

Can Health Care Teams Improve Primary Care Practice?

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THE NOTION OF A HEALTH CARE team is as rarely challenged in principle as it is achieved in practice. Currently, a resurgence of interest in team-based care is evident. The Institute of Medicine has called for a *New Health System for the 21st Century* with primary care teams playing a central role.¹ The quantum leap in the complexity of tasks prevents physicians alone from coping with the scope of practice. The imperative of cost containment leads provider organizations to favor lower-paid clinicians over physicians. The demand for quality encourages primary care to add caregivers with skills that physicians may not possess.

Will the primary care team come of age in the 21st century? This article in the series "Innovations in Primary Care" critically examines the primary care team. We begin by addressing the fundamental question: "What is a team?" We describe 2 practice organizations that highlight key characteristics of high-functioning teams. Discussions of teams generally include a consideration of 2 major issues: "Who is on the team?" and "How does the team function?" This article primarily focuses on the second question.

Groups and Teams

In health care settings, individuals from different disciplines come together to care for patients: the surgeon, nurse, and anesthesiologist in the operating room; the oncologist, radiation therapist, and surgeon for patients with cancer; and the physician, medical assistant, and receptionist in the primary

care office. These groupings conform to one definition of a patient care team as "a group of diverse clinicians who communicate with each other regularly about the care of a defined group of patients and participate in that care."² But is a group of people who happen to be thrown together in a surgical suite or primary care office truly a team? Dr R works in a private practice that includes herself and one other general internist. She begins her 20-minute visit with Mr H by thumbing through the chart to find the dates and results from his most recent hemoglobin A_{1c}, low-density lipoprotein cholesterol, eye examination, and prostate-specific antigen tests. The office has a medical records clerk never trained to perform these tasks. Dr R then spends 5 minutes comparing the medication bottles brought by Mr H with her chronic medication list. Reviewing the health maintenance form, she leaves the room to request a medical assistant to draw up pneumonia and influenza immunizations, finding the medical assistant sitting at her desk waiting for instructions about what to do next. Returning to the examination room, Dr R learns that Mr H has been unable to obtain an appointment with the urologist for a prostate biopsy; she promises to arrange the appointment herself. As Mr H leaves, Dr R realizes that she did not need

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a medical degree to accomplish any of the tasks performed during the medical visit.

Few people would argue that Dr R, the medical records clerk, and the medical assistant—although working together to care for the same patients—truly function as a team.

A consideration of teams evokes 2 questions: “Who should be the players on the team?” and “How can the players act as a team rather than as a collection of individuals?” A familiar team is a football squad. Football teams need the right mix of players. A 22-member team with 11 quarterbacks and 11 defensive linebackers would win few games. Similarly, a primary care practice with 3 physicians and no receptionist, medical assistant, or billing clerk is seldom a winning combination. Even with the right mix of players, a football team with no plays, no practice sessions, and no game plan would be unlikely to land in the Super Bowl. In fact, such a “team” is not truly a team but simply a group of individuals. Even though groups of health care personnel thrown together in an office, clinic, or hospital floor are generally called teams, they need to earn true team status by demonstrating teamwork.³

A simple definition of team may help to distinguish unstructured groups vs organized teams: “A team is a group with a specific task or tasks, the accomplishment of which requires the interdependent and collaborative efforts of its members.”⁴ The football example clarifies the difference between a group and a team:

It is naive to bring together a highly diverse group of people and expect that, by calling them a team, they will in fact behave as a team. It is ironic indeed to realize that a football team spends 40 hours a week practicing teamwork for the two hours on Sunday afternoon when their teamwork really counts. Teams in organizations seldom spend two hours per year practicing when their ability to function as a team counts 40 hours per week.⁴

A Brief History of Primary Care Teams in the United States

The general practitioner of the early 20th century was a lone ranger. Black

bag in hand, he treated and comforted patients, often in their homes. As office practice emerged, the first primary care team was husband and wife, the wife serving as receptionist, billing clerk, and bookkeeper. As practice became more complex, nonphysician tasks became further subdivided into receptionist, medical assistant, and billing clerk, a pattern found in the myriad of small practices dotting the United States.

