,291 physicians trained in a generalist discipline, 1,205 (93%) reported practicing as generalists. Conversely, of the 3,517 not trained in a generalist discipline, 3,358 (95%) were not practicing as generalists. These results indicate GME training is a valid predictor of self-reported practice and provide baseline data to monitor future changes.

*Evaluation & The Health Profession. 1999; 22: 539-544.*

**A STATEWIDE SYSTEM TO TRACK MEDICAL STUDENTS' CAREERS:  
THE PENNSYLVANIA MODEL**

*Howard K. Rabinowitz, J. Jon Veloski, Robert C. Aber, Sheldon Adler, Silvia Ferretti, Gerald J. Kelliher, Eugene Mochen, Gail Morrison, Susan L. Rattner, Gerald Sterling, Mary R. Robeson, Mohammadreza Hojat, Gang Xu*

In 1994 the Commonwealth of Pennsylvania announced a statewide Generalist Physician Initiative (GPI) modeled after The Robert Wood Johnson Foundation's GPI. Three-year grants totaling more than \$9 million were awarded to seven of Pennsylvania's medical schools, including two that had already received GPI grants from the foundation. Stimulated by these initiatives, the state's six allopathic and two osteopathic medical schools decided to work together to develop a collaborative longitudinal tracking system to follow the careers of all their students from matriculation into their professional careers. This statewide data system, which includes information for more than 18,000 students and graduates beginning with the entering class of 1982, can be used to evaluate the impact of the Pennsylvania GPI, and it also yielded a local longitudinal tracking system for each medical school. This paper outlines the concept of the system, its technical implementation, and the corresponding implications for other medical schools considering the development of similar outcomes assessment systems.

*Academic Medicine. 1999; 74(January Supplement): S112-S118.*

**DEVELOPMENT AND IMPLEMENTATION OF A LONGITUDINAL TRACKING SYSTEM FOR MEDICAL SCHOOL GRADUATES**

*Howard K. Rabinowitz, J. Jon Veloski, Mary R. Robeson, Gang Xu, Mohammadreza Hojat*

In the evolving healthcare system in the United States, a need for balance between generalists and specialists was recognized and recommendations were made to medical schools to develop strategies to increase the number of graduates in generalist disciplines (e.g. general internal medicine, family medicine and general pediatrics). In support of these recommendations, the Commonwealth of Pennsylvania in 1994 provided financial incentives to seven medical schools in Pennsylvania for education of generalist physicians (the Generalist Physician Initiative Project, GPI). There was cognizance of a need to evaluate the effects of the program by employing a clear definition of outcomes and uniform data collection methods. In response to this need, a proposal was developed at the Center for Research in Medical Education and Health Care of Jefferson Medical College to design and implement a statewide tracking system to enable medical schools to examine individually and collectively specific educational outcomes such as graduates' specialties and career preferences. The tracking system was developed based on 30 years of experience of Jefferson medical education researchers in their well-documented Longitudinal Study of Medical Education. The tracking begins when a student enters one of the participating schools and extends throughout each individual's professional career. Data for more than 18,000 students and graduates who have matriculated in the participating medical schools since 1982 are included in the tracking database. The tracking project has resulted in the development of a computerized system that can enable medical schools nationwide to examine important educational outcomes.

*Changing Medical Education and Medical Practice. 1998; 13: 8-9.*



## GENERALIST CAREER PLANS: TRACKING MEDICAL SCHOOL SENIORS THROUGH RESIDENCY

*Howard K. Rabinowitz, Gang Xu, Mary R. Robeson, Mohammadreza Hojat, Susan L. Rattner, Marilyn H. Appel, Carol Cochran, Jeffrey J. Johnson, Steven L. Kanter, J. Jon Veloski*

**Context:** Public and private groups undertaking initiatives to increase the number of generalist physicians require systematic data to assess the outcomes of their efforts. In particular, information about the consistency between generalist career plans at the end of medical school and completion of residency is lacking.

**Method:** Senior career plans as reported on the AAMC GQ and subsequent outcomes at the end of graduate medical education were studied for 2,530 physicians who graduated from six Pennsylvania medical schools in 1990-1992.

**Results:** Overall, 24% of the seniors planned generalist careers and 27% left their residency in family practice, internal medicine or pediatrics without subspecializing. Of the seniors planning to be generalists, 86% maintained that direction throughout graduate medical education.

**Conclusion:** The aggregate results of seniors' career plans are reasonably accurate predictors of career direction at the end of graduate medical education. However, as medical schools, foundations and government agencies monitor the results of their generalists initiatives, it is now clear that assessment must be based not only on students' intentions at the end of medical school and early in residency, but on career decisions throughout graduate medical education.

*Academic Medicine. 1997; 72: 103-105.*

## ASSESSMENT OF PHYSICIANS' INTEREST IN PRIMARY CARE TRAINING/RETRAINING

*Susan L. Rattner, Mary R. Robeson, J. Jon Veloski*

**Purpose:** To assess generalists' and specialists' interest in primary care training and the factors associated with this interest.

**Method:** The study sample was drawn from the alumni of the Jefferson Medical College of Thomas Jefferson University (classes of 1970-1990) who were practicing in Pennsylvania. Family practitioners and general internists were defined as generalists; obstetrician-gynecologists (ob-gyns) and internal medicine subspecialists were defined as specialists. In 1995 a questionnaire was mailed consisting of 46 items assessing the physicians' interest in participating in primary care educational programs, reasons for any such interest, and preferences for content. Two items on the specialists' questionnaire asked about changing careers from specialist to generalist, and two items on the generalists' questionnaire asked about broadening the scope of their practices.

**Results:** The response rate was 54% (381/707). In all, 78% of the physicians expressed interest in primary care training. The generalists were more interested in primary care training than were the specialists ( $p < .001$ ). The ob-gyns were more interested in primary care training than were the medical subspecialists ( $p = .01$ ). Few of the medical subspecialists and no ob-gyns were influenced by plans to change careers to primary care. More of the ob-gyns than the medical subspecialists were motivated by plans to shift emphasis to provide more primary care.

**Conclusion:** The results suggest (1) that although many specialists have an interest in primary care training, it is rarely motivated by plans to change to primary care practice, and (2) that generalists are very interested in expanding their abilities. Both of these findings should be considered in workforce planning.

*Academic Medicine. 1997; 72: 1103-1105.*

**CHANGING SPECIALTIES: DO ANESTHESIOLOGISTS DIFFER FROM  
OTHER PHYSICIANS?**

*Joseph L. Seltzer, J. Jon Veloski*

Data for the present study were derived from a longitudinal study of medical students and graduates conducted at Jefferson Medical College since 1968. Questionnaires were available for 1,306 (78%) of the 1,676 students in the graduating classes of 1968 through 1976. The actual specialties of all but 155 of these Jefferson graduates were obtained five or more years after graduation from the alumni office of the College. The remaining 1,151 (69%) graduates were classified into 11 large specialty groupings and one group that included small numbers of graduates in ophthalmology, otolaryngology and preventive medicine programs. Thirty five (3%) of the 1,151 graduates listed anesthesiology as their specialty. Of the 31 students who had planned, prior to graduation, to go into anesthesiology, 26 actually did so. Nine physicians had changes from other specialties to anesthesiology, which represented a 26% gain. It was concluded from the study that, for whatever reasons physicians change specialties, anesthesiology does not appear to be different from other specialties in its ability to retain or gain physicians. The data in this study represent only one medical school and, if students at other medical colleges receive different types or amounts of formal training in anesthesiology, there could be a greater number of physicians changing to or from anesthesiology.

*Anesthesia and Analgesia. 1982; 61(6):504-506.*

## ACADEMIC PERFORMANCE OF PSYCHIATRISTS COMPARED TO OTHER SPECIALISTS BEFORE, DURING, AND AFTER MEDICAL SCHOOL

*Frederick S. Sierles, Michael J. Vergare, Mohammadreza Hojat, Joseph S. Gonnella*

**Objective:** This study was designed to compare psychiatrists with other physicians on measures of academic performance before, during, and after medical school.

**Method:** More than three decades of data for graduates of Jefferson Medical College (N=5,701) were analyzed. Those who pursued psychiatry were compared to physicians in seven other specialties on 18 performance measures. Analysis of covariance was used to control for gender effect.

**Results:** Compared to other physicians, psychiatrists scored higher on measures of verbal ability and general information before medical school and on evaluations of knowledge and skills in behavioral sciences during medical school, but they scored lower on United States Medical Licensing Examinations step 3.

**Conclusions:** The results generally confirmed the authors' expectations about psychiatrists' academic performance. More attention should be paid to the general medical education of psychiatrists.

*American Journal of Psychiatry. 2004; 161(8): 1477-1482.*

Available online at publisher's site:

<http://ajp.psychiatryonline.org/cgi/content/abstract/161/8/1477>

**PERFORMANCE ON THE NBME PART II EXAMINATION AND  
CAREER CHOICE**

*Tennyson Williams, Larry Sachs, J. Jon Veloski*

In the present study the authors hypothesized that the NBME Part II examination subtest scores of students selecting various specialty residency programs would demonstrate profiles that were unique for each specialty chosen. The hypothesis was based on the assumption that students will seek careers dealing with content with which they are comfortable and that this comfort derives from successful academic performance.

Separate but parallel analyses were conducted on data from the Jefferson Medical College (JMC) and the Ohio State University College of Medicine (OSU). Students from each school who took the NBME Part II Examination from 1978 through 1984 were grouped according to their residency choice: family medicine, internal medicine, obstetrics/gynecology, pediatrics, psychiatry, surgery and "other." The sample sizes totaled 1,534 for JMC and 1,429 for OSU.

One of the major results was the similarity of profiles across the two schools. The students who selected a residency for which there is a major subtest in the NBME Part II examination showed a higher performance on the subtest corresponding to their residency choice than on any other subtest. The family medicine group and the "other" group did not have any subtest means significantly different than the group mean. The magnitude of the difference between scores on the subtest of the specialty chosen and other subtests is impressive. The authors consider that counseling to enter particular specialties for students who have scores unusually high on one subtest would be appropriate. Even when a student scores very high on two subtests, the career decisions are made easier. In such cases, students should give high priority to personal factors in deciding between the two disciplines.

*Journal of Medical Education. 1986; 61: 979-981.*

**MEDICAL STUDENTS WHO ENTER GENERAL SURGERY RESIDENCY PROGRAMS: A FOLLOW-UP BETWEEN 1972 AND 1986**

*Philip J. Wolfson, Mary R. Robeson, J. Jon Veloski*

It is generally assumed that most students who enter surgical residency programs each year are destined for careers in the surgical field—general surgery, a specialty of general surgery, or a related specialty (ENT, orthopaedic surgery, ophthalmology or urology). While it has always been recognized that a small number of surgical residents do leave the surgical field, little has been reported about what actually happens to them. We undertook this long-term follow-up of our graduates to find out what proportion do end up in a surgical field and to identify any patterns of change that may have taken place over the past fifteen years. Between 1972 and 1986, 459 JMC graduates (about 14 percent) entered PGY-1 programs in general surgery. Using recent follow-up data available from the college's alumni office and the American Medical Association, we classified each of the graduates into one of three groups: 1) those remaining in general surgery/subspecialty, 2) graduates in a specialty within the surgical field and 3) those in a specialty outside of the surgical field (anesthesiology, dermatology, family practice, emergency medicine, pediatrics, pathology or radiology). The three groups were compared across years on demographics, academic credentials and surgery program director's ratings of their performance in PGY-1.

Throughout the fifteen-year time period, approximately 70% of the graduates did remain in general surgery/subspecialty while about 15% moved to one of the other specialties within the surgical field. Although the percentage of surgery residents who left the surgical field remained constant throughout nearly two decades, there were statistically significant changes in the academic credentials of the residents who remained within the surgical field compared with those who left. During the mid-1970s the residents who remained within the surgical field had better academic credentials on average as measured by medical school grades and National Board scores (about 40 points higher) than those who switched out of the surgical field. However, in the more recent time period of the late 1970s and the early 1980s, the trend reversed. Those residents who left the surgical field had academic credentials that were, on average, equal to or better than those who remained. There were no differences between the groups on age, sex, and program director's ratings of their performance in the first year of the surgical residency.

These results have important implications for student counseling and resident selection. They suggest that some good students are being recruited into surgical programs but are later being lost in major career switches. Studies need to be undertaken to find out why these students are changing. Perhaps these changes are related to young residents' preferences for specialties that offer more controllable lifestyles than the surgical field.

*The American Journal of Surgery. 1991; 162(5): 491-494.*

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**PERCEPTIONS OF PRACTICE PROBLEMS ENCOUNTERED BY FAMILY PHYSICIANS, PEDIATRICIANS AND ORTHOPEDIC SURGEONS**

*Gang Xu , Timothy P. Brigham, J. Jon Veloski , Joseph F. Rodgers*

Information about physicians' practice problems was solicited through a structured questionnaire mailed to a group of family physicians, pediatricians, and orthopedic surgeons. Overall, a lack of personal time was the major concern across the three groups of physicians. Comparisons among the three types of physicians revealed two patterns: Family physicians reported more concerns in the "interpersonal" dimension, whereas orthopedic surgeons had more concerns in the "legal-economic" dimension. These patterns of differences persisted with two variables controlled: gender and time period in which they completed their residency program. These findings indicate that physicians' concerns in their practice vary among the specialties, and they imply that the changed economy and reimbursement system might have more impact on one than the other. Thus the effectiveness of residency training and continuing education might be improved by emphasizing the specialty-related problems in practice.

