

A Comparison of Outcomes Resulting From Generalist vs Specialist Care for a Single Discrete Medical Condition

A Systematic Review and Methodologic Critique

Gerald W. Smetana, MD; Bruce E. Landon, MD, MBA; Andrew B. Bindman, MD; Helen Burstin, MD, MPH; Roger B. Davis, ScD; Jennifer Tjia, MD, MSc; Eugene C. Rich, MD

Background: Studies of clinical outcomes for generalist vs specialist care for diagnoses within a specialist's narrow domain have tended to favor specialty care.

Methods: A MEDLINE search from January 1, 1980, through April 1, 2005, and a hand search of retrieved bibliographies of English-language studies that compared generalist vs specialist care for individual patients with a single discrete medical condition were performed. Two reviewers determined eligibility for each study and abstracted data onto a standardized instrument.

Results: A total of 49 articles met our inclusion criteria: 24 studies favored specialty care, 13 found no difference in outcomes, 7 varied by individual outcome, 1 depended on physician experience, and 4 favored generalist care. Only 8 studies reported integration into health delivery systems, 4 considered physician experience, 3 documented information technology support, and 2 con-

sidered the impact of care management programs. Selection bias was adequately addressed in 58% of studies that favored specialty care and in 71% of studies that found no difference or favored generalist care ($P=.52$). Studies that favored specialty care were less likely to consider 4 key, potentially confounding physician or practice characteristics compared with studies that found no difference or favored generalist care (3% vs 15% of potential instances, respectively; $P=.009$).

Conclusions: The literature regarding the influence of generalist vs specialist care on outcomes for patients with a single discrete condition suffers from important methodologic shortcomings. Further research is needed to inform health care policy as it pertains to the optimal role of generalists and specialists in the physician marketplace.

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Author Affiliations: Division of General Medicine and Primary Care, Beth Israel Deaconess Medical Center (Drs Smetana, Landon, and Davis) and Department of Health Care Policy (Dr Landon), Harvard Medical School, Boston, Mass; Division of General Internal Medicine, San Francisco General Hospital, University of California, San Francisco (Dr Bindman); Center for Primary Care, Prevention, and Clinical Partnerships, Agency for Healthcare Research and Quality, Rockville, Md (Dr Burstin); Division of Geriatric Medicine, University of Pennsylvania School of Medicine, Philadelphia (Dr Tjia); and Department of Medicine, Creighton University School of Medicine, Omaha, Neb (Dr Rich).

GREAT DEBATE EXISTS REGARDING the types of physicians who should provide care for patients with particular medical conditions. Generally, this debate focuses on the quality of care provided by specialists in a particular clinical area compared with generalist physicians. Much of the available literature demonstrates that specialist physicians are able to deliver care of higher quality within the narrow, specific areas of their specialty.¹⁻⁵ Many have relied on this literature to justify preferential resource allocation to specialists when compared with generalists.

Other arguments suggest that relying solely on these types of studies may lead to flawed conclusions about the value of primary care. Some studies have demonstrated that generalists appear to provide care of equal quality to specialists,⁶⁻¹⁰ and ecological studies that examine the availability and use of primary care in the community sug-

gest that patients who live in areas with more primary care have better outcomes.¹¹⁻¹⁵

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Certain generalists have levels of experience similar to specialists because of their training, natural inclinations, or patient population.^{7,8,16} In most studies, however, authors combine these "generalist experts" with less experienced generalists. Furthermore, it is not possible to divorce physicians from the context in which they practice. For instance, the use of electronic medical records, availability of guidelines, or ready access to other experts for discussion and informal consultation could also influence quality of care.¹⁷⁻¹⁹

There are likely important differences in the types of patients who receive care from generalists or from specialists that observational studies might not accurately capture. Patients who seek specialist care might be more inclined to take an active

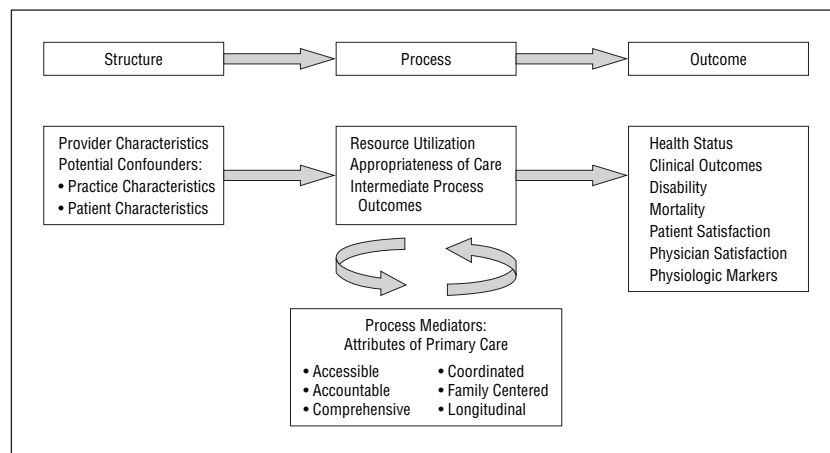


Figure 1. Conceptual framework for studies that compare generalist with specialist care.