In 1915, teams of physicians, health educators, and social workers were created at Massachusetts General Hospital's outpatient department. Primary care team models were developed at New York's Montefiore Hospital in 1948 and Yale in 1951.⁴ The Neighborhood Health Center program of the 1960s developed primary care teams in some early health centers.^{5,6} Larger group practices also incorporated a diverse complement of health professionals into teams.

Despite these efforts, primary care teams did not become the dominant paradigm. One obstacle was the “overwhelming barriers of disciplinary territoriality and systems inertia.”⁷ Payment systems failed to reimburse work performed by nonphysician professional members of the team, undermining the financial viability of teams. Perhaps most critical was the failure to articulate the objectives of a team model and to provide evidence on the advantages of team models for achieving these objectives. The “team meeting”—lengthy sessions in which each team member offered his or her perspective on a patient and family—became emblematic of these failures. A physician veteran of 1970s team practice writes,

Because our goals were so lofty, we needed to spend enormous amounts of time together to explore all the intricacies and nuances of comprehensive health care. . . . The central organizing event was the pre-clinic meeting, usually held at one of a number of local restaurants. Quite regularly, critical decisions were made at this time. The most memorable of these was restaurant selection for the next week. . . . the patients/families? No one really knows how it was for them (R. Goldschmidt, MD, written communication).

At the start of the 21st century, do well-functioning primary care teams exist in the United States? Two case studies highlight organizations striving toward high-performing teams. One setting is a small private office, the other a large group practice.

Two Contemporary Primary Care Teams

Dr Charles Burger. Charles Burger is a private practitioner in Bangor, Me. From a distance, this remarkable primary care practice resembles thousands of physician offices throughout the country. Upon entering the office door, it is clear that—within a traditional practice setting—Dr Burger has created a smoothly functioning primary care team. The entire office functions as one team—2 physicians and 2 nurse practitioners are the clinicians, complemented by medical assistants, greeters, receptionists, and schedulers. The practice is financially stable and is busy, with each clinician seeing 23 to 30 patients per day. The following case typifies how the team model works:

Ms P called Dr Burger's office complaining of recurrent abdominal discomfort after eating. The receptionist consulted her computerized triage protocol and told Ms P to come the same day. When she arrived, the greeter, already aware of the patient's problem, gave her a medical history questionnaire specifically related to abdominal pain, which Ms P filled out in the waiting room. Ms P met with the medical assistant who checked her vital signs and quickly entered her questionnaire responses into the computer. Ms P then saw the physician, who reviewed the history, performed a relevant physical examination, and consulted a diagnostic software program. Discussing the options with Ms P, the physician and patient decided on a diagnostic and treatment plan. Ms P then met with the scheduler, who arranged laboratory and ultrasound studies.

Dr Burger's staff members were all trained at a 15-week course in quality management at a nearby college. Greeters, receptionists, and schedulers (who are cross-trained) also received 6 weeks of in-office training.

All clinical processes in Dr Burger's office are guided by a system. The practice has adopted advanced access scheduling, offering patients same-day appointments. For years, the office has tracked demand and can predict how each day will unfold. On Mondays, heavy with telephone calls, more staff act as receptionists and few scheduled appointments are made.

Whereas in most offices, receptionists are not trained to properly triage patients into emergency, urgent, and routine categories, Dr Burger designed a triage system that receptionists consult on every telephone call. When Ms P called with abdominal complaints, the receptionist pulled up the gastrointestinal screen on the triage protocol, which prompted a series of questions including pain severity and presence of vomiting, diarrhea, black and/or bloody stools, or fever. In the case of positive answers, the protocol tells the receptionist to send Ms P to the emergency department. For milder symptoms, an appointment is made, perhaps with pre-visit laboratory studies. The interaction is routed to Ms P's medical record and a clinician's e-mail in-box.