*Evaluation & The Health Professions. 1993; 16: 119-129.*

**PRIMARY CARE AND NONPRIMARY CARE PHYSICIANS' CONCERNS IN PRACTICE AND PERCEPTIONS OF MEDICAL SCHOOL CURRICULUM**

*Gang Xu, Mohammadreza Hojat, Timothy P. Brigham, Mary R. Robeson, J. Jon Veloski*

The purpose of the present study is to address the issue of physicians' concerns in practice and their perception of a medical school's curriculum with an emphasis on comparisons between primary and nonprimary care physicians. The sample consisted of 663 physicians who graduated from Jefferson Medical College (JMC) between 1982 and 1986 and also responded to a mailed questionnaire. Comparisons were made between physicians in primary care (n = 235) and in nonprimary care (n = 429) specialties on their responses regarding concerns in medical practice and evaluation of the medical school curriculum. Primary care physicians were more concerned about the time for their professional development whereas nonprimary care physicians were more concerned about an oversupply of physicians in their specialties, prospective hospital payment, and malpractice litigation. Regardless of the specialties, the physicians overall seemed very concerned about their personal time. Interpersonal skills were regarded by all respondents as an important aspect of the medical school's curriculum. The importance of psychological, social, and cultural factors in the curriculum was strongly supported by these physicians' responses, particularly among primary care and women physicians.

*Evaluation and The Health Professions. 1994; 17: 436-445.*



**FACTORS ASSOCIATED WITH CHANGING LEVELS OF INTEREST  
IN PRIMARY CARE DURING MEDICAL SCHOOL**

*Gang Xu, Mohammadreza Hojat, Timothy P. Brigham, J. Jon Veloski*

**Background:** Previous studies have indicated that there is a need for an understanding of the effect of medical school curricula on students' choice of primary care specialties. The present study examined students' change of interest in primary care as related to their clinical experience during medical school and to other variables.

**Method:** A total of 1,911 (74%) responded to a national survey of all allopathic medical school graduates in early 1993. Their reported change of interest in primary care during medical school was cross-tabulated with their clinical experiences in medical school, their demographics, their interest prior to medical school, and their future plan in practice.

**Results:** Students' increased interest in primary care during medical school was strongly associated with the electives they took in primary care. The positive change of interest in primary care is also associated their interest prior to medical school and their future plan in primary care in later career.

**Conclusion:** Schools wishing to implement a program to increase the number of graduates entering primary care specialties may consider increasing the number of primary care elective courses to increase students' interests and help them make a decision to enter and remain in primary care specialties.

*Academic Medicine. 1999; 74: 1011-1015.*

**EMERGENCY MEDICINE CAREER CHANGE: ASSOCIATIONS WITH PERFORMANCES IN MEDICAL SCHOOL AND IN THE FIRST POSTGRADUATE YEAR AND WITH INDEBTEDNESS**

*Gang Xu, Mohammadreza Hojat, J. Jon Veloski*

**Objective:** Emergency medicine has been identified as the specialty that has gained the most young physicians who have changed their careers. To identify factors that may have contributed to such career changes, the authors compared the characteristics of three groups of physicians trained at their medical school: those who chose and stayed in emergency medicine, those who migrated into emergency medicine from other specialties, and those who moved out of emergency medicine.

**Methods:** A prospective longitudinal study was conducted. The sample consisted of physicians who chose emergency medicine as their careers at graduation and stayed in the specialty (n = 24), those who migrated from other specialties into emergency medicine (n = 51), and those who moved out of emergency medicine (n = 10). This sample was obtained from a total of 2,173 graduates of Jefferson Medical College between 1978 and 1987. The three groups of physicians were compared according to their academic performances both during medical school and after graduation. The dependent variables were freshman and sophomore grade point averages (GPAs), written clinical examination scores, scores on National Board of Medical Examiners examination (Parts I, II, and III), and residency program directors' ratings. Age and indebtedness at medical school graduation and board certifications status also were examined.

**Results:** Those physicians who stayed in emergency medicine and those who migrated from other specialties into emergency medicine had similar measures of academic performance, but both of these groups had higher academic performance measures and higher board certification rates than did the physicians who moved out of emergency medicine. Those who stayed in emergency medicine had the highest mean debt in the senior year of medical school.

**Conclusions:** High academic performance and high indebtedness are factors associated with choosing or staying in the specialty of emergency medicine.

*Academic Emergency Medicine. 1994; 1: 443-447.*

**THE CHANGING HEALTHCARE SYSTEM: A RESEARCH AGENDA  
FOR MEDICAL EDUCATION**

*Gang Xu, Mohammadreza Hojat, J. Jon Veloski, Joseph S. Gonnella*

The volatility in the U.S. healthcare system due to unprecedented changes in its organization, financing, and delivery, coupled with a growing physician surplus in certain areas, suggests the need for a research agenda to investigate the impact of these forces on the educational programs of medical schools. This article discusses the potential impact of trends in the healthcare environment on the following key aspects of undergraduate medical education: admissions, faculty, curriculum, and educational outcomes. A representative set of research questions intended to stimulate inquiry and guide empirical studies in each of the four domains is proposed.

*Evaluation and The Health Professions. 1999; 22(2): 152-168.*

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**A NATIONAL STUDY OF THE FACTORS INFLUENCING MEN AND WOMEN  
PHYSICIANS' CHOICES OF PRIMARY CARE SPECIALTIES**

*Gang Xu, Susan L. Rattner, J. Jon Veloski, Mohammadreza Hojat, Sylvia K. Fields,  
Barbara Barzansky*

**Background:** Despite a recent increase in the percentage of graduating U.S. medical students planning to pursue generalist careers, interest in primary care among students is still far below what it was in the early 1980s and falls well short of the stated goal of the Association of American Medical Colleges that half of all graduates should choose generalist careers. Also during the past decade, the number of women students and physicians has increased. Given the importance of concerns regarding the primary care work force, it is timely to examine the relationship between gender and other factors that influence the decision to enter primary care.

**Method:** Totals of 1,038 (65%) men and 558 (35%) women primary care physicians selected from the 1983 and 1984 graduates of all allopathic U.S. medical schools were surveyed in early 1993. Gender comparisons were made on the 19 variables that influenced the physicians' decisions to enter primary care specialties and on the six factor scores derived from a factor analysis of these 19 variables. Also included in the gender comparisons were characteristics of practice, populations served, timing of making the decision to enter primary care, and personal demographic information.

**Results:** Men, more than women, were influenced to become primary care physicians by early role models. Women, more than men, were influenced by personal and family factors. Overall, medical school experience and personal values are two important factors that explained the largest variances of the 19 predictor variables influencing the physicians' choices of primary care disciplines. There was no gender difference in place of origin, family income as a child, timing of the decision to become a primary care physician, or the amount of debt upon graduation.

**Conclusion:** The nationwide study of primary care physicians indicates that men and women physicians differ in their perceptions of the relative importances of factors influencing the choice of a primary care specialty. Gender-specific factors should receive more attention in the development of successful strategies to attract more medical students into primary care specialties.

*Academic Medicine. 1995; 70: 398-404.*

**COMPARING THE ACADEMIC PERFORMANCES OF GERIATRICIANS  
AND OTHER FAMILY PHYSICIANS AND INTERNISTS**

*Gang Xu, J. Jon Veloski*

This study compared the academic performances of geriatricians and other family physicians and internists. The sample consisted of the graduates of Jefferson Medical College from 1971 through 1981 whose first board certifications were in either family medicine or internal medicine. Of the family physicians, there were 14 whose second or third certificates were in geriatrics. Of the internists, there were 26 whose second or third certificates were in geriatrics. The graduates who had second or third certificates in areas other than geriatrics were removed from the analysis, leaving 250 family physicians and 197 internists to be compared with the geriatricians in their respective fields.

The graduates who were board certified in family medicine and held geriatrics certificates had better academic performances during medical school than did those who were certified only in family medicine. They had significantly ( $p < .05$ ) higher freshman and sophomore grade-point averages, clinical clerkship examination scores, and National Board of Medical Examiners (NBME) Part I and Part II examination scores. There was no significant difference between the two groups on the NBME Part III. The academic performances of the graduates who were board-certified in internal medicine and held geriatrics certificates were not significantly different from those of the graduates who were certified only in internal medicine. In addition, the academic performances of the geriatricians certified in family medicine were compared with those of the geriatricians certified in internal medicine, showing no significant difference.

Geriatrics is becoming a well-defined field and is one rooted in primary care. This study addresses the public concern about the quality of geriatricians and shows that highly qualified physicians in family medicine and internal medicine are obtaining geriatrics certificates—a positive outcome worthy of investigations in other studies.

*Academic Medicine. 1993; 68: 388.*

**FACTORS INFLUENCING PHYSICIANS' DECISIONS TO REMAIN  
IN EMERGENCY MEDICINE**

*Gang Xu, J. Jon Veloski*

Our study examined the factors influencing physicians' decisions to continue their careers in emergency medicine (EM). A questionnaire was sent to 53 graduates (classes of 1981-1990) of Jefferson Medical College whose specialty choices in their senior year had been EM. They were asked to indicate to what extent each of 23 factors had encouraged them to remain in EM (with 0 = no influence, 1 = minor positive influence, and 4 = major positive influence). Thirty-six physicians (68%) returned usable questionnaires. For the 33 who had remained in EM, the mean scores for the most important factors were as follows: challenging diagnostic problems, (3.38); predictable working hours, (3.03); intellectual content of the specialty, (2.93); income, (2.93); and opportunity to deliver primary care, (2.91). The mean scores for the least important factors were as follows: examples of family or friends, (0.67); minimum patient contact, (0.67); fewer malpractice problems, (0.83); and encouragement from other physicians, (1.16). The level of educational debt was also rated as minor influential factor, (1.43).

This study revealed that those who chose EM highly valued the predictable working hours, which reinforces the notion of the importance of lifestyle in influencing physicians' career choice. We previously reported for this same group of physicians that their actual amount of educational indebtedness was highest as compared with the indebtedness of other specialty groups. However, the self-reported data presented here suggest that these physicians' decisions to be emergency doctors were not influenced by indebtedness. This leads us to speculate that physicians might not be consciously aware of the influence of indebtedness on career decisions even though it exists.

*Academic Medicine. 1992; 67: 413.*

**A COMPARISON OF JEFFERSON MEDICAL COLLEGE GRADUATES WHO CHOSE EMERGENCY MEDICINE WITH THOSE WHO CHOSE OTHER SPECIALITIES**

*Gang Xu, J. Jon Veloski*

Using the database of the Jefferson Medical College Longitudinal Study of students and graduates, fifty-three Jefferson graduates who chose emergency medicine (EM) over the decade from 1981 through 1990 were compared with the other Jefferson graduates during that decade who chose other specialties. As seniors, those who chose EM had the highest debt of seniors going into any specialty. However, the mean peak income they expected was higher than expected by the other nonsurgeons, although it was below that expected by the surgeons. The EM group compared favorably with those who chose other specialties in terms of their academic records and had the highest mean Part III score on the National Board of Medical Examiners examination of any of the groups studied. The students who chose EM also indicated their great willingness to see patients from low-income households and were willing to spend more of their practice time serving these groups than were the students who chose the other specialties. The authors discuss these findings as related to the nature of EM and medical school graduates' choices of specialties.

*Academic Medicine. 1991; 66: 366-368.*

**COMPARISONS AMONG THREE TYPES OF GENERALIST PHYSICIANS:  
PERSONAL CHARACTERISTICS, MEDICAL SCHOOL EXPERIENCES,  
FINANCIAL AID, AND OTHER FACTORS INFLUENCING CAREER CHOICE**

*Gang Xu, J. Jon Veloski, Barbara Barzansky, Mohammadreza Hojat, James J. Diamond,  
Vincent M.B. Silenzio*

A national survey of family physicians, general internists, and general pediatricians was conducted in the U.S. to examine differences among the three groups of generalist physicians, with particular regard to the factors influencing their choice of generalist career. Family physicians were more likely to have made their career decision before medical school and were more likely to have come from inner-city or rural areas. Personal values and early role models play a very important role in influencing their career choice. In comparison, a higher proportion of general internists had financial aid service obligations, and their choice of the specialty was least influenced by personal values. General pediatricians had more clinical experiences either in primary care or with underserved populations, and they regarded medical school experiences as more important in influencing their specialty choice than did the other two groups. Admission committees may use these specialty-related factors to develop strategies to attract students into each type of generalist career.

*Advances in Health Sciences Education. 1996; 1(3): 197-207.*

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## CHANGING INTEREST IN FAMILY MEDICINE AND STUDENTS' ACADEMIC PERFORMANCE

*Gang Xu, J. Jon Veloski, Mohammadreza Hojat*

In recent years, there has been declining interest in family practice among medical school graduates nationwide. Although a change in the proportion of students interested in certain specialties does not necessarily mean a corresponding change in their academic credentials, some recent studies reported a significant decrease in the percentage of top students choosing careers in primary care specialties, including family practice, and a significant increase in the percentage of these top students choosing controllable lifestyle specialties such as anesthesiology, radiology, pathology, and emergency medicine. The study addresses this general question: How do students who choose family medicine compare academically with those who choose other specialties?

The sample consisted of all graduates from Jefferson Medical College from 1980 through 1991 (a total of 12 years). Students' performance in medical school and on the National Board of Medical Examiners (NBME) examinations were collected prospectively as a part of a longitudinal study. Also included in this study was information gathered through a questionnaire given to all seniors before they received the results of the National Resident Matching Program, which included their plans for specialization after the first year of post-graduate training and the community in which they planned to work.

Of the 2,263 graduates studied, 385 (17%) preferred family practice, and the proportion decreased from 18.2% in 1980-1982 to 14.7% in 1989-91. In comparisons of academic performances during medical school, the family medicine group performance was comparable with that of most other specialty groups. Of particular note here were the NBME Part III scores where the family medicine group was ranked the second highest and is scored significantly higher than each of the remaining five specialty groups. There was no significant difference in any one of the four measured areas of residency program director ratings among the specialty groups compared. Consistent with national statistics, this study sample demonstrated a decline in the number of students preferring family practice. However, the performance of those in the family medicine group was comparable to that of those in other specialties.