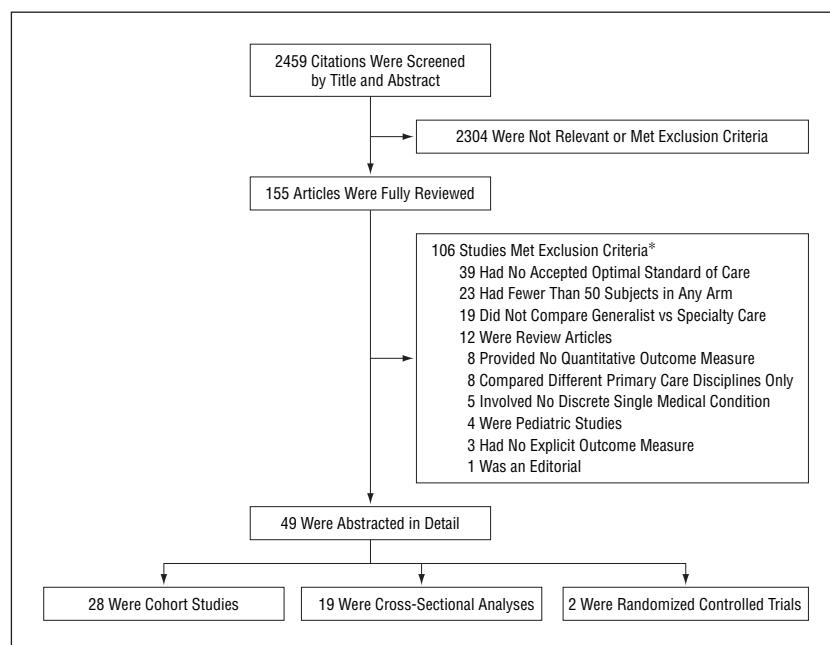


Figure 2. Results of title and detailed search. *Reasons for exclusion sum to greater than 106 studies because we allowed more than 1 reason for exclusion per study.

role in their health care or adhere to lifestyle and other physician recommendations. Patients of specialist physicians tend to be younger and have fewer medical problems.^{3,20-22} In addition, generalists often care for complex patients with multiple chronic conditions, whose care requires explicit trade-offs and potential for conflict involving the use of multiple medications and treatments.^{23,24} Finally, the literature has generally not assessed aspects of care that are difficult to measure including accessibility, care coordination, and communication.

In the present study, we systematically reviewed the literature to examine the extent to which prior stud-

ies accounted for some of these potential confounders. We posed 3 specific questions: (1) To what extent do studies adjust for selection bias and the characteristics of patients who receive care from specialists and generalists? (2) How do studies adjust for measures of physician experience and/or interest? and (3) To what extent do existing studies accurately characterize physician characteristics and practice environment?

METHODS

CONCEPTUAL FRAMEWORK

As our point of departure, we adapted the framework of structure, process, and

outcomes of Donabedian²⁵ to develop a larger framework that compares the care provided by generalists and specialists (**Figure 1**). The 4 major attributes of primary care (as defined by the Institute of Medicine) including accessibility, communication, coordination, and comprehensiveness each inform process measures.²⁶

Studies that compare generalist with specialist care range from the microlevel (individual patient with a single discrete medical condition) to the macrolevel (comparison between countries that vary in their proportions of generalist and specialist care). Most articles have focused on the individual patient with a single discrete disease that falls within the narrow domain of the particular specialist. Few, if any, studies have evaluated the outcomes of care for patients with multiple chronic illnesses. We therefore restricted our review to studies of individual patients with single discrete conditions.

LITERATURE SEARCH AND SELECTION CRITERIA

We performed a MEDLINE search of articles published between January 1, 1980, and March 27, 2004. We began with a previously published search strategy⁵ and added a MeSH term for health care costs. We combined the MeSH term *specialties, medical* (unexploded term) with any of the following MeSH terms: (1) *health knowledge, attitudes, practice*, (2) *drug utilization*, (3) *health care costs or health care expenditures*, (4) *prescriptions, drug*, (5) *preventive medicine*, (6) *primary prevention*, (7) *physician's practice patterns*, and (8) *treatment outcome*. This search retrieved 745 articles.

We performed a hand search of the bibliographies of retrieved articles and identified 45 additional articles. We reviewed indexed MeSH terms from retrieved articles and identified additional commonly occurring terms. We used these terms to perform a second search and combined each term with *specialties, medical* (unexploded term). These additional MeSH terms were *family practice, comparative study, referral and consultation, primary health care, quality of health care, ambulatory care, practice guidelines, and evaluation studies*. We updated the original search through April 1, 2005. These searches yielded an additional 1669 articles for a total of 2459 articles (**Figure 2**). A search of the Cochrane Database of Systematic Reviews yielded no additional articles.