Most communication is routinized by the office's clinical systems. Team members do not attend endless meetings. Incoming calls are routed to the e-mail in-box of the appropriate team member. Urgent messages are delivered in person. Diagnostic studies go to the appropriate e-mail in-box and the medical record. The well-trained medical assistants order clinical preventive studies based on the patient's age and sex. Clinic goals and performance measures are communicated to all staff by posters prominently displayed in the office.

Kaiser Permanente in Georgia

At the opposite end of the primary care spectrum is Kaiser-Permanente's large delivery system. In 1997, Kaiser-Permanente's Georgia region (KP/Georgia) developed primary care teams with several goals: increased patient satisfaction, improved Health Employer Data and Information Set scores, and lowered costs.

This group practice model currently consists of 9 primary care offices with 25 teams. Each team has 3 to 5 clinicians (physicians, nurse practitioners or physician assistants), 2 registered nurses, 1 to 2 receptionists or clerks, and 6 to 7 licensed practical nurses or medical assistants, providing care to a panel of 8000 to 15 000 patients. Prior to the rollout of the team structure, clinicians and staff received training in team-oriented care.

Patients view their clinician, not the team, as their primary caregiver, but are aware that a nonphysician clinician may provide care for acute problems or if the physician is not available. Eighty-five percent of visits are handled by a clinician on the patient's team.

Kaiser-Permanente's Georgia team, like Charles Burger's practice, has well-defined systems and protocols for all clinical processes, including triaging telephone calls, reviewing and informing patients of laboratory and x-ray results, making referrals, and renewing prescriptions. One registered nurse is the advice nurse, answering patient questions and triaging patients who telephone or drop in. The other registered nurse is the team coleader, working with the physician coleader to solve day-to-day problems, ensure that clinical systems are functioning well, and supervise team members.

Each team receives a budget based on the number of patients on the team's panel with risk adjustment according to age and disease severity. Initially given limited decision-making autonomy, teams demonstrating effective self-management are allowed flexibility in staffing mix and division of labor. Teams can decide if they want more physicians, more nonphysician clinicians, or more support staff in their personnel mix. Some teams delegate chronic care management functions to licensed practical nurses and medical assistants; others are less successful in this redesign. Each team decides how chronic disease registries are used to improve its panel's outcome measures. Some use the registries extensively, others minimally.

Each team receives a quarterly report on team functioning, patient satisfaction, staff satisfaction, and clinical quality measures, enabling KP/Georgia's central leadership to assess each team's functioning and allowing each team to compare itself with other teams.

Building Teams

What are the features that distinguish the teams of Charles Burger and KP/Georgia from the dysfunctional working group of the fictional Dr R? The conceptual work of several scholars has highlighted 5 key elements of team building: clear goals with measurable outcomes, clinical and administrative systems, division of labor, training, and communication (BOX).^{3,7-9} Both Dr Burger's practice and the KP/Georgia teams exemplify these 5 elements. Both of these practices have concrete goals and measure their performance in reaching these goals, eg, patient satisfaction, good clinical outcomes, and in the case of KP/Georgia, cost reduction. Both of these institutions have established detailed systems to accomplish the tasks that all primary care practices must fulfill. They have constructed a division of labor so that each team member knows, and is well-trained to accomplish, the role he or she must play in performing each task. Dr Burger's practice illustrates a creative approach to division of labor by devising nontraditional positions, such as the "greeter," and by delegating to receptionists and medical assistants some tasks that are typically performed by clinicians. Practice systems, division of labor, and training are missing elements in the fictional practice of Dr R. While Dr Burger's practice makes a substantial investment in staff training, Dr R—like many primary care practices—puts new employees to work after a scant 2-hour orientation. In the practices of both Dr Burger and KP/Georgia, communication is accomplished via systems and protocols and by face-to-face, minute-to-minute conversations rather than by lengthy meetings.

Research on Health Care Teams

Is there evidence that building a cohesive primary care team is worth the effort—for better quality of care, lower costs for equivalent quality, or improved workplace satisfaction?