*Academic Medicine. 1993; 68(Supplement): 52-54.*

*Also in Proceedings of the Thirty-second Annual Conference on Research in Medical Education, Washington, DC, November 1993.*

**PHYSICIANS' INTENTION TO STAY IN OR LEAVE PRIMARY CARE  
SPECIALTIES AND VARIABLES ASSOCIATED WITH SUCH INTENTION**

*Gang Xu, J. Jon Veloski, Mohammadreza Hojat, Sylvia K. Fields*

A national mail survey of primary care physicians was conducted in 1993 to examine the differences between those who planned to leave and those who planned to stay in primary care disciplines. The physicians who planned to stay in primary care were those who, at the time of choosing primary care specialties, were more influenced by factors such as personal social values, religion, and the presence of a role model prior to medical school. Physicians' race, sex, workload, debt, place where they grew up, family income as a child, and timing when they made the decision to enter primary care disciplines are not associated with their plans to stay in or leave primary care disciplines. Findings indicated that personal social values, religious beliefs, and the presence of a role model prior to medical school not only influenced physicians' choice of primary care, but had a lasting effect on their commitment to such choice.

*Evaluation and The Health Professions. 1995; 18: 92-102.*

**FACTORS INFLUENCING PRIMARY CARE PHYSICIANS' CHOICE  
TO PRACTICE IN MEDICALLY UNDERSERVED AREAS**

*Gang Xu, J. Jon Veloski, Mohammadreza Hojat, Robert M. Politzer, Howard K. Rabinowitz,  
Susan L. Rattner*

**Purpose:** To examine the factors associated with primary care physicians' practice location in underserved areas.

**Method:** The sample was randomly drawn from practicing generalist physicians who graduated in 1983 and 1984 from MD-granting and DO-granting medical schools. The survey was conducted in 1993. A multiple logistic regression model with maximum likelihood procedures was used in which physician's practice location in an underserved area (1=Yes; 0=No) was the dependent variable and 15 other variables as regressors.

**Results:** A 75% response rate was obtained. Physicians' underrepresented minority status, the area where the physicians grew up, the interests expressed prior to medical school to care for the underserved, and financial aid obligations were the most significant predictors in the model. The physicians' experiences with primary care or with underserved patients, both during medical school and in residency, were not associated with their decision to locate in an underserved area.

**Conclusions:** Physician's personal and demographic characteristics are the most important factors influencing decisions to practice in underserved areas. Admission policies that are targeted to applicants with minority backgrounds, who grew up in a rural or inner city area, and who express a strong interest prior to medical school to practice in the underserved area would likely increase physician manpower in these areas. Supporting the target individuals who have financial obligations is an additional crucial factor.

*Academic Medicine. 1997; (Supplement 1 to 72): S109-S111.*

## DEMOGRAPHICS

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### GENDER SEGREGATION BY SPECIALTY DURING MEDICAL SCHOOL

*Ann Boulis, Jerry Jacobs, J. Jon Veloski*

In this retrospective cohort study from the University of Pennsylvania, U.S.A., the authors examined how gender segregation across specialties has changed during the past 20 years and how gender segregation changes during medical school. Data from the Jefferson Longitudinal Study of Medical Education on 4,312 medical students' specialty choices before, during, and after medical school were analyzed. Women constituted 26.7% of students in the sample. Intended specialty choices were limited to: (1) anesthesiology, pathology, and radiology, referred to as hospital-based specialties; (2) emergency medicine; (3) family practice; (4) internal medicine; (5) obstetrics-gynecology; (6) ophthalmology; (7) pediatrics; (8) psychiatry; (9) surgery; (10) other; and (11) undecided. There was a significant trend toward increased gender segregation among specialties between the 1980s and 1990s, with an increased concentration of men in surgery, hospital specialties, and internal medicine, and an increased concentration of women in pediatrics, family practice, and obstetrics-gynecology. Also, there was an increase in gender based segregation during medical school that the authors attributed primarily to the large percentage of students (over one-third) who enter medical school without a specialty preference and who ultimately distribute themselves across specialties in a gender segregated way. Seventy-nine percent of female students and 75% of male students were either undecided initially or changed specialties during medical school. The authors say that for the vast majority of students the medical school experience not only had the potential to influence their choice of specialty, but that it also played a role in the gender based segregation of specialty choice amongst students.

*Academic Medicine. 2001; 76(10): S65-S67.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200110001-00022.pdf>

**COMPARING THE ACCURACIES OF ENTIRE-GROUP AND SUBGROUP MODEL TO PREDICT NBME I SCORES FOR MEDICAL SCHOOL APPLICANTS**

*James B. Erdmann, Mohammadreza Hojat, J. Jon Veloski*

To address the question of whether prediction models for subgroups of medical school applicants lead to more accurate predictions of performance than does one model for an entire group of applicants, the authors used data from two groups of students at Jefferson Medical College: 415 students who entered Jefferson in 1985 and 1986 and 396 who entered in 1987 and 1988. Both groups were divided into two subgroups by gender and two subgroups by age. Data from the first group were used to develop prediction models based on the entire group and on its four subgroups. The predictors were undergraduate grade-point averages and Medical College Admission Test scores; the criterion measures were scores on the National Board of Medical Examiners Part I examinations. The prediction models were then applied to data from the second group and its four subgroups; differences in the validity coefficients (.40 to .56) and residual scores (7.2 to 17.9) were not considered to be of practical importance. Hence, the authors suggest that gender and age do not contribute to a prediction bias and that an entire-group prediction model can be used without serious concern for over- or underestimating the predicted scores.

*Academic Medicine. 1992; 67: 860-862.*

### AFRICAN AMERICAN AND WHITE PHYSICIANS: A COMPARISON OF SATISFACTION WITH MEDICAL EDUCATION, PROFESSIONAL CAREERS AND RESEARCH ACTIVITIES

*John Gartland, Mohammadreza Hojat, Edward B. Christian, Clara A. Callahan, Thomas J. Nasca*

**Background:** Given the disparity between proportions of minority in the general population and in the physician workforce and the projected increase in the minority population, it is important and timely to examine factors that contribute to satisfaction of minority physicians.

**Purpose:** To examine similarities and differences between African American and White physicians in their satisfaction with medical school, their medical careers, and their professional and research activities and achievements.

**Methods:** A questionnaire was mailed to the 148 active African American graduates of Jefferson Medical College (1960-1995). Control group was 148 active White classmates matched as to gender, year of graduation, and scores on Step 2 of the United States Medical Licensing Examination (formerly Part 2 of the National Board).

**Results:** Overall response rate-61% (African Americans-59%, White control group-63%). Both groups were equally satisfied with medical education, careers and professional and research activities. No differences were noted between the groups in satisfaction with medical school financial support, preparation for a medical career, with the educational experience and academic environment, with medical careers and with practice incomes. African Americans reported greater dissatisfaction than Whites with interactions with medical school faculty and administrators and with the medical school social environment. African Americans were less likely than Whites to recommend Jefferson to minority applicants and to contribute to Annual Alumni Giving. More African Americans than Whites practiced medicine in economically deprived areas and cared for poor minority patients.

**Conclusions:** African American respondents were comparable with White respondents as to their medical careers, professional activities and achievements as physicians. Their practice patterns reflected a greater sense of community need and involvement than their White counterparts. The sense of dissatisfaction with the social environment of medical school noted by African American respondents seems to persist during their professional careers.

*Teaching and Learning in Medicine. 2003; 15(2)106-112.*

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**PERFORMANCE AND CAREER EXPECTATIONS OF WOMEN MEDICAL STUDENTS: A COMPARISON WITH MEN**

*Mary W. Herman, J. Jon Veloski*

In this study, data are presented pertaining to the performance and career expectations of women entering medical school between 1966-1968. Women are compared with men, both as a point of reference for general trends and to measure changes in sex differences. The data were derived from an ongoing longitudinal study of medical students at Jefferson Medical College. No significant differences were found between the sexes in attrition or in measures of clinical competence. Significant differences between men and women in expected hours of work and years of professional activity disappear in the latter part of the study period. Women have lower income expectations, and more of them plan to work in small communities in the latter time period, but they do not differ from men in the proportions interested in primary care specialties or clinical careers. Both sexes showed, over time, increased interest in family medicine and working in small communities.

*The New England Journal of Medicine. 1980; 302: 1035-36.*



### GENDER COMPARISONS OF MEDICAL STUDENTS' PSYCHOSOCIAL PROFILES

*Mohammadreza Hojat, Karen Glaser, Gang Xu, J. Jon Veloski, Edward B. Christian*

**Objectives:** This study was designed to compare male and female medical students on selected personality attributes that could influence their academic attainment and personal success.

**Design:** Participants were 1157 medical students (743 men, 414 women) who completed a set of psychosocial questionnaires measuring intensity and chronicity of loneliness, general anxiety, test anxiety, neuroticism, depression, extraversion, self-esteem, locus of control, perceptions of parents, general health and appraisals of stressful life events. Data were analyzed by employing multivariate and univariate analysis of variance and chi-square analysis.

**Setting:** Jefferson Medical College.

**Subjects:** Medical Students.

**Results:** Men scored significantly higher on the intensity of loneliness, and women scored higher on general anxiety, test anxiety and neuroticism scales, but the magnitudes of the effect size estimates were not large. No significant gender difference was observed on measures of chronicity of loneliness, depression, extraversion, self-esteem, external locus of control, perception of the mother and the father. Women who experienced stressful life events, such as death in the family or personal illness, appraised these events more negatively than did their male counterparts.

**Conclusions:** Implications of the findings for medical education and practice are discussed.

*Medical Education. 1999; 33(5): 342-349.*

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<http://www.blackwell-synergy.com/doi/abs/10.1046/j.1365-2923.1999.00331.x>

**GENDER COMPARISONS OF INCOME EXPECTATIONS IN THE U.S.A.  
AT THE BEGINNING OF MEDICAL SCHOOL DURING THE PAST  
TWENTY-EIGHT YEARS**

*Mohammadreza Hojat, Joseph S. Gonnella, James B. Erdmann, Susan L. Rattner, J. Jon Veloski,  
Karen Glaser, Gang Xu*

This study was designed to investigate gender differences in the U.S.A. in anticipated professional income. Participants were 5,314 medical students (3,880 men, 1,434 women) who entered Jefferson Medical College between 1970 and 1997. The annual peak professional income estimated at the beginning of medical school was the dependent variable and gender within selected time periods was the independent variable. Results showed significant differences between men and women on their anticipated future incomes in different time periods. Women generally expected 23% less income than men. The effect size estimates of the differences were moderately high. The gender gap in income expectations was more pronounced for those who planned to pursue surgery than their counterparts who planned to practice family medicine or pediatrics. A unique feature of this study is that its outcomes could not be confounded by active factors such as experience, working hours, age and productivity. Findings suggest that social learning may contribute to gender gap in anticipated income.

*Social Science & Medicine. 2000; 50(11): 1665-1672.*

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### **GENDER COMPARISONS OF YOUNG PHYSICIANS' PERCEPTIONS OF THEIR MEDICAL EDUCATION, PROFESSIONAL LIFE, AND PRACTICE: A FOLLOW-UP STUDY OF JEFFERSON MEDICAL COLLEGE GRADUATES**

*Mohammadreza Hojat, Joseph S. Gonnella, Gang Xu*

**Purpose:** To obtain information from a group of young physicians and compare men and women on their evaluations of selected areas of the medical school curriculum, their perceptions of issues related to medical practice and professional life, and their specialty choices, professional activities, and research productivity.

**Method:** In 1992, a questionnaire was mailed to 1,076 physicians who had graduated from Jefferson Medical College between 1982 and 1986. The responses of men and women were compared using multivariate and univariate analyses of variance, t-tests, chi-square, and median test.

**Results:** Completed questionnaires were returned by 667 graduates (530 men and 137 women). The curriculum areas of interpersonal skills, disease prevention, medical ethics, and economics of health care were rated by both men and women as being the most important in medical training. Conversely, research methodology and statistics received the lowest ratings. Women, in general, valued psychosocial aspects of medical care higher than did men. Among the areas of perceived problems related to practice, lack of leisure time received the highest ratings (as being the greatest problem) and interpersonal interactions received the lowest ratings (as being the least problem) from both men and women. The men were more concerned than the women about the areas of patient chart and documentation, malpractice litigation, physician oversupply, peer review, and interaction with patients. These differences remained when specialties and numbers of hours worked per week were held constant. Generally, the physicians reported satisfaction with their professional lives, but the men tended to be more satisfied than the women about their decisions to become physicians and in their perceptions of medicine as a rewarding career. The proportion of men employed full-time (99.4%) was significantly higher than that for women (84%). Women were more likely to practice general pediatrics, while men were more likely to practice surgery and surgical subspecialties. Full-time employed women worked fewer hours per week (57) than men (63), and men reported more research productivity than women.

**Conclusion:** The implications of the findings of numerous gender differences are discussed regarding the issues of physician workforce, types of care rendered by men and women, and possible changes in the national healthcare system.

*Academic Medicine. 1995; 70: 305-312.*

**GENDER COMPARISONS PRIOR TO, DURING, AND AFTER MEDICAL SCHOOL USING TWO DECADES OF LONGITUDINAL DATA AT JEFFERSON MEDICAL COLLEGE**

*Mohammadreza Hojat, Mary R. Robeson, J. Jon Veloski, Robert S. Blacklow, Gang Xu, Joseph S. Gonnella*

Similarities and differences prior to, during, and after medical school between 3,541 men and 1,121 woman graduates of Jefferson Medical College were investigated. Gender comparisons were made on examination scores, admissions interview ratings, competence ratings in residency, specialty choice, board certification, income estimates, and academic appointments. Results indicated that prior to medical school, women scored higher on verbal tests, whereas men outscored women on quantitative and science tests. During medical school, men performed better than women in the basic science examinations, but not in the clinical science examinations. Men and women had similar postgraduate competence ratings, except that women were rated higher than men in the socioeconomic aspects of patient care. Women had lower board certification rates, expected less income, and had a higher proportion of faculty appointments than did men. Gender differences in specialty choices, faculty appointments, and estimated income could have important implications for healthcare manpower.

*Evaluation & The Health Professions. 1994; 17: 290-306.*

### CHANGE OF INTEREST IN SURGERY DURING MEDICAL SCHOOL: A COMPARISON OF MEN AND WOMEN

*Karen Novielli, Mohammadreza Hojat, Pauline K. Park, Joseph S. Gonnella, J. Jon Veloski*

**Problem statement and background:** Women are under-represented in the field of surgery. Reasons for this are incompletely understood.