Eligible studies reported outcomes for individual patients with a single discrete medical condition. We estab-

lished explicit a priori exclusion criteria for eligibility for our review. We excluded studies without primary data (reviews, letters, and editorials), abstracts, pediatric studies, non-English language studies, and studies with fewer than 50 subjects in any arm owing to actuarial instability. We also excluded studies that compared generalist specialties with each other (eg, general internal medicine and family practice), studies that provided no explicit definition for outcomes, studies with no quantitative outcomes, and those that did not compare generalist vs specialty care. In addition, we excluded studies in which no accepted optimal standard of care existed for the outcome in question because it was not possible to determine if generalists or specialists provided superior care in these reports.

Paired reviewers independently reviewed the titles and abstracts of each article for potential relevance to our study questions. Based on this review, we excluded 2304 studies that either did not compare generalist vs specialty care for individual patients with single diagnoses or that obviously met at least 1 of our exclusion criteria. We used a standardized instrument to perform a detailed abstraction of each of the remaining 155 articles that form the basis of our review. Paired reviewers reviewed each article, independently abstracted data using the standardized instrument, and resolved any resulting discrepancies by consensus. Discrepancies occurred in fewer than 10% of potentially eligible articles.

We rated whether studies adequately addressed the potential bias associated with the selection of patients to generalist vs specialist care. We considered randomized controlled trials and physician surveys that tested knowledge or behaviors using case vignettes to have adequately addressed selection bias. Using a previously published definition,²⁷ we also judged studies to be adequate if authors used 1 of the following strategies to perform case-mix adjustment: (1) multivariable analyses that incorporate patient age and sex and clinically or survey-derived measures of illness severity and health status, or both (eg, APACHE [Acute Physiology and Chronic Health Evaluation] and SF-36 [Medical Outcomes Study 36-Item Short-Form Health Survey]), or individual, clinically derived characteristics such as diagnoses and blood pressure; (2) comparisons applying use of propensity scores that incorporate patient age, sex, and multiple, clinically derived patient characteristics; or (3) multivariable analyses of administrative data with severity adjustment by patient age, sex, and computed severity adjustment (eg, ad-

justed clinical groups) or at least some measure(s) of health status or morbidity. We considered case adjustment inadequate if authors made some attempt at adjustment for patient characteristics, but these adjustments were less robust. Examples include traditional multivariable analysis using administrative data adjusted for patient age, sex, and diagnosis but with no adjustment for disease severity or comorbidity.

STATISTICAL ANALYSIS

We used the Fisher exact test to compare the proportion of studies that included each key methodologic attribute between studies that favored specialist care and those that favored generalist care or found no difference. To compare the use of key attributes, we considered 4 potential attributes per study: (1) physician volume or experience, (2) information technology support, (3) care management programs, and (4) practice size and integration into health delivery systems. We used the Fisher exact test to determine whether the proportion of attributes evaluated differed by study conclusions.

RESULTS

On detailed review of 155 potentially eligible articles, we excluded 106 that met our predefined exclusion criteria (Figure 2). The most common reasons for exclusion were no accepted optimal standard of care ($n=39$), fewer than 50 subjects in any group ($n=23$), and no comparison of generalist vs specialty care ($n=19$).

Table 1 provides the characteristics of the 49 eligible studies, which included 28 cohort studies, 19 cross-sectional analyses, and 2 randomized controlled trials. Data sources included physician interviews or surveys in 19 studies, patient interviews or surveys in 9 studies, administrative data in 14 studies, and medical chart reviews in 23 studies (14 studies used more than 1 data source). Disease categories included coronary artery disease (16 studies), diabetes (7 studies), congestive heart failure (6 studies), human immunodeficiency virus (HIV) infection (5 studies), breast cancer (3 studies), hypertension (3 studies), and immunizations (2 studies). Outcomes for patients with liver disease, rheumatoid arthritis, tuberculosis, chronic obstructive pulmo-

nary disease, depression, and *Helicobacter pylori* infection, and approaches to cholesterol management and smoking cessation were evaluated by 1 study each.

Table 2 details the use of key methodologic strategies stratified by diagnosis category. Thirty-nine studies (80%) used multivariable analysis. Thirty-three studies (67%) met our minimum criteria for adequately addressing selection bias. Strategies to address selection bias included case-mix adjustment (20 studies), physician surveys (7 studies), and case vignettes (4 studies). Only 2 eligible studies were randomized controlled trials (1 diabetes study and 1 HIV infection study).