To the extent that clinical care involves groups of people working together, research indicates that a group with better teamwork tends to perform better than one lacking teamwork. Although studies differ in how they measure teamwork, most approaches attempt to capture the types of characteristics listed in the Box. In a variety of industries, research has found that team cohesiveness is associated with effectiveness in carrying out the team's tasks, even though there is not always an association with improved productivity.^{3,10-14} A team-oriented culture in intensive care units is associated with better technical quality of care, lower length of stay, and improved relationships with family members but not with improved risk-adjusted mortality.¹⁵

Two recent studies of general practices in England demonstrated that better teamwork and team climate are associated with better processes of care for patients with diabetes¹⁶ and better continuity of care, access to care, and patient satisfaction.¹⁷ Primary care teams in Spain with clear goals and healthy communication did better than less cohesive groups on the outcomes of patient-perceived quality and patient satisfaction.¹⁸ One exploratory study found that better relationships with practice staff were predictive of greater job and career satisfaction among physicians.¹⁹ Researchers have studied the KP/Georgia teams described above. Initial findings suggest that teams with higher “collaborative clinical culture” scores have superior patient outcomes, including better patient satisfaction and better control of diabetes and hyperlipidemia.²⁰

In addition to research on teamwork, other studies have investigated the effect of team composition on practice outcomes: Who should be the players on the primary care team? One mo-

Box. Key Elements of Team Building

1. Defined Goals

Overall organizational mission statement

Examples:

- Improvement of patient's health
- Reduction in barriers to access to care
- Improvement in practice's financial performance
- Physician and staff satisfaction

Specific, measurable operational objectives

Examples:

- At least 80 of diabetic patients in practice will have hemoglobin A_{1c} lower than 8
- Ninety percent of people calling for a nonurgent appointment will receive the appointment within 1 week
- Practice will achieve a targeted level of practice revenue
- Each team member will achieve an explicitly identified goal for personal professional development

2. Systems

Clinical systems

Examples:

- Procedures for providing prescription refills
- Procedures for informing patients of laboratory results

Administrative systems

Examples:

- Procedures for making patient appointments
- Policies on how decisions are made in the medical practice

3. Division of labor

Definition of tasks

Assignment of roles (Determining which people on the team perform which tasks within the clinical and administrative systems of the medical practice)

4. Training

Training for the functions that each team member routinely performs

Cross-training to substitute for other roles in cases of absences, vacations, or periodic heavy demands on one part of the team

5. Communication

Communication structures

Examples:

- Routine communication through paper and electronic information flow
- Minute-to-minute communication through brief verbal interactions among team members
- Team meetings

Communication processes

Examples:

- Giving feedback
- Conflict resolution

tivation for adding team members is to conserve expensive physician labor through substitution of other personnel for physician effort. Baldwin⁷ offers the “general dictum that services (tasks) should be performed at the lowest level of professional training, which

leaves those with greater training or responsibility free to perform tasks or to solve problems for which they are uniquely equipped.”

Most formal research on substitution in primary care has examined the role of nurse practitioners and physician assis-

tants. Two recent meta-analyses provide evidence that nurse practitioners can deliver care of equivalent quality to that delivered by primary care physicians,^{21,22} with the caveat that most studies reviewed included small numbers of clinicians and few examined long-term outcomes for patients with chronic illness or complex conditions. In contrast, there is a lack of rigorous research on other types of substitution in primary care, comparing how different staffing mixes of registered nurses, licensed practical nurses, and medical assistants affect patient outcomes. Nor has research assessed clinical outcomes for the substitution occurring in Dr Burger's practice through delegation of greater clinical responsibilities to medical assistants and receptionists.