**Methods:** Male and female graduates from a single medical school over the past three decades (n=4,676) were grouped by their interest in a surgical career at the beginning and the end of medical school. Factors associated with choice of a surgical residency were compared.

**Results:** Compared to men, women were less likely to enter medical school interested in surgery, more likely to lose interest, and less likely to gain interest in surgery. Ratings of clinical competence in surgery clerkship were among the factors associated with losing or gaining interest in surgery. Income expectation was associated with gender and with a surgical career choice.

**Conclusions:** Retention and recruitment of medical students to surgery is significantly lower for women.

*Academic Medicine. 2001; 76(October Supplement): S58-S61.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200110001-00020.pdf>

## PREDICTION OF STUDENTS' PERFORMANCE ON LICENSING EXAMINATIONS USING AGE, RACE, SEX, UNDERGRADUATE GPAS AND MCAT SCORES

*J. Jon Veloski, Clara A. Callahan, Gang Xu, Mohammadreza Hojat, David B. Nash*

**Purpose:** To evaluate students' age, race, sex, undergraduate grades and MCAT scores as predictors of licensing examination scores.

**Method:** Data for 30 classes (n=6,239) matriculating at a medical school between 1968 and 1997 were analyzed using multiple linear regression to predict NBME Parts I, II and III and USMLE Steps 1, 2 and 3.

**Results:** The regression weight for MCAT science was two-to-three times that of MCAT verbal in predicting the first, pre-clinical examination. However, the weights for MCAT science, MCAT verbal and science GPA were equally-weighted for the clinical and postgraduate tests. There was a negative weight associated with women on Part I, but positive weights on Steps 2 and 3. Being older showed no relationships. Every model yielded a negative weight for Asian-American students.

*Academic Medicine. 2000; 75(October Supplement): S28-S30.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200010001-00009.pdf>

### **A NATIONAL STUDY OF FACTORS INFLUENCING PRIMARY CARE CAREER CHOICES AMONG UNDERREPRESENTED-MINORITY, WHITE, AND ASIAN AMERICAN PHYSICIANS**

*Gang Xu, Mohammadreza Hojat, J. Jon Veloski, Jack Brose*

This study examined the differences between three groups of physicians—underrepresented-minority (URM), white, and Asian-American—on factors that influenced their choice of primary care specialties. The groups were also compared with regard to their family backgrounds, financial aid obligations, educational debt, current practice settings, and level of satisfaction with their career choice. The general hypothesis was that, as URMs were more likely than whites and Asians to grow up in underserved areas and to receive financial aid from the government for their medical education, their decision to choose primary care careers would be more influenced by their family background, receipt of financial aid, and obligations to serve in underserved areas. Clinical experiences with underserved patients may also have differentiated effects on different groups of physicians regarding their choice of primary care career.

*Academic Medicine. 1996; (71): S10-S12.*

**BOARD CERTIFICATION: ASSOCIATIONS WITH PHYSICIANS'  
DEMOGRAPHICS AND PERFORMANCES DURING MEDICAL SCHOOL  
AND RESIDENCY**

*Gang Xu, J. Jon Veloski, Mohammadreza Hojat*

**Purpose:** To examine the associations between board certification and both physicians' demographics and their performances during medical school and residency.

**Method:** Data were prospectively collected for 1,186 medical students in three major specialty areas for the Jefferson Medical College's graduating classes of 1976 through 1985.

**Results:** Older students and underrepresented minorities were less likely to achieve certification. Overall, physicians who achieved board certification had performed better during medical school and residency than had those without certification. The prediction of board certification using academic performance indicators is limited, particularly for older and minority groups.

**Conclusions:** This study demonstrated an overall positive relationship between physicians' board certification status and their past academic performances. The potential impact of the increase of both older students and minority physicians on rates of board certification needs to be considered by specialty boards and other policymakers.

*Academic Medicine. 1998; 73: 1283-1289.*



### LONGITUDINAL COMPARISON OF THE ACADEMIC PERFORMANCES OF ASIAN-AMERICAN AND WHITE MEDICAL STUDENTS

*Gang Xu, J. Jon Veloski, Mohammadreza Hojat, Joseph S. Gonnella, Benjamin Bacharach*

The purpose of the study was to compare the academic performances of Asian-American medical students—before, during, and after medical school—with those of white students. A total of 140 Asian-American graduates and 2,269 white graduates from the classes of 1981-1992 at Jefferson Medical College were studied prospectively: data on academic performance, indebtedness, and delayed graduation were analyzed and compared for all the graduates. F-tests, chi-square tests, and regression models were used. The Asian-Americans had statistically significantly higher scores on the SAT (Scholastic Aptitude Test) quantitative subtest and on the MCAT (Medical College Admission Test) chemistry, physics, and science problems subtests; the whites had significantly higher scores on the MCAT reading subtest, third-year grade-point averages for required clerkships, and scores on the National Board of Medical Examiners Part I, II, and III examinations (NBME I, II, and III). No significant difference was found in the other performance measures, including ratings in the first year of residency. Regression analysis showed that the MCAT reading score was the major predictor of Asian-Americans' performances on the NBME I and II.

Because the MCAT reading score is the major predictor of later performance for Asian-American students, schools should consider employing different criteria in predicting and monitoring these students' performances.

*Academic Medicine. 1993; 68: 82-86.*

*Reprinted (in Chinese) International Medicine. 1993; 4: 179-183.*

## **PSYCHOSOCIAL ATTRIBUTES**

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### **ECONOMIC DIVERSITY IN MEDICAL EDUCATION: THE RELATIONSHIP BETWEEN STUDENTS' FAMILY INCOME AND ACADEMIC PERFORMANCE, CAREER CHOICE, AND STUDENT DEBT**

*Raelynn Cooter, James B. Erdmann, Joseph S. Gonnella, Clara A. Callahan,  
Mohammadreza Hojat, Gang Xu*

Providing access to higher education across all income groups is a national priority. This analysis assessed the performance, career choice, and educational indebtedness of medical college students whose educational pursuits were assisted by the provision of financial support. The study looked at designated outcomes (academic performance, specialty choice, accumulated debt) in relation to the independent variable, family (parental) income, of 1,464 students who graduated from Jefferson Medical College between 1992 and 2002. Students were classified into groups of high, moderate, and low income based on their parental income. During the basic science years, the high-income group performed better; however, in the clinical years, performance measures were similar. Those in the high-income group tended to pursue surgery, while those in the low-income group preferred family medicine. The mean of accumulated educational debt was significantly higher for the low-income group. The study provides support for maintaining economic diversity in medical education.

Evaluation & The Health Professions. 2004; 27(3): 252-264.

Available online at publisher's site:

<http://ehp.sagepub.com/cgi/content/abstract/27/3/252>

**CHARACTERISTICS OF MEDICAL STUDENTS COMPLETING AN HONORS PROGRAM IN PATHOLOGY**

*Bruce A. Fenderson, Mohammadreza Hojat, Ivan Damjanov, Emanuel Rubin*

The Honors Program in pathology at Jefferson Medical College provides a voluntary enrichment opportunity for students who have demonstrated a superior ability to cope with the pathology curriculum and who rank in the upper fifth of their class. This study was performed to determine whether honor students possess cognitive and psychosocial attributes that distinguish them from their classmates. Students from five academic years (entering classes 1991 to 1995) were divided into 3 groups: (1) those who completed the Honors Program (n=85), (2) those in the top 20% of the class who were offered the option but chose not to participate in the Honors Program (n=128), and (3) students who did not qualify for the program (n=953). Comparisons between these three groups were made on the basis of selected measures of academic achievement retrieved from the Jefferson Longitudinal Study database and psychosocial data obtained from a questionnaire completed during the first-year orientation. Students who completed the Honors Program in pathology had scored higher on the physical science section of the Medical College Admission Test (MCAT) and had obtained higher first-year grade point averages than students in both of the other groups. Subsequently, they attained higher second-year grade point averages and scored higher on Step 1 and Step 2 of the United States Medical Licensing Examination (USMLE), compared with their peers in the other groups. There were no significant differences in psychosocial measures between honor students and the rest of the cohort (group 3). However, students in the top 20% of the class who declined the invitation to participate in the Honors Program (group 2) showed higher scores on the Taylor Manifest Anxiety Scale and the Eysenck Emotional Instability (Neuroticism) Scale than did their classmates. Despite these differences, students who completed the Honors Program (group 1) and eligible students who declined participation (group 2) selected similar pathways of postgraduate residency training: both groups preferred internal medicine to family practice, and both were more likely than the rest of the cohort to begin residency training at a top-ranked academic/research medical center. Voluntary participation in an Honors Program is a self-selection system that identifies students who are most likely to succeed academically at the highest levels. Residency selection committees may wish to pay close attention to student involvement in similar programs, because this information may provide insights into student personality and general aptitude.

*Human Pathology. 1999; 30(11): 1296-1301.*

Available online at publisher's site:

[http://dx.doi.org/10.1016/S0046-8177\(99\)90059-X](http://dx.doi.org/10.1016/S0046-8177(99)90059-X)

### **BIOTECHNOLOGY AND ETHICS IN MEDICAL EDUCATION OF THE NEW MILLENNIUM: PHYSICIAN ROLES AND RESPONSIBILITIES**

*Joseph S. Gonnella, Mohammadreza Hojat*

Although the medical education curriculum varies internationally, we suggest that it is desirable for medical educators to share a universal responsibility to prepare physicians to perform three distinct yet interrelated professional roles. The first is that of a clinician who has the knowledge and technical skills to care for individual patients as well as the public. The second role can be viewed as that of an educator, a teacher, or a consultant who has the interpersonal skills and personal qualities to teach, advise, and counsel patients and the public about their health and illness, risk factors, and healthy lifestyle. The third role is that of a resource manager to enable physicians to care for patients and serve the public not only by drawing on available material assets but also by prudent use of the resources for better serving the most number of people at the least expense without compromising the quality of care. The very nature of the medical profession also obligates medical educators throughout the world to sensitize medical students and physicians to the ethical responsibilities that are implicit to each of the three aforementioned roles. Although the basic ethical responsibilities of do no harm and confidentiality are universal, certain global changes, such as rapid advancements in biotechnology and resource allocation, are now reshaping medical ethics on every continent. Spawned by the rapid advances in the biomedical sciences, biotechnology is revolutionizing human reproduction, sustaining human life, cloning human beings, and mapping the entire human genetic terrain. These advances imply changes in medical education and the formal preparation of physicians in performing their roles as clinicians, educators, and resource managers. These biotechnological developments, coupled with the increasing cost of health care and maldistribution of resources worldwide, present unprecedented ethical-social challenges that need to be addressed in the education of the physician in the new millennium.

*Medical Teacher. 2001; 23(4): 371-377.*

Available online at publisher's site:

<http://taylorandfrancis.metapress.com/openurl.asp?genre=article&id=doi:10.1080/01421590120042982>

**MEDICAL STUDENTS' OPINIONS ON ECONOMIC ASPECTS OF THE  
HEALTHCARE SYSTEM**

*Mary W. Herman*

Responses of 423 freshmen and 410 seniors at Jefferson Medical College in 1980-81 and 1982-83 to 15 questions on economic aspects of the healthcare system were compared. A majority of the students considered the cost of medical care, the cost of medical education, malpractice claims, and the failure of individuals to assume responsibility for their health to be major problems. A majority of the seniors also considered excessive government influence on the financing of medical care a major problem. More freshmen than seniors favored national health insurance and health maintenance organizations. More seniors than freshman supported the professional standards review organization concept and action to discourage increases in the supply of physicians. Concern about the number of physicians entering the profession increased among seniors between 1981 and 1983. The data suggest that at graduation the students were more concerned about the position of physicians but might not be more informed about important aspects of the functioning of the healthcare system than they were at entry.

*Journal of Medical Education. 1985; 60: 431-438.*

*Also in Proceedings of the Twenty-third Annual Conference on Research in Medical Education, Chicago, IL, October 1984; 329-334.*

### MEDICAL STUDENTS' OPINIONS CONCERNING THE HEALTHCARE SYSTEM

*Mary W. Herman*

The opinions of freshman and senior medical students on major health system problems and policies were investigated in 1980-81. Responses of 214 freshmen and 203 seniors are reported in four major areas: (1) physician dominance of the healthcare system, (2) autonomy in patient care, (3) availability of services, and (4) preventive and social aspects of care. With respect to physician dominance, more seniors (63%) than freshman (44%) agree that physicians should determine health policy and that dominance over other health personnel is necessary (75% and 61% respectively). Professional review of patient care is generally acceptable to both classes, but more freshmen than seniors agree that evaluation should be a condition for relicensure. Less than a fifth of the students in either class believe that patients should be told as little as possible or that they should accept the authority of doctors without question. More freshmen than seniors consider the availability of medical care a major problem (76% and 58% respectively), and similar proportions believe it is the responsibility of government to assure access to all. Freshmen and seniors generally agree on the need for greater emphasis on prevention and social aspects of illness. Because of the important role played by physicians in the healthcare system, it is recommended that serious attention be devoted to education in this area, even though it may have a limited impact on professional attitudes.

*The Journal of Community Health. 1984; 9(3): 196-205.*

Available online at publisher's site:

<http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/BF01326700>

**PROFESSIONAL ATTITUDES AND INTERPERSONAL RELATIONSHIPS  
OF PHYSICIANS: ARE THEY A PROBLEM?**

*Mary W. Herman, J. Jon Veloski, Mohammadreza Hojat*

The study used the ratings of recent graduates from Jefferson Medical College to address two questions of major importance to medical educators: 1) How extensive is the problem of poor professional attitudes, and 2) are low ratings on professional attitudes associated with low ratings in other areas of competence? The study sample comprised 496 individuals who graduated in the years 1978 through 1980. Ratings were obtained from hospitals in which the graduates took their first year of postgraduate training. Fewer than 5 percent of the graduates received the lowest possible rating on any item, and the majority of the 5 percent received the lowest rating on ability to handle anxiety-producing situations, admit to an error in judgment, devote sufficient time to their work, seek help when needed, and relate to other healthcare personnel. The ratings were then related to whether or not the rating institution would offer the resident further training. Ninety percent of the sample would be made such an offer. Only those graduates with low ratings in all four noncognitive areas were likely not to be offered further residency training. Ratings on professional attitudes were more closely related to the residency offers than were the ratings on knowledge or data gathering skills, but ratings on clinical judgment were more important than professional attitudes. The study supports the view that there is a problem of poor professional attitudes among physicians, and this problem is not always associated with poor performance in other areas. It can be concluded that, despite the difficulties involved in evaluating clinical competence, regularly obtained ratings from a number of observers can provide adequate information for remedial action, and it is important that medical schools assume this responsibility.