Among the 6 key methodologic attributes that we defined a priori, the remaining attributes were present in a smaller number of eligible studies. Eight studies (16%) included data regarding practice size and integration into health delivery systems. Only 4 studies (8%) considered volume or physician experience (eg, generalist experts) as criteria to classify physician specialty. Consideration of the impact of information technology support (3 studies) and the availability of care management programs (2 studies) were infrequent among eligible studies in our review.

We stratified eligible studies by principal conclusion to identify potential correlates between key methodologic attributes and outcomes (**Table 3**). In our analyses, we combined those studies that found no difference or favored generalist care as both outcomes demonstrate that specialist care did not achieve the expected outcome of better care within the narrow area of their specialty. Selection bias was adequately addressed in 14 (58%) of 24 studies that reported specialist outcomes to be superior to generalist outcomes and 12 (71%) of 17 studies that found no difference in outcomes or that reported generalist outcomes to be superior ($P=.52$). Investigators used multivariable analytic techniques in 94% of studies that found no difference or favored generalist outcomes compared with 67% of studies that favored specialist outcomes ($P=.06$). Key attributes were present 10 times among 68 potential instances in studies that re-

Table 1. Characteristics of Eligible Studies

Source	Study Type	Timeline	Data Analysis	Diagnosis Category	Study Hypothesis	Data Collection	Principal Result
McFall et al, ²⁸ 1994	Cohort with comparison	Prospective	MV	Breast cancer	To examine the extent that physician specialty and characteristics express judgments consistent with National Institutes of Health consensus recommendations regarding the treatment of breast cancer	Physician interview or survey	Varies according to specific outcome
Taplin et al, ²⁹ 1994	Cohort with comparison	Retrospective	UV	Breast cancer	Does physician specialty as primary source of care influence mammography rates?	Patient interview or survey	Specialists favored
Finison et al, ³⁰ 1999	Cohort with comparison	Retrospective	MV	Breast cancer	Does primary care physician specialty or gynecologist visit affect screening mammography rates?	Administrative data	Generalists favored
Stafford et al, ³¹ 1997	Cross-sectional	NA	MV	Cholesterol management	Do physician specialty and patient characteristics influence testing, counseling, and treatment of patients with and without known lipid abnormalities?	Physician interview or survey	Varies according to specific outcome
Thorndike et al, ³² 1998	Cross-sectional	NA	MV	Cigarette cessation	Does physician specialty influence rates of physician screening, counseling, and nicotine replacement use for smokers?	Physician interview or survey	Generalists favored
Edep et al, ³³ 1997	Cross-sectional	NA	MV	Congestive heart failure	Does physician specialty influence management practice for patients with CHF and concordance with guidelines?	Physician interview or survey	Specialists favored
Chin et al, ² 1997	Cross-sectional	NA	MV	Congestive heart failure	Does physician specialty influence appropriate use of ACE inhibitor in patients with CHF?	Physician interview or survey	Specialists favored
Reis et al, ³⁴ 1997	Cohort with comparison	Retrospective	MV	Congestive heart failure	Does physician specialty influence treatment and outcomes for patients admitted with CHF?	Medical chart review	Varies according to specific outcome
Chin et al, ³⁵ 1997	Cohort with comparison	Retrospective	MV	Congestive heart failure	Does physician specialty influence use and dosing of ACE inhibitor for patients with CHF?	Medical chart review	No difference
Croft et al, ³⁶ 1997	Cross-sectional	NA	UV	Congestive heart failure	What are national patterns of physician use of ACE inhibitor for patients with CHF?	Physician interview or survey	Specialists favored
Cujec et al, ³⁷ 2005	Cohort with comparison	Prospective	MV	Congestive heart failure	Does physician specialty or patient volume influence inpatient and 1-year mortality for patients with newly diagnosed heart failure?	Medical chart review	No difference
Regueiro et al, ³⁸ 1998	Cohort with comparison	Prospective	MV	COPD	Do resource use, hospital costs, and survival differ for inpatients with severe COPD for care provided by generalists or pulmonologists?	Medical chart review, patient interview or survey, and physician interview or survey	No difference
Ayanian et al, ³⁹ 1994	Cross-sectional	NA	MV	Coronary artery disease	Does physician knowledge regarding treatment of acute MI differ by physician specialty?	Physician interview or survey	Specialists favored
Borowsky et al, ⁴⁰ 1995	Cohort with comparison	Retrospective	MV	Coronary artery disease	What is the effect of physician specialty and usual source of care on the use of necessary coronary angiography?	Medical chart review Patient interview or survey	Specialists favored
Schreiber et al, ⁴¹ 1995	Cohort with comparison	Prospective	UV	Coronary artery disease	Does physician specialty influence use of effective prescription and mortality among patients with unstable angina?	Medical chart review	Specialists favored
Friedmann et al, ⁴² 1996	Cross-sectional	NA	UV	Coronary artery disease	Are FPs, IMs, or cardiologists more likely to correctly estimate risk of cardiovascular events or value of treatments to reduce risk?	Physician interview or survey	Specialists favored
Jollis et al, ³ 1996	Cohort with comparison	Retrospective	MV	Coronary artery disease	Does specialty of admitting physician influence outcome for patients with acute MI?	Medical chart review, administrative data	Specialists favored