Research is also inconclusive about whether substitution of personnel with lower salaries in primary care always translates into lower cost per visit. Although several studies indicate that the use of nonphysician clinicians can reduce costs in primary care practices,²³⁻²⁷ some of these studies have been criticized for not fully accounting for nonphysician clinicians seeing fewer patients per hour and working fewer hours per week than primary care physicians.²⁸ A recent study of the KP/Georgia teams that carefully accounted for visit productivity and work effort concluded that teams that made greater use of nurse practitioners and physician assistants relative to physicians had lower overall team labor costs per visit.²⁹

Configuring team personnel is not just a matter of substitution for economic benefit. Another objective is enhancement of clinical performance. Team members may contribute unique talents that enhance the skill mix of the practice. Wagner² has argued that nurses' training makes them better than physicians at following chronic care management protocols. Nurse practitioners may also have better patient education and communication skills than do physicians. Numerous studies suggest that multidisciplinary clinical teams produce clinical outcomes superior to those achieved by "usual care"

arrangements, with many of these studies evaluating the addition of nurses, social workers, psychologists, and clinical pharmacists to teams.^{2,30-40}

A limitation of these studies is that few examine team models for the varied problems that predominate in primary care practice. Many of these studies focus on hospitalized patients or investigate teams designed for a well-demarcated population or condition, such as frail elders or patients with diabetes. Confounding variables are plentiful, such as the quality of personnel on one team vs another and the resources available to one team vs another.⁴¹

The Problems With Teams

If teams are such a good idea, why aren't they more prevalent? Teams have some inherent drawbacks related to their added organizational complexity. As team size increases, the transaction costs of interpersonal communication increase exponentially and may overtake the benefits of teamwork.⁴² Team size may have a U-shaped relation to teamwork; too few or too many team members reduce effectiveness.⁸ One study suggests that 6 team members is the optimal size; teams with greater than 12 members are too large.⁴³ Teams also require dealing with the challenges of human relationships and personalities.⁴⁴ While some team members may shine as initiators, clarifiers, or encouragers, others may play negative roles as dominators, blockers, evaders, and recognition seekers.³

Despite evidence that teams may enhance clinical performance, teams may conflict with other important practice values. Delegating tasks to other team members may erode work satisfaction for the generalist physician attracted by the idea of personally delivering comprehensive care. Greater team size may interfere with patient preferences for continuity of care with a single clinician.⁴²

The undifferentiated and varied nature of clinical problems in primary care makes team building especially challenging. A single specialty "service line" practice will find it relatively easy to delineate tasks and define roles, com-

pared with a primary care practice facing a more diffuse array of clinical tasks.

Finally, financial incentives matter. Economic disincentives are prominent under current fee-for-service payment policies; an office visit with a physician or nurse practitioner, but not with a medical assistant, is billable, negating the economic benefit of the practice of substitution.

Introducing Teams Into Primary Care

How can primary care physicians take the first steps toward creating more effective teamwork? Building a cohesive primary care team begins with an assessment of one's own working group, using the Box as a guide. Does the practice have clearly articulated clinical, business, and work environment goals with measurable outcomes to assess improvement? One English general practice successfully pioneered a process of engaging clinicians and staff to agree on practice goals.⁴⁵ Once the goals are formulated, does the practice have the best mix of personnel to meet the goals?

Do detailed systems exist to routinize practice tasks, for example, how patient telephone calls are triaged, how laboratory and x-ray results (normal or abnormal) are communicated to patients, and how refills for different categories of prescriptions are handled? Does each team member have clearly defined tasks within these systems and is each well-trained to perform those tasks? In the vignette about Dr R, the medical records clerk could have been trained to maintain a flow sheet with patients' laboratory data and the medical assistant could have been trained how to make specialty appointments for elderly patients unable to navigate the health care system. Training team members takes place on the job and does not require additional funding. The training does require physicians to spend time up front, an investment that should save physicians like Dr R substantial time over the long run.

Could nonphysician personnel substitute for physicians in performing some tasks, thereby decompressing

physician work load? Practices frequently underuse the capabilities of receptionists and medical assistants. In the case of Dr R, a medical assistant could have been trained in comparing the patient's medication list with the pills the patient was actually taking, saving Dr R 5 minutes of the medical visit. Low-cost investment in staff training—either on-the-job or in local community colleges—can unleash the full potential of team members.