*Proceedings of the Twenty-First Annual Conference on Research in Medical Education, Washington, DC, 1982: 117-120.*



### **SATISFACTION WITH EARLY RELATIONSHIPS WITH PARENTS AND PSYCHOSOCIAL ATTRIBUTES IN ADULTHOOD: WHICH PARENT CONTRIBUTES MORE?**

*Mohammadreza Hojat*

The relationships between perceived satisfaction with early relationships with parents and adults' psychosocial attributes were addressed in this study. The participants were 928 medical students (37% women) who completed a set of personality questionnaires. The results indicated that perceived satisfaction with the mother in childhood was significantly associated with less intensity and chronicity of loneliness, less depression, less anxiety, a less negative view of stressful life events, higher self-esteem, and more satisfaction with peer relationships. No significant association was found between perceived satisfaction with the father and these personality measures. The results are discussed in the context of attachment theory and internal working models.

*Journal of Genetic Psychology. 1998; 159: 203-220.*

Available online at publisher's site:

<http://pqasb.pqarchiver.com/heldref/access/29543590.html?dids=29543590:29543590:29543590:29543590&FMT=ABS&FMTS=ABS:FT:TC:PAGE&date=Jun+1998&pub=The+Journal+of+Genetic+Psychology&startpage=203>

**PERCEPTION OF MATERNAL AVAILABILITY IN CHILDHOOD AND  
SELECTED PSYCHOSOCIAL CHARACTERISTICS IN ADULTHOOD**

*Mohammadreza Hojat*

The associations between reported perception of maternal availability in childhood and a set of psychosocial measures in adulthood were examined. Participants were 362 medical students who were divided into three groups based on their retrospective report of maternal availability before their 50th birthday: Mothers mostly available (n=260), partly available (n=70), and mostly unavailable (n=32). Those with mostly unavailable mothers scored significantly higher on the intensity and chronicity of loneliness scales, reported more depression, scored lower on self-esteem, perceived themselves as less healthy, evaluated the same stressful events more negatively, and perceived both of their parents more negatively than those with mostly available mothers.

*Genetic, Social, and General Psychology Monographs. 1996: 122: 425-450.*

Available online at publisher's site:

<http://pqasb.pqarchiver.com/heldref/access/7268345.html?dids=7268345&FMT=ABS&FMTS=ABS&date=Jul+1990&pub=The+Journal+of+General+Psychology&startpage=241>

### **MEDICAL STUDENTS' PERSONAL VALUES AND THEIR CAREER CHOICES A QUARTER-CENTURY LATER**

*Mohammadreza Hojat, Timothy P. Brigham, Edward Gottheil, Gang Xu, Karen Glaser, J. Jon Veloski*

A longitudinal study of 391 physicians tested two hypotheses regarding personal values and career choices: that higher preference for social values would be associated with physicians' being more interested in "people-oriented" rather than "technology-oriented" specialties and that higher preference for economic values would be associated with expectations of high income. The physicians (344 men, 47 women) were graduates of Jefferson Medical College in 1974 and 1975 who completed the Allport-Vernon-Lindzey Study of Values during medical school. Analysis showed that physicians currently in the "people-oriented" specialties scored significantly higher on the Social Value scale than their peers in "technology-oriented" specialties. A moderate but statistically significant correlation was found between scores on the Economic Value scale and expectations of higher income. The findings suggest that physicians' personal values are relevant to their career decisions such as specialty choice and expectations of income. The findings have implications with regard to two major issues in the evolving healthcare system, namely, the distribution of physicians by specialty and cost containment.

*Psychological Reports. 1998; 83: 243-248.*

**STUDENTS' PERSONALITY AND RATINGS OF CLINICAL COMPETENCE  
IN MEDICAL SCHOOL CLERKSHIPS: A LONGITUDINAL STUDY**

*Mohammadreza Hojat, Clara A. Callahan, Joseph S. Gonnella*

This study was designed to examine the associations between students' personality and assessments of their clinical competence in medical school. A set of questionnaires was completed by 1,710 medical students to measure their self-esteem, sociability, loneliness, general anxiety, test anxiety, neuroticism (emotionality), perceptions of early relationships with parents, and general health. Students were divided into three groups of the low, moderate, and high competent based on the number of 'honors' ratings they received in core clinical clerkships during their third year of medical school. Multivariate statistical analyses showed that the low competent students scored significantly lower on the self-esteem and sociability, but higher on the loneliness scale. The low competent students also perceived their early relationships with their parents as less satisfactory. Findings suggest that medical students' clinical competence assessments are associated with some aspects of their personality and with perceptions of early relationships with their parents. Findings have implications for the development of educational remedies and counseling strategies.

*Psychology, Health & Medicine. 2004; 9(2): 247-252.*

Available online at publisher's site:

<http://www.journalsonline.tandf.co.uk/openurl.asp?genre=article&id=doi:10.1080/13548500410001670771>

### **A STUDY OF PSYCHOMETRIC CHARACTERISTICS OF ABRIDGED VERSIONS OF SELECTED PSYCHOLOGICAL MEASURES GIVEN TO MEDICAL SCHOOL STUDENTS FOR THE PURPOSE OF PREDICTING THEIR CLINICAL COMPETENCE**

*Mohammadreza Hojat, James B. Erdmann, Mary R. Robeson, Ivan Damjanov, Karen Glaser*

This study was designed to investigate the psychometric characteristics of abbreviated versions of nine psychological scales for medical school students' population. The scales and their items were selected based on their relevance to academic performance and their established psychometrics. Five items were chosen from each of the following scales: The UCLA loneliness scale, test anxiety, general anxiety, self-esteem, extroversion, external locus of control, neuroticism, and stressful life events scales. In addition to these scales, the abridged version of the Beck depression inventory and a questionnaire were given to medical students, 199 of whom returned their completed set of the instruments. Descriptive statistics, alpha reliability, and construct and concurrent validities are reported. Correlations among psychological scales, reproducibility of the findings, and validation of the instruments by contrast groups are examined. Preliminary analyses indicated that the psychological measures contributed to the prediction of performance and clinical competence in medical school. Suggestions are made for future studies.

*Interdisciplinaria. 1994; 11: 129-148.*

**ASSOCIATIONS BETWEEN SELECTED PSYCHOSOCIAL ATTRIBUTES  
AND RATINGS OF PHYSICIAN COMPETENCE**

*Mohammadreza Hojat, Karen M. Glaser, J. Jon Veloski*

**Objective:** To investigate the associations between selected psychosocial attributes and ratings of clinical competence of physicians.

**Methods:** Participants were 110 physicians (52% of the total class who graduated from the Jefferson Medical College of Thomas Jefferson University in 1991 [38% women]). They completed the psychosocial questionnaires voluntarily while in medical school and also granted written permission to collect clinical competence ratings from their residency program directors.

**Psychosocial Measures:** Included Taylor Manifest Anxiety Scale, Emotional Instability, Extraversion, Rosenberg Self-Esteem Scale, UCLA Loneliness, Beck Depression Inventory, measures of poor-relationships, and satisfaction with early relationships with mothers and fathers.

**Outcome Measures:** Included physician clinical competence ratings in three areas of clinical competence: data-gathering skills, interpersonal relations and attitudes, and socioeconomic aspects of patient care.

**Results:** Results showed that physicians rated in the top half in any clinical competence area scored significantly lower on the anxiety and emotional instability scales than did their counterparts in the bottom half of the clinical competence measures. Also, top-rated physicians reported better peer relationships than did their bottom-rated counterparts. With regard to the perceptions of early relationships with parents, perceptions of warm relationships with fathers in childhood were not significantly associated with clinical competence ratings, but physicians in the top half of the rating distribution of interpersonal relations and attitudes and socioeconomic aspects of patient care reported warmer relationships with their mothers than did their counterparts in the bottom half of the distributions.

*Academic Medicine. 1996; 71(Supplement): S103-S105.*

### PHYSICIANS' PERCEPTIONS OF THE CHANGING HEALTHCARE SYSTEM: COMPARISONS BY GENDER AND SPECIALTIES

*Mohammadreza Hojat, Joseph S. Gonnella, James B. Erdmann, J. Jon Veloski, Daniel Z. Louis,  
Thomas J. Nasca, Susan L. Rattner*

This study was designed to investigate physicians' perceptions of changes in the United States healthcare system impacting academic medicine, quality of care, patient referrals, cost, and ethical and socio-political aspects of medicine. A survey was mailed in 1998 to 1,272 physicians (graduates of Jefferson Medical College between 1987 and 1992); 835 physicians (66%) responded. Results showed that substantial majority (92%) believed that learning to work in a managed care environment should become an essential component of medical education. Physicians perceived that current changes impair physicians' autonomy (94%) and restrain physician's freedom to provide optimal care (84%). A sizable majority (75%) endorsed patients' freedom to seek specialist care, and 55% believed that capitation reduces physician' motivation for long-term monitoring of patients. The majority endorsed universal health coverage (80%) and agreed to support rather than resist the changes (62%). Only 18% hold a positive view of the changes in the future. The majority believed that medical education should prepare physicians to provide end-of-life care (92%) and that organized medicine should take a stand on social issues that can influence the well-being of society (79%). Only 34% endorsed the legalization of physician-assisted suicide. No gender differences were observed, but a few differences were found between generalists and specialists. Results can help in understanding physicians' perceptions of current changes in the United States.

*Journal of Community Health. 2000; 25(6): 455-471.*

Available online at publisher's site:

<http://www.springerlink.com/link.asp?id=t20230578567513m>

**MEDICAL STUDENT'S COGNITIVE APPRAISAL OF STRESSFUL LIFE EVENTS AS RELATED TO PERSONALITY, PHYSICAL WELL-BEING, AND ACADEMIC PERFORMANCE: A LONGITUDINAL STUDY**

*Mohammadreza Hojat, Joseph S. Gonnella, James B. Erdmann, Wolfgang H. Vogel*

This longitudinal study was designed to test three hypotheses that medical students who can cope better with adversity would: (1) have a more positive personality profile, (2) report less physical illnesses, and (3) perform better academically. Total participants were 2,114 medical students at Jefferson Medical College who completed a set of psychosocial questionnaires and were prospectively followed up during medical school education and beyond. Participants reported on a five-point scale their appraisal of five stressors (death or health deterioration of a family member, personal illness, financial and academic problems). Students who experienced the stressors ( $n = 1446$ , 68% of total participants) were divided into three groups (Resilient, Intermediate, Frail) based on their appraisal of the stressors. The three groups were compared on a set of personality scales (e.g. general anxiety, depression, test anxiety, neuroticism, loneliness, self-esteem, and extraversion), physical well-being factors (e.g. chronic health, eating/drinking/smoking, agitation symptoms, somatic symptoms, and global sickness), academic performance indicators in medical school (e.g. grade point averages, class rank, and medical licensing examinations), and ratings of clinical competence in postgraduate medical training. Hypotheses 1 and 2 were confirmed, and hypothesis 3 was partially confirmed. Implications for developing coping skills, stress management strategies, and student counseling are discussed.

*Personality and Individual Differences. 2003; 35(1): 219-235.*

Available online at publisher's site:

[http://dx.doi.org/10.1016/S0191-8869\(02\)00186-1](http://dx.doi.org/10.1016/S0191-8869(02)00186-1)



### **PSYCHOSOCIAL CHARACTERISTICS OF FEMALE STUDENTS IN THE ALLIED HEALTH AND MEDICAL COLLEGES: PSYCHOMETRICS OF THE MEASURES AND PERSONALITY PROFILES**

*Mohammadreza Hojat, Kevin Lyons*

For the purpose of developing a comprehensive assessment method of predicting academic and professional success among health professions students, a set of 12 psychosocial measures were administered, and their psychometric properties were examined. Participants were 141 female allied health and 71 female medical students. Alpha and test-retest reliabilities and construct and concurrent validities of the measures were studied, and most of the measures were found to have satisfactory psychometric properties. Comparisons were also made between medical and allied health sciences students using the 12 psychosocial measures. Allied health students scored higher on loneliness, anxiety, and depression and scored lower on perception of general health and perception of their fathers as compared to medical students. Implications of the findings for development of prediction models of academic and professional performance are discussed.

*Advances in Health Sciences Education. 1998; 3(2): 119-132.*

Available online at publisher's site:

<http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1023/a:1009733623166>

**A COMPARISON OF THE PERSONALITY PROFILES OF INTERNAL  
MEDICINE RESIDENTS, PHYSICIAN ROLE MODELS, AND THE  
GENERAL POPULATION**

*Mohammadreza Hojat, Thomas J. Nasca, Mike Magee, Kendra Feeney, Rudolfo Pascual, Frank Urbano, Joseph S. Gonnella*

**Purpose:** To compare personality profiles of internal medicine residents with those of the general population and positive role models in medicine.

**Method:** A widely used personality inventory, NEO PI-R(c), which measures five major personality factors and 30 important personality facets, was administered to 104 physicians in internal medicine residency and to a nationwide sample of 188 physicians selected as positive role models in medicine.

**Results:** The internal medicine residents, compared with the general population, were more likely to be attentive, to have deeper intellectual curiosity, to have higher aspiration levels, to have more vivid imagination, to be more receptive to their emotions, to be interested in mental stimulation, and to think carefully before acting. The residents, compared with role models in medicine, were less eager to face challenges, less able to control their impulses, less able to cope with adversity, less easygoing, and less relaxed, but were more likely to crave excitement.