(continued)

Table 1. Characteristics of Eligible Studies (cont)

Source	Study Type	Timeline	Data Analysis	Diagnosis Category	Study Hypothesis	Data Collection	Principal Result
Stein et al, ⁴³ 1996	Cohort with comparison	Retrospective	UV	Coronary artery disease	Does physician specialty influence appropriate ordering of radionuclide exercise stress testing?	Medical chart review	Specialists favored
Ayanian et al, ¹ 1997	Cohort with comparison	Retrospective	MV	Coronary artery disease	Do treatment and outcome of patients with acute MI differ among patients of cardiologists and generalists?	Medical chart review, administrative data	No difference in mortality; other outcomes varied
Whyte et al, ⁴⁴ 1997	Cohort with comparison	Retrospective	UV	Coronary artery disease	Does treatment of hyperlipidemia in the secondary prevention of coronary artery disease differ between generalists and specialists?	Medical chart review	Specialists favored
Stafford and Blumen-thal, ⁴⁵ 1998	Cross-sectional	NA	MV	Coronary artery disease	1. Are cardiologists more likely to provide cardiovascular prevention services than other physicians? 2. What patient and physician characteristics influences cardiovascular prevention rates?	Physician interview or survey	No difference
Frances et al, ⁴⁶ 1999	Cohort with comparison	Retrospective	MV	Coronary artery disease	1. Do cardiologists provide more recommended therapies or adhere more often to established practice guidelines for patients with acute MI? 2. Do variations in process of care or case mix account for differences in outcomes?	Medical chart review, administrative data	No difference
Nash et al, ⁴⁷ 1999	Cohort with comparison	Retrospective	MV	Coronary artery disease	Does physician specialty influence the magnitude and mechanism of inpatient mortality for patients with acute MI?	Medical chart review	No difference
Norcini et al, ⁴⁸ 2000	Cohort with comparison	Prospective	MV	Coronary artery disease	Does physician specialty influence mortality rates from acute MI?	Medical chart review, administrative data	Specialists favored
Gottwik et al, ⁴⁹ 2001	Cohort with comparison	Prospective	MV	Coronary artery disease	How do treatment and outcomes differ for patients with acute MI admitted to German hospitals with and without cardiology departments?	Medical chart review	Specialists favored
Fehrenbach et al, ⁵⁰ 2001	Cohort with comparison	Prospective	MV	Coronary artery disease	Do physician characteristics affect β -blocker treatment rates post-MI?	Administrative data	No difference
Majumdar et al, ⁵¹ 2001	Cohort with comparison	Prospective	MV	Coronary artery disease	1. Does physician specialty influence rates of calcium channel blockers and other medications after MI? 2. Does physician specialty influence adoption of new calcium channel blocker treatment standards?	Medical chart review	Specialists favored
Ayanian et al, ⁵² 2002	Cohort with comparison	Retrospective	MV	Coronary artery disease	Does physician specialty in ambulatory setting affect mortality among elderly patients after MI?	Patient survey, medical chart review, administrative data	Specialists favored
Tiemeier et al, ⁵³ 2002	Cross-sectional	NA	MV	Depression	Does compliance with published depression treatment guidelines vary by specialty?	Physician interview or survey	Specialists favored
Diabetes Integrated Care Team, ⁵⁴ 1994	RCT	Prospective	UV	Diabetes	Do outcomes differ for specialist care vs coordinated care for patients with diabetes?	Medical chart review	No difference
Greenfield et al, ⁵⁵ 1995	Cross-sectional	NA	MV	Diabetes	Do outcomes differ for patients with non-insulin dependent diabetes between family practice, general internal medicine, and endocrinology?	Patient interview or survey, administrative data	No difference for 10 of 11 measured outcomes
Ho et al, ⁵⁶ 1997	Cohort with comparison	Retrospective	UV	Diabetes	Is the quality of diabetes care better in a diabetes clinic or in a general medicine clinic?	Medical chart review	Specialists favored

(continued)

Table 1. Characteristics of Eligible Studies (cont)

