

American Thoracic Society Documents

An Official American Thoracic Society Workshop Report: The Integrated Care of the COPD Patient

Linda Nici and Richard ZuWallack, on behalf of the American Thoracic Society Subcommittee on Integrated Care of the COPD Patient

THIS OFFICIAL WORKSHOP REPORT WAS APPROVED BY THE AMERICAN THORACIC SOCIETY BOARD OF DIRECTORS, JANUARY 2012

CONTENTS

Executive Summary

Introduction

Methods

Problems Associated with the Management of the Patient with COPD

The Concept of Integrated Care and its Potential in the Management of the Patient with COPD

Integrated Care and Chronic Disease Management

Applying Integrated Care Concepts to COPD

A Working Definition of Integrated Care

Pulmonary Rehabilitation as a Component of Integrated Care

Clinical Trials Evaluating the Integrated Care Approach to COPD

Applying the Components of Integrated Care to the Management of the Patient with COPD

Self Management Strategies

Clinical Information Systems

Delivery System Design

Decision Support

Community Resources

Examples of Integrated Care Programs for Patients with COPD

The Draft National Strategy for COPD in England and the

Impress Program for Health Professionals

CHRONIC: Emerging Healthcare Services in the Information Society

CIRO+, a Center of Expertise for Chronic Organ Failure

Living Well with COPD

Summary and Conclusions

The optimal care of the patient with chronic obstructive pulmonary disease (COPD) requires an individualized, patient-centered approach that recognizes and treats all aspects of the disease, addresses the systemic effects and comorbidities, and integrates medical care among healthcare professionals and across healthcare sectors. In many ways the integration of medical care for COPD is still in its infancy, and its implementation will undoubtedly represent a paradigm shift in our thinking. This article summarizes the proceedings of a workshop, The Integrated Care of the COPD Patient, which was funded by the American Thoracic Society. This workshop included participants who were chosen because of their expertise in the area as well as their firsthand experience with disease management models. Our summary describes the concepts of integrated care and chronic disease management, details specific components of disease management as they may apply to the patient with COPD, and provides several innovative examples of COPD disease management programs originating from different

healthcare systems. It became clear from the discussions and review of the literature that more high-quality research in this area is vital. It is our hope that the information presented here provides a "call to arms" in this regard.

Keywords: integrated care; disease management; COPD

EXECUTIVE SUMMARY

The ATS workshop on the Integrated Care of the COPD Patient was funded by the American Thoracic Society and was held at the 2009 and 2010 International Conference meetings. Since limited evidence-based data are available in the area of integrated care as it specifically applies to chronic obstructive pulmonary disease (COPD), this workshop was designed to discuss the problems faced in the care of these patients, define the interrelated concepts of integrated care and chronic disease management as they may apply to this disease, and present strategies currently in use. The key summary content of the workshop has been distilled in this report. The overarching conclusions of the group were as follows:

- COPD, as a chronic, complex illness with multiple systemic effects and co-morbidities, requires an integrated approach for its optimal management.
- Integrated care in this context can be defined as "a continuum of patient-centered services organized as a care delivery value chain for patients with chronic conditions with the goal of achieving the optimal daily functioning and health status for the individual patient and to achieve and maintain the individual's independence and functioning in the community."
- The chronic care model provides a template for integrating care, by encompassing six key components: self management support, clinical information systems, delivery system redesign, decision support (guidelines), healthcare organization, and community resources.
- Disease-specific clinical practice guidelines (CPGs) often fall short in patients with multiple morbidities and trying to implement several disease-specific CPGs can pose an onerous treatment burden and increase the risk of adverse drug events.
- While there is a robust literature on chronic disease management, evidence-based literature specifically pertaining to the complex patient with COPD is still early in development.
- Discussion following the presentation of four programs implementing aspects of integrated care in the worldwide community indicates that "one size will not fit all," but that each approach will necessarily depend on local demographics, needs, and resources.