**Conclusion:** Internal medicine residents and positive role models in medicine have some distinct personal qualities. Understanding the qualities of successful physicians can be helpful in career counseling of medical students and young physicians.

*Academic Medicine. 1999; 74: 54-60.*

### STUDENTS' PSYCHOSOCIAL CHARACTERISTICS AS PREDICTORS OF ACADEMIC PERFORMANCE IN MEDICAL SCHOOL

*Mohammadreza Hojat, Mary R. Robeson, Ivan Damjanov, J. Jon Veloski, Karen Glaser,  
Joseph S. Gonnella*

This study was designed to investigate the incremental effects of selected psychosocial measures—beyond the effects of conventional admission measures—in predicting students' academic performances in medical school. In 1989-90, 210 second-year students at Jefferson Medical College were each asked to complete 11 psychosocial questionnaires that were then used as predictors of performance measures in medical school. The students' scores on three subtests of the Medical College Admission Test (MCAT) were also used as predictors. Three composite measures of performance were used as the criterion measures: basic science examination grades, clinical examination grades, and ratings of clinical competence. A multiple regression algorithm (general linear model) was used for statistical analysis. The response rate was 83% (175 students). When the psychosocial measures were added to the statistical models in which the common variances of the MCAT scores were already determined, significant increments in the common variances were observed for two of the three performance measures: basic science grades and clinical examination grades. Whereas only 4% of the common variance in the ratings of clinical competence could be accounted for by the MCAT scores, 14% could be accounted for by the psychosocial measures.

The 'noncognitive', or psychosocial, measures increased the magnitude of the relationships between the predictive and criterion measures of the students' academic performances beyond the magnitude attained when only the conventional measures should be considered as significant and unique predictors of performance in medical school.

*Academic Medicine. 1993; 68: 635-637.*

**ATTITUDES TOWARD MANAGED CARE: A BRIEF INSTRUMENT TO MEASURE ATTITUDES OF MEDICAL STUDENTS TOWARDS CHANGE IN THE HEALTHCARE SYSTEM**

*Mohammadreza Hojat, J. Jon Veloski, Joseph S. Gonnella, James B. Erdmann, Susan L. Rattner*

**Background:** Efforts are being made to prepare medical students, residents, practicing physicians, and medical educators to face new challenges in the evolving healthcare systems. In this critical period of development, it is timely and important to understand the attitudes of medical students toward the changes and their perceived impacts. This study was designed to develop a research instrument to measure medical students' attitudes toward changes in the United States healthcare system.

**Methods:** Based on literature review, a preliminary draft of a questionnaire (40-item) was developed. After a pilot study the questionnaire was modified and a new version was administered to 394 medical school seniors in 1997 and 1998.

**Results:** Correlational analyses including factor analysis resulted in a brief attitude scale (8-item) with satisfactory psychometric properties. Data support the face validity, construct validity, criterion-related validity, and alpha reliability of the scale.

**Conclusions:** This psychometrically sound research instrument can be used in the assessment of educational programs to improve medical students' attitudes toward changes in the healthcare system. Further research is needed to expand this research tool for assessing physicians' attitudes toward different aspects of changes in the United States healthcare system.

*Academic Medicine. 1999; 74(October Supplement): S78-S80.*

### PERCEPTIONS OF MEDICAL SCHOOL SENIORS OF THE CURRENT CHANGES IN THE U.S. HEALTHCARE SYSTEM

*Mohammadreza Hojat, J. Jon Veloski, Daniel Z. Louis, Gang Xu, David Ibarra, Jonathan E. Gottlieb,  
James B. Erdmann*

Perceptions of medical school seniors about changes occurring in the healthcare environment were investigated. A survey was completed by 196 Jefferson Medical College seniors in the class of 1997. Of the respondents, 79% believed that cost reduction rather than quality of care is the primary consideration behind recent changes, 78% felt that managed care organizations hamper physicians' abilities to render optimal care, 83% maintained that the control of health care by insurance companies would lead to lower quality of care, 69% agreed that patients should have the freedom to seek a specialists' care without being referred by a primary care physician, 82% recommended that mentally ill patients should be referred to a mental health professional, and 82% believed that learning to work in a managed care environment should be an essential component of medical education. Assessment of student perceptions can assist in the development and implementation of appropriate curricular changes.

*Evaluation & The Health Professions. 1999; 22(2): 169-183.*

Available online at publisher's site:

<http://ehp.sagepub.com/cgi/content/abstract/22/2/169>

**EFFECTS OF ACADEMIC AND PSYCHOSOCIAL PREDICTORS OF PERFORMANCE IN MEDICAL SCHOOL ON COEFFICIENTS OF DETERMINATION**

*Mohammadreza Hojat, Wolfgang H. Vogel, Carter Zeleznik, Bette D. Borenstein*

This study was designed to answer the following questions: (1) Does a set of selected noncognitive variables predict medical school performance measures? and (2) Is there a significant increase in the coefficients of determination when noncognitive measures are added to the conventional cognitive predictors in regression models? Complete data on all measures were available for 88 sophomore medical students. Cognitive (academic) predictors were undergraduate GPA in science and nonscience courses and scores on science problems, reading, and quantitative scales of the Medical College Admission Test. Noncognitive (psychological) predictors were scores on scales of stressful life events, general anxiety, test anxiety, emotionality, external locus of control, intensity and chronicity of loneliness, sociability, self-esteem, perception of early relationships with mother, father and peers, and indices of over- and under-confidence. Criterion measures were freshman and sophomore GPAs in medical school and scores on Part I of the National Board examinations. Results indicate that (1) noncognitive predictors could significantly predict criterion measures and (2) inclusion of noncognitive measures in a model of cognitive predictors could substantially increase the magnitude of the relationships.

*Psychological Reports. 1988; 63: 383-394.*

### HOW MUCH DO MEDICAL STUDENTS KNOW ABOUT PHYSICIAN INCOME?

*Sean Nicholson*

Twenty-five cohorts of medical students were asked in their first and fourth year of school to estimate contemporaneous physician income in six different specialties. The students' income estimation errors varied systematically over time and cross-sectionally by specialty and type of student. The median student underestimated physician income by 15 percent, and the median absolute value of the estimation errors was 26 percent of actual income. Students were 35 percent more accurate when estimating market income in their fourth relative to their first year, which indicates medical students learn a considerable amount before choosing a specialty.

*The Journal of Human Resources. 2005; 40(1): 100-114.*

**CORRELATES OF PHYSICIANS' ENDORSEMENT OF THE LEGALIZATION OF PHYSICIAN-ASSISTED SUICIDE**

*Karen Novielli, Mohammadreza Hojat, Thomas J. Nasca, James B. Erdmann, J. Jon Veloski*

**Problem Statement and Background:** Empirical studies on end-of-life care and the factors associated with legalization of physician-assisted suicide (PAS) are scarce. Our purpose was to examine the extent and correlates of physicians' endorsement of legalization of PAS.

**Method:** A survey was mailed in 1998 to 1,272 physicians (Jefferson Medical College graduates from 1987-1992). 835 responded (66%), and 830 were useable for this study.

**Results:** Of the respondents, 284 (34%) endorsed, 340 (41%) did not endorse, and 206 (25%) expressed no opinion about legalization of PAS. Hospital-based physicians were more likely to endorse legalization of PAS than primary care physicians. Endorsement of legalization of PAS was correlated with views about other issues in medicine and the healthcare system.

**Conclusions:** More empirical research is needed to understand the political, moral and ethical context that frame physicians' views on PAS and to examine the impact of medical education on attitudes towards PAS.

*Academic Medicine. 2000; 75(October Supplement): S53-S55.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200010001-00017.pdf>



### INTRA- AND INTER-CULTURE COMPARISONS OF PERSONALITY PROFILES OF MEDICAL STUDENTS IN ARGENTINA AND THE UNITED STATES

*Horacio J. A. Rimoldi, Roberto Raimondo, James B. Erdmann, Mohammadreza Hojat*

This study was designed to compare the personality profiles of medical students in Argentina and the United States. The ultimate purpose of the research was to study the value of personality measures in predicting academic and professional performances. Participants were 421 medical students in Argentina (254 women, 167 men) and 623 medical students in the United States (207 women, 416 men). Eight personality measures were administered: Perception of Stressful Life Events, Test Anxiety, General Anxiety, Loneliness, Self-Esteem, Locus of Control, Extraversion, and Neuroticism. Intracultural comparisons showed some minor gender differences in personality profiles within each culture (e.g., in the United States, women scored higher than men on the Perception of Stressful Life Events and General Anxiety scales, and in Argentina women scored higher on the Test Anxiety scale). Intercultural comparisons of personality profiles showed that Argentine medical students obtained higher average scores than their American counterparts on Perception of Stressful Life Events, Test Anxiety, General Anxiety, External Locus of Control, Extraversion, and Neuroticism scales. Argentine students scored lower on the Loneliness scale than their American counterparts. Psychometric findings supported the measurement properties of the personality measures in the two cultures (e.g., construct validity, and internal consistency aspect of reliability). Further study of the implications of the findings in predicting academic attainment in medical school and to physician performance is recommended.

*Adolescence. 2002; 37: 477-494.*

**INCOME EXPECTATIONS OF FIRST-YEAR STUDENTS AT JEFFERSON  
MEDICAL COLLEGE AS A PREDICTOR OF FAMILY PRACTICE  
SPECIALTY CHOICE**

*Michael P. Rosenthal, Thane N. Turner, James J. Diamond, Howard K. Rabinowitz*

The recent decline in the number of medical students choosing careers in the primary care specialties has engendered increasing concern that economic factors are becoming more important in influencing the career choices of medical students. In order to assess the relationship of first-year medical students' income expectations to whether they chose to specialize in family practice, the authors analyzed data from 532 graduates of Jefferson Medical College (classes of 1987-1989), using the Jefferson Longitudinal Study. At entrance to medical school, each student listed his or her initial specialty preference and future expected peak income; the determination of actual specialty choice was based on the first year of postgraduate training. Both expected peak incomes and freshman specialty choices were independent predictors of actual specialty choices. The students who entered family practice residencies had lower initial expected peak incomes than did the students entering other specialties, especially the surgery specialties. In addition, according to logistic regression analysis, the students with relatively lower income expectations and a freshman preference for family practice were predicted to be nine times more likely to enter family practice residencies than were students with higher income expectations and no initial family practice preference (56% versus 6%). This study suggests that a freshman's income expectation is an important predictor of family practice specialty choice, independent of age, sex, degree of indebtedness, and initial specialty preference. The authors discuss their results in light of the decline in the number of medical students choosing family practice and the other primary care specialties.

*Academic Medicine. 1992; 67: 328-331.*

### MINDFULNESS-BASED STRESS REDUCTION LOWERS PSYCHOLOGICAL DISTRESS IN MEDICAL STUDENTS

*Steven Rosenzweig, Diane K. Reibel, Jeffrey M. Greeson, George C. Brainard, Mohammadreza Hojat*

**Background:** Medical students confront significant academic, psychosocial, and existential stressors throughout their training. Mindfulness-based stress reduction (MBSR) is an educational intervention designed to improve coping skills and reduce emotional distress.

**Purpose:** The purpose of this study was to examine the effectiveness of the MBSR intervention in a prospective, nonrandomized, cohort-controlled study.

**Methods:** Second-year students ( $n = 140$ ) elected to participate in a 10-week MBSR seminar. Controls ( $n = 162$ ) participated in a didactic seminar on complementary medicine. Profile of Mood States (POMS) was administered preintervention and postintervention.

**Results:** Baseline total mood disturbance (TMD) was greater in the MBSR group compared with controls ( $38.7 \pm 33.3$  vs.  $28.0 \pm 31.2$ ;  $p < .01$ ). Despite this initial difference, the MBSR group scored significantly lower in TMD at the completion of the intervention period ( $31.8 \pm 33.8$  vs.  $38.6 \pm 32.8$ ;  $p < .05$ ). Significant effects were also observed on Tension-Anxiety, Confusion-Bewilderment, Fatigue-Inertia, and Vigor-Activity subscales.

**Conclusion:** MBSR may be an effective stress management intervention for medical students.

*Teaching and Learning in Medicine. 2003; 15(2): 88-92.*

Available online at publisher's site:

[http://www.leaonline.com/doi/abs/10.1207/S15328015TLM1502\\_03](http://www.leaonline.com/doi/abs/10.1207/S15328015TLM1502_03)

**THE INCOME EXPECTATIONS OF MEDICAL STUDENTS IN THE TIME  
PERIOD 1970 TO 1980**

*J. Jon Veloski, Carter Zeleznik, Mohammadreza Hojat*

This study reports students' expectations of income over the past decade and analyzes the effects of factors related to these income expectations. Data collected by means of questionnaires administered to seniors at one medical school approximately three months prior to commencement were analyzed. The questionnaires included items dealing with the students' plans for specialty training, the number of hours per week expected to work and the type of career planned after completion of training. The results show that graduating medical students are knowledgeable about income differentials among specialties. Women reported lower peak income expectations in each of the specialties considered, and the graduates who plan clinical careers expect higher incomes than those planning academic careers. Presently there is concern that reduced government support for education will result in student debt level changes or changes in the demographic characteristics of medical students. A long range implication of these findings is that they provide essential baseline data needed to monitor the effects of major changes in the financing of medical education.