Barriers to team development are

considerable. A predator of the primary care team is the hamster.⁴⁶ “Hamster health care”—the rapidly revolving treadmill upon which so many clinicians find themselves—creates a state of mental exhaustion that frustrates attempts at planning and cooperation. Though a well-functioning team with a clear division of labor might relieve physicians of some of their workload, finding the time to participate in team development is difficult for physicians. Whether or not a primary

care practice chooses to focus on team development as a major innovation, many practices may benefit by introducing or improving one or more components of high-performing teams—clear goals with measurable outcomes, defined tasks and roles, clinical and administrative systems with a clear division of labor, and effective communication. Making time to step off the treadmill to invest in team planning may yield long-term benefits in the form of an improved work environment.

REFERENCES

- Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington DC: National Academy Press; 2001.
- Wagner EH. The role of patient care teams in chronic disease management. *BMJ*. 2000;320:569-572.
- Fried BJ, Rundal TG, Topping S. Groups and teams in health services organizations. In: Shortell SM, Kaluzny AD, eds. *Health Care Management*. Albany, NY: Delmar Thomson Learning; 2000.
- Wise H, Beckhard R, Rubin I, Kyte AL. *Making Health Teams Work*. Cambridge, Mass: Ballinger Publishing Co; 1974.
- Lashof JD. The health care team in the Mile Square area, Chicago. *Bull NY Acad Med*. 1968;44:1363-1369.
- Wise H. The primary care team. *Arch Intern Med*. 1972;130:438-444.
- Baldwin DC. *The Role of Interdisciplinary Education and Teamwork in Primary Care and Health Care Reform*. Washington, DC: Health Resources and Services Administration, Dept of Health and Human Services; 1994.
- Cohen SG, Bailey DE. What makes teams work: group effectiveness research from the shop floor to the executive suite. *J Manage*. 1997;23:239-290.
- Rubin IM, Beckhard R. Factors influencing the effectiveness of health teams. *Milbank Mem Fund Quart*. 1972;50:317-335.
- Bettenhausen KL. Five years of group research: what we have learned and what needs to be addressed. *J Manage*. 1991;17:345-381.
- Gully SM, Devine DJ, Whitney DJ. A meta-analysis of cohesion and performance. *Small Group Res*. 1995;26:497-520.
- Cannon-Bowers JA, Oser R, Flanagan DL. Work teams in industry: a selected review and proposed framework. In: Swezey RW, Salas E, eds. *Teams: Their Training and Performance*. Norwood, NJ: Ablex Publishing; 1992.
- Vinokur-Kaplan D. Enhancing the effectiveness of interdisciplinary mental health treatment teams. *Adm Policy Ment Health*. 1995;22:521-530.
- Seashore S. *Group Cohesiveness in the Industrial Work Group*. Ann Arbor: University of Michigan Institute for Social Research; 1954.
- Shortell SM, Zimmerman JE, Rousseau DM, et al. The performance of intensive care units: does good management make a difference? *Med Care*. 1994;32:508-525.
- Stevenson K, Baker R, Farooqi A, Sorrie R, Khunti K. Features of primary health care teams associated with successful quality improvement of diabetes care. *Fam Pract*. 2001;18:21-26.
- Campbell SM, Hann M, Hacker J, et al. Identifying predictors of high quality care in English general practice: observational study. *BMJ*. 2001;323:1-6.
- Goni S. An analysis of the effectiveness of Spanish primary care teams. *Health Policy*. 1999;48:107-117.
- Williams ES, Konrad TR, Linzer M, et al. Refining the measurement of physician job satisfaction. *Med Care*. 1999;37:1140-1154.
- Roblin DW, Kaplan SH, Greenfield S, Roberts MH, Jacobs LD, Carlton DG. Collaborative clinical culture and primary care outcomes. In: Program and abstracts of the annual meeting of the Academy for Health Services Research and Quality; June 23-25, 2002; Washington, DC.
- Brown SA, Grimes DE. A meta-analysis of nurse practitioners and nurse midwives in primary care. *Nurse Res*. 1995;44:332-339.