The goals of this ATS Workshop on the Integrated Care of the COPD Patient were to: (1) highlight the problems associated with the care of the complex patient with COPD; (2) define

the concept of integrated care and its potential in the management of the patient with COPD; (3) outline how the components of integrated care might be applied to these patients; and (4) describe what progress has been made so far and what remains to be done. Our intent was not to discuss healthcare policy, but rather to outline the problem, elaborate on pivotal aspects of integrated care for the patient with COPD, and declare a call to arms for further thought, research, and implementation. The workshop committee was multidisciplinary and international, thereby allowing these proceedings to reflect a wide breadth of knowledge and experience.

METHODS

Sixteen invited guests participated in the workshop. The group was multidisciplinary and had international representation. Fourteen of the sixteen participants were members of the American Thoracic Society Pulmonary Rehabilitation Assembly; they were selected on the basis of their knowledge of the topic, publications in the area, and experience with disease management programs. The remaining two attendees were chosen outside of the pulmonary rehabilitation field: Sandra Adams, who was the lead author on a systematic review of the chronic care model in COPD; and Cynthia Boyd, a geriatrician who has expertise in the design of clinical practice guidelines for patients with multiple co-morbidities. The workshop committee met in 2009 and 2010 at the time of the ATS International Conference. The 2009 agenda focused on the following areas: definition and concept of integrated care for COPD; integrated care around the COPD exacerbation; pulmonary rehabilitation and integrated care; integrating care of the patient with COPD into the home setting; the role of information technology in integrated care; and self-management education. The 2010 agenda began with two keynote addresses by Drs. Adams and Boyd on their respective areas (*see above*) and then proceeded to discussions of novel disease management programs as follows: The UK IMPRESS program; the CHRONIC project from Spain; CIRO+ from The Netherlands; and Living Well with COPD from Canada. Discussion of each topic highlighted additional issues yet to be explored. All participants summarized their presentations and discussions; these were then distilled into this report. All participants submitted conflict of interest information, none of which was relevant to the discussion. A methods table is included in the online supplement.

PROBLEMS ASSOCIATED WITH THE MANAGEMENT OF THE PATIENT WITH COPD

COPD is a progressive disease with systemic manifestations and common comorbidities, which result in loss of function, high-cost pharmacologic treatment, increased need for scheduled and unscheduled care, and an increased risk of death (1). The optimal management of the patient with COPD requires a holistic approach that encompasses three necessary components: (1) The recognition and treatment of all aspects of the disease, its systemic effects and co-morbidities; (2) the bringing together of all the dimensions of COPD care in a continuum through the lifetime of the patient; and (3) the integration of medical care among healthcare professionals and across healthcare sectors using a patient-centered approach.

Although COPD is defined as a preventable and treatable disease characterized by airways obstruction that is not fully reversible (2, 3), it often has substantial extrapulmonary effects and comorbidities that contribute to morbidity and mortality (4, 5). The patient with COPD has, on average, 3.7 other chronic medical conditions, compared with 1.8 for patients with other chronic illnesses (6). In addition, over half of deaths in patients with COPD are from comorbidities (7). These multiple chronic conditions and their treatments may interact negatively (8);

therefore, focusing therapy solely on reversing airways obstruction is suboptimal care and will likely produce suboptimal outcomes. The optimal management of these patients requires providing the right treatment at the right time and in the right place.

The current acute care model, which tends to be reactive rather than proactive, falls short of this ideal perspective (9, 10). In many countries, there is a substantial gulf between primary and secondary care sectors, with poor communication, little to no collaboration, and insufficient coordination of services and providers. All of these promote fragmentation of care. Nowhere is this more keenly felt than at the time of the acute exacerbation of COPD, when morbidity is considerable, mortality risk is increased, and healthcare utilization is substantial. What is truly needed is an approach that integrates medical care across healthcare professionals and systems, centering on the unique medical and psychosocial problems, needs, and goals of the patient, and actively involving the patient—that is, an “anticipatory” model.

THE CONCEPT OF INTEGRATED CARE AND ITS POTENTIAL IN THE MANAGEMENT OF THE PATIENT WITH COPD

Integrated Care and Chronic Disease Management

A standard definition of integration is to “combine to form a whole.” Applying this general concept to healthcare, the World Health Organization (WHO) defines integrated care as “a concept bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion” (11). Alternatively, integrated care can be considered as “an organizational process of coordination that seeks to achieve seamless and continuous care, tailored to the patient’s needs, and based on a holistic view of the patient” (12). These two definitions are in fact complementary, with the former stressing the importance of coordination of services and the latter stressing the need to tailor care to the individual patient (13).