Source	Study Type	Timeline	Data Analysis	Diagnosis Category	Study Hypothesis	Data Collection	Principal Result
Zgibor et al, ⁵⁷ 2000	Cohort with comparison	Prospective	MV	Diabetes	Does inclusion of a specialist influence hemoglobin A _{1c} levels in patients with type 1 diabetes?	Medical chart review	Specialists favored
Chin et al, ⁵⁸ 2000	Cross-sectional	NA	MV	Diabetes	Do health status, quality of care, and resource utilization differ among older diabetic Medicare patients cared for by endocrinologists or generalists?	Patient interview or survey	Specialists favored
Zgibor et al, ⁵⁹ 2002	Cohort with comparison	Prospective	MV	Diabetes	Does physician specialty influence total care received or diabetic complications among patients with type 1 diabetes?	Medical chart review, physician interview or survey	Specialists favored
Fendrick et al, ⁶⁰ 1996	Cross-sectional	NA	UV	<i>Helicobacter pylori</i>	Does physician specialty influence early adoption of <i>H pylori</i> treatment guidelines?	Physician interview or survey	Specialists favored
Turner et al, ⁶¹ 1994	Cohort with comparison	Retrospective	MV	HIV	Does generalist or AIDS specialty care influence hospitalization rates and likelihood of switching physicians within 6 mo after AIDS diagnosis?	Administrative data	Specialists favored
Keitz et al, ⁶² 2001	RCT	Prospective	MV	HIV	1. Do IM and ID specialists differ in correct application of preventive services for HIV patients? 2. Does targeted education of IMs improve outcome in HIV patients?	Administrative data, medical chart review	Varies according to specific outcome
Stone et al, ⁶³ 2001	Cross-sectional	NA	MV	HIV	Do physician specialty and HIV experience influence correct application of antiviral guidelines to hypothetical patients in a survey?	Physician interview or survey	Depends on physician experience
Landon et al, ⁷ 2003	Cohort with comparison	Prospective	MV	HIV	Does physician specialty, expertise, or volume influence HAART use in patients with HIV infection?	Patient interview or survey, physician interview or survey	No difference
Wilson et al, ⁶⁴ 2005	Cross-sectional	NA	MV	HIV	Which practice and physician characteristics influence rates of early HAART adoption?	Patient interview, physician survey	No difference
Greenfield et al, ⁵⁵ 1995	Cross-sectional	NA	MV	Hypertension	Do outcomes differ for patients with hypertension between family practice, general internal medicine, and cardiology?	Patient interview or survey, administrative data	No difference
Huse et al, ⁶⁵ 2001	Cross-sectional	NA	UV	Hypertension	Do generalists differ from specialists in knowledge, attitudes, and practice in the pharmacologic treatment of hypertension?	Physician interview or survey	Most differences nonsignificant
Ren et al, ⁶⁶ 2002	Cross-sectional	NA	MV	Hypertension	What patient and physician characteristics affect compliance with antihypertensive medications?	Medical chart review, administrative data	No difference
Nichol and Zimmerman, ⁶⁷ 2001	Cross-sectional	NA	MV	Immunizations	How do knowledge, attitudes, and practices regarding influenza and pneumococcal vaccines differ between generalists and specialists?	Physician interview or survey	Generalists favored
Daniels et al, ⁶⁸ 2004	Cohort without comparison	Retrospective	MV	Immunizations	Do vaccination rates vary among adults in primary and specialty care practices?	Medical chart review	Generalists favored
Ko et al, ⁶⁹ 2001	Cohort with comparison	Retrospective	MV	Liver disease	Does attending physician specialty influence cost, mortality, and admission rates for end-stage liver disease?	Administrative data	No difference
Shipton et al, ⁷⁰ 2004	Cohort with comparison	Retrospective	MV	Rheumatoid arthritis	Does access to specialty care influence rates of disease modifying drugs in rheumatoid arthritis?	Administrative data	Specialists favored
Summartojo et al, ⁷¹ 1997	Cross-sectional	NA	MV	Tuberculosis	Do physician specialty, years since medical school graduation, and other physician characteristics influence correct treatment of active tuberculosis?	Physician interview or survey	Specialists favored

Abbreviations: ACE, angiotensin-converting enzyme; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; FP, family practice; HAART, highly active antiretroviral therapy; HIV, human immunodeficiency virus; ID, infectious disease; IM, internal medicine; MI, myocardial infarction; MV, multivariate; NA, not applicable; RCT, randomized controlled trial; UV, univariate.