- Horrocks S, Anderson E, Salisbury C. Systematic review of whether nurse practitioners working in primary care can provide equivalent care to doctors. *BMJ*. 2002;324:819-823.
- Flood AB, Fremont AM, Jin K, Bott DM, Ding J, Parker RC. How do HMOs achieve savings? the effectiveness of one organization's strategies. *Health Serv Res*. 1998;33:79-99.
- Scheffler RM, Waitzman NJ, Hillman JM. The productivity of physician assistants and nurse practitioners and health work force policy in the era of managed healthcare. *J Allied Health*. 1996;25:207-217.
- Grzybicki DM, Sullivan PJ, Oppy JM, Bethke AM, Raab S. The economic benefit for family/general practices employing physician assistants. *Am J Manag Care*. 2002;8:613-620.
- Hooker RS. A cost analysis of physician assistants in primary care. *JAAPA*. 2002;15:39-42, 45, 48.
- Venning P, Durie A, Roland M, Roberts C, Leese B. Randomized controlled trial comparing cost effectiveness of general practitioners and nurse practitioners in primary care. *BMJ*. 2000;320:1048-1053.
- DeAngelis CD. Nurse practitioner redux. *JAMA*. 1994;271:868-871.
- Roblin DW, Howard DH, Becker ER, Adams EK, Roberts MH. Use of midlevel practitioners to achieve labor cost savings in the primary care practice of a MCO. *Health Serv Res*. In press.
- DeBusk RF, Miller NH, Superko Hr, et al. A case-management system for coronary risk factor modification after acute myocardial infarction. *Ann Intern Med*. 1994;120:721-729.
- Aubert RE, Herman WH, Waters J, et al. A randomized controlled trial of nurse case management within an HMO to improve glycemetic control in patients with diabetes. *Ann Intern Med*. 1998;129:605-621.
- Wagner EH, Glasgow RE, Davis C, et al. Quality improvement in chronic illness care: a collaborative approach. *Jt Comm J Qual Improv*. 2001;27:63-80.
- Sommers LS, Marton KI, Barbaccia JC, Randolph J. Physician, nurse, and social worker collaboration in primary care for chronically ill seniors. *Arch Intern Med*. 2000;160:1825-1833.
- American College of Physicians-American Society of Internal Medicine. Pharmacist scope of practice. *Ann Intern Med*. 2002;136:79-85.
- Hanlon JT, Weinberger M, Samsa GP, et al. A randomized, controlled trial of a clinical pharmacist intervention to improve inappropriate prescribing in elderly outpatients with polypharmacy. *Am J Med*. 1996;100:428-437.
- Bogden PE, Abbott RD, Williamson P, Onopa JK, Koontz LM. Comparing standard care with a physician and pharmacist team approach for uncontrolled hypertension. *J Gen Intern Med*. 1998;13:740-745.
- Gattis WA, Hasselblad V, Whellan DJ, O'Connor CM. Reduction in heart failure events by the addition of a clinical pharmacist to the heart failure team. *Arch Intern Med*. 1999;159:1939-1945.
- Leape LL, Cullen DJ, Clapp MD, et al. Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. *JAMA*. 1999;282:267-270.
- Halstead LS. Team care in chronic illness: a critical review of the literature of the past 25 years. *Arch Phys Med Rehabil*. 1976;57:507-511.
- Wells KB, Sherbourne C, Schoenbaum M, et al. Impact of disseminating quality improvement programs for depression in managed primary care: a randomized controlled trial. *JAMA*. 2000;283:212-220.
- Schmitt MH, Farrell MP, Heinemann GD. Conceptual and methodologic problems in studying the effects of interdisciplinary geriatric teams. *Gerontologist*. 1988;28:753-764.
- Barr DA. The effects of organizational structure on primary care outcomes under managed care. *Ann Intern Med*. 1995;122:353-359.
- Starfield B. *Primary Care*. New York, NY: Oxford University Press; 1998.
- Lencioni P. *The Five Dysfunctions of a Team*. San Francisco, Calif: Jossey-Bass; 2002.
- Adelaide Medical Centre Primary Health Care Team. A primary health care team manifesto. *Brit J Gen Pract*. 1991;41:31-33.
- Morrison I, Smith R. Hamster health care: time to stop running faster and redesign health care. *BMJ*. 2000;321:1541-1542.