Integrated care and the chronic care model of disease management are so similar in concept that they may be considered interchangeable. Bodenheimer and colleagues proposed a chronic care model originally developed by Wagner for the care of patients with chronic illnesses (Figure 1) (14). Chronic care integrates services and therapies across settings and providers and tailors therapy to the individual needs of the patient. The chronic care model has six key components: (1) self-management support, (2) clinical information systems, (3) delivery system redesign, (4)

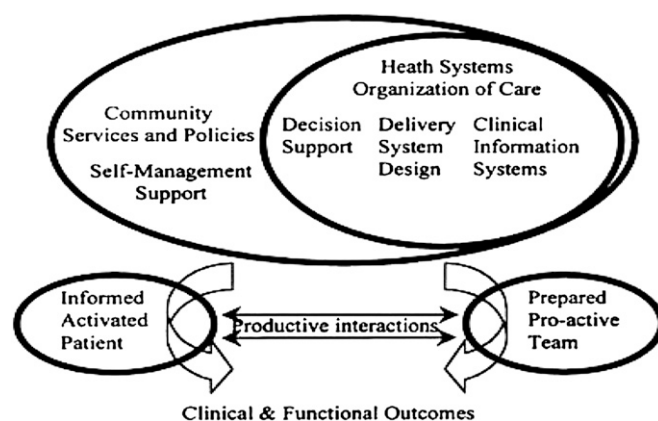


Figure 1. Model for improvement of chronic illness care: the model suggests that patient–provider interactions result in care that improves outcomes. Reprinted with permission from Reference 49.

decision support (guidelines), (5) healthcare organization, and (6) community resources (14). While this model traditionally emphasized medication adherence and behavior change to improve outcomes, especially healthcare utilization, later concepts became broader in scope and more closely resemble what we consider integrated care (15). It is not known at present which of these components (if not all) are necessary for optimal management of the patient with COPD; however, it appears from a systematic review that two or more components are needed (16).

Applying Integrated Care Concepts to COPD

The most common application of the integrated care concept to COPD is a systems approach that promotes collaboration of hospital and community services to work together to maintain health and prevent hospital admissions. In many settings, the patient with COPD is diagnosed and managed in the community and referred to a specialist when appropriate. The implementation of a locally agreed-upon integrated care pathway helps facilitate such an approach by guiding health professionals and patients through the process. This pathway guides care and ensures that appropriate referrals are made at the correct stage. Collaborative self-management is a key feature of this care. Ideally, this model fosters a productive interaction among the skilled health professionals and the knowledgeable proactive patient, who are all supported by clinical guidelines, information systems, and case management. There is ongoing debate on whether the patient with COPD is better served by a specialist (who may have more knowledge and experience of this disease), or a primary care clinician (who may know the patient better and may be better equipped to deal with all aspects of patient care) (17). Integrated care transcends this argument by stressing the importance of both primary and specialty care, and by establishing better lines of communication supported by ongoing health professional education to optimally manage these patients.

Another application of integrated care is a patient-centered, holistic approach that provides the components of care based on the patient's unique needs. Providing the right treatment at the right time requires a seamless blending of multiple interventions; which may include promotion of healthy behaviors, self-management education, pharmacological therapy, pulmonary rehabilitation, oxygen therapy, psychosocial support, nutritional advice, and consideration for surgery. These services must, of course, be coordinated among healthcare providers. Such a framework also recognizes that, in the absence of substantial disease modification, palliative care is an important component of ongoing management (18).

Another dimension of integrated care is implementing a unified care plan for the multi-morbid patient with COPD. This recognizes the fact that multiple morbidities are common in COPD and must be addressed concurrently and cohesively with the respiratory problem (19).

A Working Definition of Integrated Care

For the purposes of this workshop, we define integrated care as "The continuum of patient-centered services organized as a care delivery value chain for patients with chronic conditions with the goal of achieving the optimal daily functioning and health status for the individual patient and to achieve and maintain the individual's independence and functioning in the community."