*Proceedings of the Twentieth Annual Conference on Research in Medical Education, Washington, DC, November 1981; 61-66.*

### STUDENTS' CERTAINTY DURING COURSE TEST-TAKING AND PERFORMANCE ON CLERKSHIPS AND BOARD EXAMS

*Carter Zeleznik, Mohammadreza Hojat, Carla E. Goepf, Peter Amadio, Dhodanand Kowlessar, Bette D. Borenstein*

Psychometric aspects of multiple-choice tests were investigated using a confidence-weighted scoring technique. The contributions of two indices, overconfidence and under-confidence, in the prediction of subsequent academic performance of examinees were studied. A total of 444 sophomore students (entering classes of 1982 and 1983) in one medical school were asked to indicate their confidence, on a 5-point scale (100, 75, 50, 25, and 0), in the correctness of their responses to each multiple-choice item on a Introduction to Clinical Medicine examination. Examinations were scored in two ways: in the conventional way, using the total number of correct responses, and by a confidence-weighted technique based on the level of certainty indicated for each response by the examinee. Only the conventional score determined the grade; the confidence-weighted score was calculated for the purely experimental purposes of this study. Overconfidence and under-confidence indices were also calculated by using the indicated levels of certainty. Improvements in the psychometrics of the examinations were observed when confidence-weighted scores and indices of over- and under-confidence contributed significantly to predicting scores of the students on Parts I and II of the National Board of Medical Examiners examination, whereas the conventional score did not contribute to the prediction of Part II scores. Significant differences on junior clerkship examinations and ratings were observed between those who were highly overconfident and those who were slightly overconfident. The highly overconfident students also estimated higher future incomes than did those who were slightly overconfident.

*Journal of Medical Education. 1988; 63: 881-891.*

## **PROFESSIONALISM**

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(EMPATHY, INTERPROFESSIONAL COLLABORATION, LIFELONG LEARNING)

### COMPARISONS OF NURSES AND PHYSICIANS ON AN OPERATIONAL MEASURE OF EMPATHY

*Sylvia K. Fields, Mohammadreza Hojat, Joseph S. Gonnella, Salvatore Mangione, Gregory C. Kane, Mike Magee*

In view of many changes taking place in today's healthcare marketplace, the theme of empathy in health provider-patient relations needs to be revisited. It has been proposed that patients benefit when all members of the healthcare team provide empathic care. Despite the role of empathy in patient outcomes, empirical research on empathy among health professionals is scarce partly because of a lack of a psychometrically sound tool to measure it. In this study, we briefly describe the development and validation of the Jefferson Scale of Physician Empathy (JSPE), an instrument that was specifically developed to measure empathy among health professionals (20 Likert-type items). The purpose of this study was to compare nurses and physicians on their responses to the JSPE. Study participants were 56 female registered nurses and 42 female physicians in the Internal Medicine postgraduate medical education program at Thomas Jefferson University Hospital. The reliability coefficients (Chronbach's coefficient alpha) were 0.87 for the nurses and 0.89 for physicians. Results of t-test showed no significant difference between nurses and physicians on total scores of the JSPE; however, multivariate analyses of variance indicated statistically significant differences between the two groups on 5 of 20 items of the JSPE. Findings suggest that the JSPE is a reliable research tool that can be used to assess empathy among health professionals including nurses.

*Evaluation & The Health Professions. 2004; 27(1): 80-94.*

Available online at publisher's site:

<http://ehp.sagepub.com/cgi/content/abstract/27/1/80>

**EMPATHY: AN NP/MD COMPARISON**

*Mohammadreza Hojat, Sylvia K. Fields, Joseph S. Gonnella*

The Jefferson Scale of Physician Empathy (JSPE, 20 Likert-type items) was administered to 32 female nurse practitioners, 37 female pediatricians, and 33 female physicians in hospital-based specialties (anesthesiology, pathology, radiology). Nurse practitioners and pediatricians obtained higher JSPE mean scores than physicians in hospital-based specialties.

*The Nurse Practitioner. 2003; 28(4): 45-47.*

Available online at publisher's site:

<http://www.tnpj.com/pt/re/nursepract/abstract.00006205-200304000-00010.htm>



### ATTITUDES TOWARD PHYSICIAN–NURSE ALLIANCE: COMPARISONS OF MEDICAL AND NURSING STUDENTS

*Mohammadreza Hojat, Sylvia K. Fields, Susan L. Rattner, Margaret Griffiths, Mitchell J. M. Cohen,  
James D. Plumb*

This study was undertaken to examine empirically the similarities and differences between medical and nursing students in their attitudes toward physician-nurse alliances upon entry into their respective professional curricula.

The participants were 408 medical students (208 first year, 200 second year) and 149 nursing students (64 first year, 85 second year) representing 90% and 89% respectively of students in their corresponding classes.

The findings suggest considerable attitudinal congruities among medical and nursing students as they begin their professional education. Overall the medical students hold to the traditional views of physician authority and medical responsibility in these areas to a higher degree than the nursing students, although the data suggest more concordance and recognition of professionalism in nursing than would have been seen in the past. The findings of the present study provide useful information regarding the areas of focus for interdisciplinary educational programs.

*Academic Medicine. 1997; 72(Supplement): S1-S3.*

**PSYCHOMETRIC PROPERTIES OF AN ATTITUDE SCALE MEASURING  
PHYSICIAN-NURSE COLLABORATION**

*Mohammadreza Hojat, Sylvia K. Fields, J. Jon Veloski, Margaret Griffiths, Mitchell J. M. Cohen,  
James D. Plumb*

This study examined the psychometric properties of an assessment tool for measuring attitudes toward physician-nurse collaboration. A survey addressing the areas of responsibility, expectations, shared learning, decision making, authority, and autonomy was administered to first-year medical and nursing students. Factor analysis of the survey indicated that the survey measured four underlying constructs of shared education and collaborative relationships, caring as opposed to curing, nurse's autonomy, and physician's authority. A scale was developed in which 15 items of the survey with large factor loadings were included. The alpha reliability estimates of the scale for medical and nursing students were .84 and .85, respectively. The mean of the scale was significantly higher for nursing than medical students. Results supported the construct validity and reliability of the scale. This scale can be used to evaluate the effectiveness of programs developed to foster physician-nurse collaboration and to study group differences on attitudes toward interpersonal collaboration.

*Evaluation & The Health Professions. 1999; 22(2): 208-220.*

Available online at publisher's site:

<http://ehp.sagepub.com/cgi/content/abstract/22/2/208>

### **EMPATHY SCORES IN MEDICAL SCHOOL AND RATINGS OF EMPATHIC BEHAVIOR IN RESIDENCY TRAINING THREE YEARS LATER**

*Mohammadreza Hojat, Joseph S. Gonnella, Salvatore Mangione, Thomas J. Nasca, Mike Magee*

This study was designed to examine association between scores on a self-report empathy scale (Jefferson Scale of Physician Empathy) administered in medical school and ratings of empathic behavior made three years later by directors of residency training programs. Study participants included 106 physicians. Relationships between scores of The Jefferson Scale of Physician Empathy (20 Likert-type items), administered at the beginning of the third-year of medical school, and ratings of empathic behavior made by directors of residency training programs were examined. Top scorers on the JSPE, compared to Bottom scorers obtained a significantly higher average rating of empathic behavior three years later in residency ( $p < .05$ , effect size = 0.50). Findings provide evidence in support of long-term predictive validity of the self-report empathy scale despite different methods of evaluations (self-report and supervisors' ratings) and time interval between evaluations (3 years). Because empathy is relevant to prosocial and helping behavior, it is important to enhance our understanding of its correlates and outcomes among health professionals.

*Journal of Social Psychology. 2005; 145: 663-672.*

Available online at publisher's site:

<http://pqasb.pqarchiver.com/heldref/access/939463221.html?dids=939463221:939463221:939463221:939463221&FMT=ABS&FMTS=ABS:FT:TG:PAGE&date=Dec+2005&&pub=The+Journal+of+Social+Psychology&startpage=663>

**PHYSICIAN EMPATHY IN MEDICAL EDUCATION AND PRACTICE:  
EXPERIENCE WITH THE JEFFERSON SCALE OF PHYSICIAN EMPATHY**

*Mohammadreza Hojat, Joseph S. Gonnella, Salvatore Mangione, Thomas J. Nasca, Mike Magee*

Despite the importance of physician empathy in patient care, empirical investigation on the topic is scarce because of conceptual ambiguity and a lack of a psychometrically sound tool for measuring physician empathy. In this article we describe different conceptual views of empathy, draw a distinction between empathy and sympathy, and define physician empathy. We also describe the development and psychometric properties (i.e. validity and reliability) of the Jefferson Scale of Physician Empathy (JSPE), a brief research tool (20 Likert-type items) that we developed as a response to the need for an operational measure of physician empathy. We outline an agenda for future research on physician empathy. We conclude that research regarding physician empathy is crucial considering the rapid developments in biotechnology and the current trend toward market-driven, corporate medicine, which strain the physician-patient relationships.

*Seminars in Integrative Medicine. 2003; 1(1): 25-41.*

Available online at publisher's site:

[http://dx.doi.org/10.1016/S1543-1150\(03\)00002-4](http://dx.doi.org/10.1016/S1543-1150(03)00002-4)

### EMPATHY IN MEDICAL STUDENTS AS RELATED TO ACADEMIC PERFORMANCE, CLINICAL COMPETENCE, AND GENDER

*Mohammadreza Hojat, Joseph S. Gonnella, Salvatore Mangione, Thomas J. Nasca, J. Jon Veloski, James B. Erdmann, Clara A. Callahan, Mike Magee*

**Context:** Empathy is a major component of patient-physician relationships, and the cultivation and evaluation of empathy is a learning objective for all American medical schools as proposed by the Association of American Medical Colleges (AAMC). It is important to address the measurement of empathy, its development, and its correlates in medical schools.

**Objectives:** We designed this study to test two hypotheses: 1. Medical students with higher empathy scores would obtain higher ratings of clinical competence in core clinical clerkships. 2. Women would obtain higher empathy scores than men.

**Materials and Subjects:** A 20-item empathy scale developed by the authors (Jefferson Scale of Physician Empathy) was completed by 371 third-year medical students (198 men, 173 women).

**Methods:** Associations between empathy scores and ratings of clinical competence in six core clerkships, gender, and performance on objective examinations were studied by using t-test, analysis of variance, and correlation coefficients.

**Results:** Both research hypotheses were confirmed. Empathy scores were associated with ratings of clinical competence and gender, but not with performance on objective examinations such as the Medical College Admission Test (MCAT), and Steps 1 and 2 of the United States Medical Licensing Examinations (USMLE).

**Conclusions:** Empathy scores are associated with gender and ratings of clinical competence in medical school. It is important to further examine educational and clinical correlates of empathy, as well as stability and changes in empathy at different stages of undergraduate and graduate medical education in future research.

*Medical Education. 2002; 36(6): 522-527.*

Available online at publisher's site:

<http://www.blackwell-synergy.com/doi/abs/10.1046/j.1365-2923.2002.01234.x>

**COMPARISONS OF AMERICAN, ISRAELI, ITALIAN AND MEXICAN  
PHYSICIANS AND NURSES ON THE TOTAL AND FACTOR SCORES OF  
THE JEFFERSON SCALE OF ATTITUDES TOWARD PHYSICIAN-NURSE  
COLLABORATIVE RELATIONSHIPS**

*Mohammadreza Hojat, Joseph S. Gonnella, Thomas J. Nasca, Sylvia K. Fields, Americo Cicchetti,  
Alessandra Lo Scalzo, Francesco Taroni, Anna Maria Vicenza Amicosante, Manuela Macinati,  
Massimo Tangucci, Carlo Liva, Gualtiero Ricciardi, Shmuel Eidelman, Hanna Admi, Hana Geva,  
Tanya Mashiach, Gideon Alroy, Adelina Alcorta-Gonzalez, David Ibarra, Antonio Torres-Ruiz*

This cross-cultural study was designed to compare the attitudes of physicians and nurses toward physician-nurse collaboration in the United States, Israel, Italy and Mexico. Total participants were 2,522 physicians and nurses who completed the Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration (15 Likert-type items). They were compared on the total scores and four factors of the Jefferson Scale (shared education and team work, caring as opposed to curing, nurses' autonomy, physicians' dominance). Results showed inter-and intra-cultural similarities and differences among the study groups providing support for the social role theory and the principle of least interest in inter-professional relationships. Implications for promoting physician-nurse education and inter-professional collaboration are discussed.

*International Journal of Nursing Studies. 2003; 40(4): 427-435.*

Available online at publisher's site:

[http://dx.doi.org/10.1016/S0020-7489\(02\)00108-6](http://dx.doi.org/10.1016/S0020-7489(02)00108-6)

**THE JEFFERSON SCALE OF PHYSICIAN EMPATHY: FURTHER  
PSYCHOMETRIC DATA AND DIFFERENCES BY GENDER AND  
SPECIALTY AT ITEM LEVEL**

*Mohammadreza Hojat, Joseph S. Gonnella, Thomas J. Nasca, Salvatore Mangione, J. Jon Veloski,  
Michael Magee*

**Objective:** This study was designed to investigate the psychometric properties of individual items of the Jefferson Scale of Physician Empathy by examining differences between men and women and between physicians in the “people-oriented” and “technology-oriented” specialties.

**Method:** The Jefferson Scale of Physician Empathy (20 Likert-type items) was mailed to 1,007 physicians affiliated with the Jefferson Health System in the greater Philadelphia region; 704 (70%) responded.

**Results:** Descriptive statistics for items and item-total score correlations were reported. Women scored higher than men on 6 items. Physicians in the “people-oriented” specialties scored significantly higher than those in “technology-oriented” specialties on 11 items.

**Conclusions:** Findings provided further evidence in support of the psychometric properties of the Scale. Group differences observed in this study indicate that some aspects of empathy are more related than others to physician’s gender and specialty.

*Academic Medicine. 2002; 77(10): S58-S60.*

Available online at publisher's site:

<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200210001-00019.pdf>

**PHYSICIAN EMPATHY: DEFINITION, COMPONENTS, MEASUREMENT,  
AND RELATIONSHIP TO GENDER AND SPECIALTY**

*Mohammadreza Hojat, Joseph S. Gonnella, Thomas J. Nasca, Salvatore Mangione, Michael J. Vergare, Michael Magee*

**Objective:** There is a dearth of empirical research on physician empathy despite its mediating role in patient-physician relationships and clinical outcomes. This study was designed to investigate the components of physician empathy, its measurement properties, and group differences in empathy scores.