Table 2. Frequency of Key Methodologic Factors Stratified by Diagnosis Category*

Diagnosis Category	No. of Studies	Selection Bias Adequately Addressed					Definition of Specialist Includes Volume or Experience	IT Support in Practice Settings Documented	Care Management Programs	Practice Size and Integration Into Health Delivery System	Multivariable Analysis
		Any	RCT	Case Vignettes	Case-Mix Adjustment	Physician Survey					
Breast cancer	3	1	0	1	0	0	0	0	0	0	2
Cholesterol management	1	1	0	0	1	0	0	0	0	0	1
Cigarette cessation	1	1	0	0	1	0	0	0	0	0	1
Congestive heart failure	6	5	0	1	3	1	1	0	0	0	5
COPD	1	1	0	0	1	0	0	0	0	0	1
Coronary artery disease	16	11	0	1	9	1	0	0	0	4	12
Depression	1	1	0	1	0	0	0	0	0	0	1
Diabetes	6	2	1	0	1	0	0	0	0	0	4
<i>Helicobacter pylori</i> infection	1	1	0	0	0	1	0	0	0	0	
HIV infection	5	5	1	0	3	1	3	1	1	2	5
Hypertension	3	1	0	0	0	1	0	0	0	0	2
Liver disease	1	0	0	0	0	0	0	0	0	0	1
Rheumatoid arthritis	1	0	0	0	0	0	0	0	0	0	1
Tuberculosis	1	1	0	0	0	1	0	0	0	0	1
Vaccinations	2	2	0	0	1	1	0	2	1	2	2
Total	49	33	2	4	20	7	4	3	2	8	39

Abbreviations: COPD, chronic obstructive pulmonary syndrome; HIV, human immunodeficiency virus; IT, information technology; RCT, randomized controlled trial.
*Data are given as number of studies.

Table 3. Methodologic Attributes Stratified by Principal Study Result*

Principal Study Result	No. of Studies	Key Methodological Attribute Present							
		Selection Bias Adequately Addressed	Strategy to Address Selection Bias	Definition of Specialist Includes Volume or Experience	IT Support in Practice Settings Documented	Care Management Programs	Practice Size and Integration Into Health Delivery System	Selection Bias Adequately Addressed and at Least 1 Other Key Methodologic Attribute	Multivariable Analysis
Specialists favored	24	14	Case vignettes, 3; physician survey, 4; case-mix adjustment, 7	0	0	0	3	3	16
Depends on physician experience	1	1	Physician survey	1	0	0	1	1	1
Varies by individual outcome	7	6	RCT, 1; case vignettes, 1; physician survey, 1; case-mix adjustment, 3	0	0	0	2	2	6
No difference in outcomes	13	9	RCT, 1; case-mix adjustment, 8	3	1	1	0	3	12
Generalists favored	4	3	Physician survey, 1; case-mix adjustment, 2	0	2	1	2	3	4

Abbreviations: IT, information technology; RCT, randomized controlled trial.
*Data are given as number of studies.

ported no difference in outcomes or favored generalist outcomes and only 3 times among 96 potential instances in studies that favored specialist outcomes ($P=.009$). Studies

that favored generalist care were more likely to include more than 1 key methodologic attribute. Only 3 of 24 studies that favored specialty care adequately adjusted for case mix

and considered at least 1 other key attribute compared with 3 of 4 studies that favored generalist care ($P=.02$). An analysis that compared the 3 groups (generalists pre-

ferred, specialists preferred, and no difference) separately for each of the aforementioned comparisons produced similar results for each of these comparisons.

Using the assumption that randomized controlled trials, case vignettes, and physician survey most effectively address issues of selection bias, 7 (53%) of 13 of such studies favored specialist care. Of the 20 studies that used adequate case-mix adjustment, 7 (35%) favored specialty care, whereas 10 (63%) of 16 studies that did not consider selection bias favored specialty care ($P=.18$).

COMMENT

When considering studies comparing generalist and specialist care for single discrete conditions, 24 of 49 studies suggest better outcomes with specialists and only 4 studies suggest that generalist care is superior. This may seem to be an unsurprising result to many. Over the past 100 years, the US health care system has evolved to a heavy reliance on care by specialist physicians.⁷²⁻⁷⁶ The American public places a high value on specialty certification,^{77,78} and US physician reimbursement policies more heavily compensate specialists than generalists, relative to the differentials in other countries.⁷⁴ Only 10% of US medical students perceive that “specialists are less important than primary care physicians,” and not surprisingly, less than 20% of graduating students plan careers in a generalist specialty.⁷⁹

Over the past 25 years, a line of ecological research has come to a very different conclusion regarding the value of generalist vs specialist care. For example, in 1993, Welch and colleagues⁸⁰ reported marked variations across metropolitan service areas in the cost of physicians' services to Medicare beneficiaries, with lower costs in metropolitan service areas that contained a high proportion of primary care practitioners. Recently, Starfield et al^{11(pw5-97)} concluded that “analyses at the county level show lower mortality rates where there are more primary care physicians, but this is not the case for specialist supply.” Indeed, in an ex-

haustive review of more than 100 such ecological studies of the relative benefits of generalist vs specialist care, Starfield et al^{12(p457)} recently concluded that the “. . . evidence shows that primary care helps prevent illness and death . . .” and “. . . that primary care (in contrast to specialty care) is associated with a more equitable distribution of health in populations.”