Pulmonary Rehabilitation as a Component of Integrated Care

The structure of pulmonary rehabilitation and its holistic approach (20) provide a convenient platform to address all the relevant morbidities of the patient with COPD and to coordinate care.

As such, the interdisciplinary, comprehensive, and patient-centered approach of pulmonary rehabilitation mirrors the integrated care model. Pulmonary rehabilitation, however, differs in some important aspects: traditionally it has not routinely incorporated self-management strategies to ensure behavior change; stressed the use of clinical information systems; emphasized communication among all healthcare providers; or focused on the development of community resources. Thus, pulmonary rehabilitation does not replace integrated care, but is a prominent component of integrated care.

Clinical Trials Evaluating the Integrated Care Approach in COPD

In 2003, Bourbeau and colleagues showed encouraging results of a randomized clinical trial that led to increased interest in self-management education programs in COPD (21). Their intervention included a self-management program supported by a skilled health professional "case-manager" and continuous communication by regular telephone contact. This study showed improvement of patients' health status and a reduction in subsequent hospitalizations.

In 2006, Casas and colleagues reported on the effectiveness of integrated care on subsequent hospitalizations in patients discharged following an exacerbation of COPD (22). Integrated care consisted of a comprehensive evaluation of the patient at discharge, self-management education, development of an individually tailored care plan, and accessibility of a specialized nurse to patients and primary care providers. This was all facilitated through a web-based call center. Compared with standard care, this form of integrated care reduced subsequent hospital admissions by about 50%. A subsequent analysis determined that patients provided with integrated care scored better in self-management areas, including COPD knowledge, identification, and early treatment of exacerbations, inhaler adherence, and in the correct use of inhalers (23).

In 2009, Koff and colleagues reported on the effectiveness of proactive integrated care for patients with severe or very severe COPD (24). Their concept of proactive integrated care included four interventions: (1) disease-specific education, (2) teaching self-management strategies, (3) enhanced communication with study coordinators, and (4) remote home monitoring. Monitoring included measuring changes in symptoms, oxygen saturation, FEV₁, and the number of steps during the 6-minute-walk distance testing. Monitoring was accomplished with a portable oximeter, an FEV₁ monitor, a pedometer, and a small telecommunication device and technology platform (the Health Buddy system; HealthHero Network, Palo Alto, CA). Twenty patients given proactive integrated care were compared with 20 given usual care. Compared with standard care, proactive integrated care resulted in significantly improved health-related quality of life, earlier detection of COPD exacerbations, and a trend toward a reduction in healthcare utilization.

More recently, Rice and colleagues reported on the reduction of emergency department visits and hospitalizations in patients with severe COPD who received one education session, an action plan for self treatment of exacerbations, and monthly telephone calls from a case-manager (25). Studies that implement multiple components of the chronic care model have demonstrated a significant reduction in healthcare utilization (unscheduled/emergency center visits, number of hospitalizations, and hospital length of stay) (26).

APPLYING THE COMPONENTS OF INTEGRATED CARE TO THE MANAGEMENT OF THE PATIENT WITH COPD

This section will elaborate on how the core components of integrated care (self management education, clinical information systems, delivery system design, decision support/guidelines,

and community resources) might be applied to the patient with COPD. As stated earlier, because of the international nature of the workshop and the diversity of healthcare, this workshop could not cover policy; rather, we focus on those components that transcend specific systems.

Self-Management Strategies

A key element of integrated care is self management, which has three components: education, behavioral support, and motivational support. The primary objective of self management is aimed at promoting behavioral changes (26). This is accomplished by (1) formulating treatment goals that are relevant to the patient, (2) encouraging patients to experiment with adaptive behaviors in everyday situations, (3) encouraging problem-solving and decision-making, and (4) promoting self efficacy. Self efficacy refers to the belief that one can successfully execute particular behaviors to produce certain outcomes, and is a major determinant for inducing and maintaining these behaviors (27, 28). The ongoing assessment of patient self efficacy is critical to the success of chronic disease management.