**Method:** A revised version of the Jefferson Scale of Physician Empathy (with 20 Likert-type items) was mailed to 1,007 physicians affiliated with the Jefferson Health System in the greater Philadelphia region; 704 (70%) responded. Construct validity, reliability of the empathy scale, and the differences on mean empathy scores by physicians' gender and specialty were examined.

**Results:** Three meaningful factors emerged (perspective taking, compassionate care, and standing in the patient's shoes) to provide support for the construct validity of the empathy scale, which was also found to be internally consistent with relatively stable scores over time. Women scored higher than men to a degree that was nearly significant with control for gender, and psychiatrists scored a mean empathy rating that was significantly higher than that of physicians specializing in anesthesiology, orthopedic surgery, neurosurgery, radiology, cardiovascular surgery, obstetrics and gynecology, and general surgery. No significant difference was observed on empathy scores among physicians specializing in psychiatry, internal medicine, pediatrics, emergency medicine, and family medicine.

**Conclusions:** Empathy is a multidimensional concept that varies among physicians and can be measured with a psychometrically sound tool. Implications for specialty selection and career counseling are discussed.

*American Journal of Psychiatry. 2002; 159(9): 1563-1569.*

Available online at publisher's site:

<http://ajp.psychiatryonline.org/cgi/content/abstract/159/9/1563>



### DEVELOPING AN INSTRUMENT TO MEASURE ATTITUDES TOWARD NURSES: PRELIMINARY PSYCHOMETRIC FINDINGS

*Mohammadreza Hojat, Mary W. Herman*

Although many doctors and nurses presumably develop good working relationships, substantial problems are frequently reported. There is a large body of reports on physicians' attitudes toward and perceptions of nurses, but no systematic attempt has been made to develop a psychometrically sound instrument to measure attitudes towards nurses. This study reports steps in developing such an instrument and its psychometric characteristics. Based on a review of the literature, a preliminary list of 59 statements of attitudes toward nurses was prepared and subsequently reviewed by 26 medical educators, nurses, and physicians. Twenty-five statements were judged to have adequate face validity and were included in a preliminary version of a questionnaire using a 4-point Likert-type format. Quantitative analyses were performed on the responses of two groups of medical students (67 freshmen and sophomores and 15 freshmen). Twenty statements yielded a significant and positive correlation with the total score. Statistical analyses of the 20-item version of the scale supported its psychometric characteristics.

*Psychological Reports. 1985; 56: 571-579.*

**RELATIONSHIPS BETWEEN SCORES OF THE JEFFERSON SCALE OF PHYSICIAN EMPATHY (JSPE) AND THE INTERPERSONAL REACTIVITY INDEX (IRI)**

*Mohammadreza Hojat, Salvatore Mangione, Gregory C. Kane, Joseph S. Gonnella*

We designed this study to examine the relationships between scores of two measures of empathy. One was specifically developed for measuring empathy in patient care situations; the other was developed for the general population. We hypothesized that the overlap between scores of the two measures would be greater for their constructs that are more relevant to patient care. Study participants were 93 first-year internal medicine residents at Thomas Jefferson University Hospital in Philadelphia. We administered the Jefferson Scale of Physician Empathy (JSPE, specifically developed for administration to health professionals), and the Interpersonal Reactivity Index (IRI, developed for the general population). We found statistically significant correlations of moderate magnitudes between the total scores of the JSPE and IRI ( $r=0.45$ ,  $p<0.01$ ). Our research hypothesis was confirmed by observing higher correlations between those scales of the IRI that were relevant to patient care (e.g., empathic concern, perspective taking) and related factors of the JSPE (compassionate care, perspective taking) than other scales of the IRI that seemed less relevant to patient care (e.g., personal distress and fantasy). These findings provide further support for the validity of the JSPE. We concluded that physician empathy as measured by the JSPE and its underlying factors are distinct personal attributes that have a limited overlap with fantasy and no overlap with personal distress defined as dimensions of an empathy measure that was developed for the general population.

*Medical Teacher. 2005; 27(7): 625-628.*

Available online at publisher's site:

<http://taylorandfrancis.metapress.com/openurl.asp?genre=article&id=doi:10.1080/01421590500069744>

### THE JEFFERSON SCALE OF PHYSICIAN EMPATHY: DEVELOPMENT AND PRELIMINARY PSYCHOMETRIC DATA

*Mohammadreza Hojat, Salvatore Mangione, Thomas J. Nasca, Mitchell J. M. Cohen, Joseph S. Gonnella, James B. Erdmann, J. Jon Veloski, Mike Magee*

Despite the importance of empathy in patient care, empirical investigation on the topic is scarce because there is no psychometrically sound instrument to operationally measure empathy in healthcare providers. This study was designed to develop a brief instrument to measure empathy in healthcare providers in patient care situations. Three groups participated in the study. Group 1 consisted of 55 physicians, Group 2 were 41 internal medicine residents, and Group 3 was comprised of 193 third year medical students. A 90-item preliminary version of the empathy scale was developed based on a review of the literature and distributed to Group 1 for feedback. After pilot testing, a revised and shortened 45-item version of the instrument was distributed to Groups 2 and 3. Also included was a set of tests to measure other conceptually-related attributes (e.g., compassion, concern, perspective taking, sympathy, warmth, dutifulness, faith-in-people, etc.). A final version of the Jefferson Scale of Physician Empathy containing 20 items based on statistical analyses was constructed. Psychometric findings provided support for construct validity, criterion-related validity (convergent and discriminant), and internal consistency reliability (coefficient alpha) of the scale. Suggestions are made for further research.

*Educational and Psychological Measurement. 2001; 61(2): 349-365.*

Available online at publisher's site:

<http://epm.sagepub.com/cgi/content/abstract/61/2/349>

**AN EMPIRICAL STUDY OF DECLINE IN EMPATHY IN MEDICAL SCHOOL**

*Mohammadreza Hojat, Salvatore Mangione, Thomas J. Nasca, Susan L. Rattner, James B. Erdmann, Joseph S. Gonnella, Mike Magee*

**Context:** It has been reported that students become more cynical as they progress through medical school. This can lead to a decline in empathy. Empirical research to address this issue is scarce because the definition of empathy lacks clarity, and a tool to measure empathy specifically in medical students and doctors has been unavailable.

**Objective:** To examine changes in empathy among medical students as they progress through medical school.

**Materials and Subjects:** A newly developed scale (Jefferson Scale of Physician Empathy (JSPE), with 20 Likert-type items) was administered to 125 medical students at the beginning (pretest) and end (post-test) of year 3 of medical school. This scale was specifically developed for measuring empathy in patient care situations and has acceptable psychometric properties.

**Methods:** In this prospective longitudinal study, the changes in pretest/post-test empathy scores were examined by using t-test for repeated measure design; the effect size estimates were also calculated.

**Results:** Statistically significant declines were observed in 5 items ( $P < 0.01$ ) and in the total scores of the JSPE ( $P < 0.05$ ) between the 2 test administrations.

**Conclusions:** Although the decline in empathy was not clinically important for all of the statistically significant findings, the downward trend suggests that empathy could be amenable to change during medical school. Further research is needed to identify factors that contribute to changes in empathy and to examine whether targeted educational programmes can help to retain, reinforce, and cultivate empathy among medical students for improving clinical outcomes.

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### ATTITUDES TOWARD PHYSICIAN-NURSE COLLABORATION: A CROSS-CULTURAL STUDY OF MALE AND FEMALE PHYSICIANS AND NURSES IN THE UNITED STATES AND MEXICO

*Mohammadreza Hojat, Thomas J. Nasca, Mitchell J. M. Cohen, Sylvia K. Fields, Susan L. Rattner, Margaret Griffiths, David Ibarra, Adelina Alcorta-Gonzalez, Antonio Torres-Ruiz, Guadalupe Ibarra, Alma Garcia*

**Background:** Inter-professional collaboration between physicians and nurses, within and between cultures, can help contain cost and insure better patient outcomes. Attitudes toward such collaboration is a function of the roles prescribed in the culture and guide professional behavior.

**Objectives:** The purpose of the study was to test three research hypotheses concerning attitudes toward physician-nurse collaboration across genders, disciplines, and cultures.

**Method:** The Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration was administered to 639 physicians and nurses in the United States (n = 267) and Mexico (n = 372). Attitude scores were compared by gender (men, women), discipline (physicians, nurses), and culture (United States, Mexico) by using a three-way factorial analysis of variance design.

**Results:** Findings confirmed the first research hypothesis by demonstrating that both physicians and nurses in the United States would express more positive attitudes toward physician-nurse collaboration than their counterparts in Mexico. The second research hypothesis, positing that nurses as compared to physicians in both countries would express more positive attitudes toward physician-nurse collaboration, was also supported. The third research hypothesis that female physicians would express more positive attitudes toward physician-nurse collaboration than their male counterparts was not confirmed.

**Conclusions:** Collaborative education for medical and nursing students, particularly in cultures with a hierarchal model of inter-professional relationship, is needed to promote positive attitudes toward complementary roles of physicians and nurses. Faculty preparation for collaboration is necessary in such cultures before implementing collaborative education.

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<http://www.nursingresearchonline.com/pt/re/nnr/abstract.00006199-200103000-00008.htm>

**AN OPERATIONAL MEASURE OF PHYSICIAN LIFELONG LEARNING: ITS DEVELOPMENT, COMPONENTS AND PRELIMINARY PSYCHOMETRIC DATA**

*Mohammadreza Hojat, Thomas J. Nasca, James B. Erdmann, Anthony J. Frisby, J. Jon Veloski, Joseph S. Gonnella*

Despite the emphasis placed on physicians' lifelong learning, no psychometrically sound instrument has been developed to provide an operational measure of the concept and its components among physicians. The authors designed this study to develop a tool for measuring physician lifelong learning, to identify its underlying components and to assess its psychometric properties. A 37-item questionnaire was developed, based on a review of literature and the results of two pilot studies. Psychometric analyses of the responses of 160 physicians identified 19 items that were included in the Jefferson Scale of Physician Lifelong Learning. Factor analysis of the 19 items showed five meaningful factors that were consistent with the definition and major features of lifelong learning. They were 'need recognition', 'research endeavor', 'self-initiation', 'technical skills' and 'personal motivation'. The method of contrasted groups provided evidence in support of the validity of the five factors. The factors' reliability was assessed by coefficient alpha. It is concluded that lifelong learning is a multifaceted concept, and its operational measure is feasible for evaluating different educational programs and for studying group differences among physicians.

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### **EMPATHY IN MEDICAL STUDENTS AS RELATED TO SPECIALTY INTEREST, PERSONALITY, AND PERCEPTIONS OF MOTHER AND FATHER**

*Mohammadreza Hojat, Marvin Zuckerman, Joseph S. Gonnella, Salvatore Mangione, Thomas J. Nasca, Michael J. Vergare, Mike Magee*

This study was designed to examine relationships between empathy, specialty interest, personality, and perceptions of mother and father. Participants were 422 first-year medical students who completed the Jefferson Scale of Physician Empathy (JSPE) and the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ, short form). They also reported their specialty interest and their perceptions of early relationships with their parents. Results showed that women outscored men on the empathy scale. Also, we found that higher scores on the JSPE were associated with students' interest in people-oriented specialties (as opposed to procedure- and technology-oriented specialties), higher level of satisfaction with early maternal relationship, higher sociability, and lower aggressive-hostility scores. Controlling for gender and social desirability did not change the general pattern of findings.

*Personality and Individual Differences. 2005; 39(7): 1205-1215.*

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## ASSESSMENT OF EMPATHY IN DIFFERENT YEARS OF INTERNAL MEDICINE TRAINING

*Salvatore Mangione, Gregory C. Kane, John W. Caruso, Joseph S. Gonnella, Thomas J. Nasca, Mohammadreza Hojat*

**Problem Statement and Background:** The issue of operational measurement of physician empathy and the question of whether empathy could change at different levels of medical education are of interest to medical educators.

**Methods:** We studied 98 internal medicine residents from all three years of training. We administered the Jefferson Scale of Physician Empathy and correlated residents' empathy scores with ratings on humanistic attributes by program directors.

**Results:** There were no statistically significant differences in empathy scores among residents of different training levels. Empathy scores remained also stable during one year of internship (test-retest reliability = .72). Correlation between empathy and ratings on humanism was .17.

**Conclusions:** Findings suggest that empathy is a relatively stable trait that is not easily amendable to change in residency training program. The issue of whether targeted educational activities for the purpose of cultivating empathy can improve the empathy scores awaits empirical scrutiny.

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### MEASURING PROFESSIONALISM: A REVIEW OF STUDIES WITH INSTRUMENTS REPORTED IN THE LITERATURE BETWEEN 1982 AND 2002

*J. Jon Veloski, Sylvia K. Fields, James R. Boex, Linda L. Blank*

**Purpose:** To describe the measurement properties of instruments reported in the literature that faculty might use to measure professionalism in medical students and residents.

**Method:** The authors reviewed studies published between 1982 and 2002 that had been located using Medline and four other databases. A national panel of 12 experts in measurement and research in medical education extracted data from research reports using a structured critique form.

**Results:** A total of 134 empirical studies related to the concept of professionalism were identified. The content of 114 involved specific elements of professionalism such as ethics, humanism, and multiculturalism, or associated phenomena in the educational environment such as abuse and cheating. Few studies addressed professionalism as a comprehensive construct (11 studies) or as a distinct facet of clinical competence (9 studies). The purpose of 109 studies was research or program evaluation rather than summative or formative assessment. Sixty-five used self-administered instruments with no independent observation of the participants' professional behavior. Evidence of reliability was reported in 62 studies. Although content validity was reported in 86 studies, only 34 provided strong evidence. Evidence of concurrent or predictive validity was provided in 43 and 16 studies, respectively.

**Conclusions:** There are few well-documented studies of instruments that can be used to measure professionalism in formative or summative evaluation. When evaluating the tools described in published research, it is essential for faculty to look critically for evidence related to the three fundamental measurement properties of content validity, reliability, and practicality.

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<http://www.academicmedicine.org/pt/re/acmed/pdfhandler.00001888-200504000-00014.pdf>

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