How can different types of research come to such starkly different results regarding the value of generalist vs specialist care? We suggest that the confusion derives in part from an overly simplistic model for the role of specialty training in patient care. We found that only 14 of the 24 studies favoring specialist care adequately considered case-mix adjustment for possible patient selection bias. Furthermore, only 3 studies considered the potential effects of the practice environment as a potential confounding factor, and none of these studies considered the volume of cases or other measures of practice experience as a measure of specialized expertise.

The failure to consider the potential influence of the physician's practice environment is a particularly interesting oversight. Numerous studies have demonstrated the effects of guidelines, care pathways, disease management, feedback, information technology, incentive plans, and corporate culture on physician care.⁸¹⁻⁸⁹ Scholars of primary care have emphasized the distinct primary care role (eg, continuous, coordinated, and comprehensive)²⁶ and have argued that it is the fulfillment of this role (rather than the certification process of the physician) that is important to care.^{75,90-92} Finally, the limited time and resources available to most US primary care physicians poses difficulties for the provision of excellent, comprehensive services.⁹³⁻⁹⁶ Thus, it might seem obvious that a simple comparison of physician care by training and background would prove uninformative unless differences in practice environment and patient characteristics were taken into account. The seemingly substantive evidence favoring specialized care of discrete conditions becomes far less compelling when these important methodologi-

cal issues are considered. In our review, while the total number of eligible studies was small, studies that favored generalist care were more likely to consider practice characteristics than were those that favored specialty care.

The dearth of studies comparing generalist vs specialist care of patients with multiple chronic conditions, a traditional strength of generalism, is another important omission in the literature. More than 80% of Medicare beneficiaries older than 65 years have at least 1 chronic condition,²³ but even more important, many have multiple chronic illnesses. Furthermore, patients with multiple chronic conditions account for most Medicare spending; 95% of Medicare expenditures are for patients with 2 or more chronic conditions.²³ Unfortunately, in a specialty-oriented health care system, coordination of care for these multiple conditions can be a significant problem. Almost 70% of respondents to a recent survey reported that coordination among the different health professionals that they saw was a problem,⁹⁷ and US patients with chronic illness report more frequent care coordination problems than do similar patients in Australia, Canada, Germany, or the United Kingdom.⁹⁸ While many studies have demonstrated the benefits of various administrative approaches to enhancing chronic illness care,⁹⁹ the benefits to chronic illness care of the certification pathway of the physician remain unclear. We suggest that further research enables comparison of generalists and specialists in health care systems that provide care for patients with complex diagnoses who require extensive coordination.

Of course, there are numerous limitations to a systematic review conducted on a complex topic such as this. First, we excluded 39 studies that reported differing rates of services or costs but did not offer any explicit optimal standard of care. Second, we identified but excluded a small number of studies that compared patient satisfaction with generalists vs specialists for patients with various conditions (instead of patients with single discrete conditions). Third, the literature on this

subject is extensive, and it is possible that a different initial search strategy would have provided additional studies to evaluate. Nonetheless, we conducted a careful hand search of the bibliographies of identified articles and an expanded MEDLINE search using additional commonly occurring MeSH terms; thus, we believe our search strategy was suitably exhaustive. In addition, we were not blinded to the results of the studies that we abstracted, and all reviewers were generalists. Finally, the limited literature that addresses the care of patients with multiple chronic medical conditions, traditionally the strength and domain of generalists, would likely produce very different results.

In conclusion, in this systematic review, we found that almost half of the studies comparing generalist and specialist care suggest better outcomes for specialists treating patients with a single discrete condition. However, many studies suffered from inadequate case-mix adjustment and failure to address the characteristics of the physicians' practice setting. Studies that favored specialty care were less likely to consider physician volume or experience, information technology support, care management programs, and integration into health delivery systems than studies that showed no difference or favored generalists. While the many benefits of highly specialized services are indisputable, well-supported generalist practice remains a critical element of the health care system, not just for acute illness care but also for the management of the many patients with chronic illness. Further research is urgently needed to inform the emerging policy debate around the proper role and nurturance of generalist physicians in the United States.

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Correspondence: Gerald W. Smetana, MD, Division of General Medicine and Primary Care, Beth Israel Deaconess Medical Center, 330 Brookline Ave, Boston, MA 02215 (gsmetana@bidmc.harvard.edu).

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in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Smetana, Landon, Bindman, Burstin, and Rich. *Acquisition of data:* Smetana, Landon, and Rich. *Analysis and interpretation of data:* Smetana, Landon, Bindman, Burstin, Davis, Tjia, and Rich. *Drafting of the manuscript:* Smetana, Landon, Burstin, and Rich. *Critical revision of the manuscript for important intellectual content:* Smetana, Landon, Bindman, Burstin, Davis, Tjia, and Rich. *Statistical analysis:* Burstin and Davis. *Obtained funding:* Smetana and Rich. *Administrative, technical, and material support:* Smetana and Rich. *Study supervision:* Smetana and Rich. **Financial Disclosure:** None reported.

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