For the patient with COPD, self-management education focuses on promoting those skills necessary to maintain health and ameliorate the effects of the respiratory disease and its multi-morbidity (3, 29). Higher levels of self efficacy will lead to positive health behaviors such as improved adherence with prescribed pharmacologic and nonpharmacologic therapies, including smoking cessation, vaccinations, regular bronchodilator use, proper inhaler technique, regular exercise, supplemental oxygen use, and increased physical activity in the home setting.

The COPD exacerbation is associated not only with changes in lung function and acute symptoms, but also with substantial decreases in exercise capacity and quality of life, increased healthcare utilization, and increased mortality risk (30). Self management focuses on the exacerbation and interventions aimed at reducing the frequency of exacerbations and reducing their severity through early recognition and appropriate treatment. The early treatment of the COPD exacerbation shortens recovery (31), reduces morbidity, and decreases healthcare utilization (29). Central to this process is the development of an action plan, which involves self recognition of a change in symptoms followed by the initiation of a predetermined series of steps, including starting medications such as oral corticosteroids and antibiotics and promptly communicating with a healthcare provider (32). The action plan requires strong collaboration between the healthcare provider and the patient.

Multicomponent self management interventions have been used successfully in COPD. Although the settings are diverse and the approaches differ somewhat, they all rely on the patient's active participation in his or her healthcare plan in close collaboration with healthcare professionals. A meta-analysis of self-management education in COPD, which consisted of eight trials and included 1,066 patients, determined that this intervention was associated with a reduction in hospital admissions (33). The odds ratio for readmission was 0.64 (95% confidence interval [CI], 0.47–0.89). Health status was also improved using the St. Georges Respiratory Questionnaire (SGRQ): 2.58 (95% CI, –5.14 to –0.02). Because of the diversity of programs, the review could not make specific recommendations on content or format of the intervention. It is important to note that education alone is not effective, but must be combined with other components of the chronic care model (34).

Clinical Information Systems

Information and communications technologies (ICT) are essential components of an integrated care program for chronic illness.

ICT addresses several challenges in the management of chronic disease, including (1) identifying relevant subpopulations for proactive care, (2) facilitating individual patient care planning, (3) sharing information with patients and the care delivery team to coordinate care, (4) providing timely reminders for providers and patients, and (5) measuring performance of the chronic care management program (35).

An example of the potential usefulness of ICT in integrating care is the development of the electronic medical record (EMR) which has greatly facilitated flow of information across disciplines and settings, thereby positively impacting the care of patients with chronic illnesses such as COPD (34). Personal health records (PHRs) are another component of ICT. The PHR is an electronic tool for patients through which they can collect, track, and share healthcare information with their healthcare team (36).

The Institute of Medicine has defined eight domains of ICT (health information and data, decision support, results management, communication/connectivity, population health management, order entry, patient support, and administrative processes) (37). A recent review of 109 articles evaluating information systems used in the care of chronic illnesses found that access to an EMR, computerized prompts, communication/connectivity (e.g., telemedicine/monitoring), population management (e.g., reports and feedback), specialized decision support, electronic scheduling, and personal health records were associated with improved quality of care outcomes (38). Among the positive outcomes were usability, guideline adherence, documentation, treatment adherence, screening and testing, and cost. Although information systems are a necessary feature of chronic disease management, successful implementation of these programs likely require additional system and technology factors (39).

ICT is emerging as a key component in the integrated care of patients with COPD. Data from several studies in COPD suggest that access to an EMR, improved communication/connectivity, and decision support are important in improving outcomes for patients with COPD. The study of integrated care by Casas and coworkers cited earlier (22) included, among its components, an ICT platform aimed at facilitating the accessibility of patients (and their care-givers) to their primary care providers and specialized nurse case managers. A central component of the ICT platform was a call center coupled to a web-based application that provided access to the medical record, action plan, and patient journals, thereby facilitating care and communication.

Telemedicine, which uses telecommunications technology, is another component of ICT. Telemedicine has been shown to improve process measures such as HgbA1C in diabetes (40) and mortality in congestive heart failure, although results have been variable (41). In COPD, home-based telemonitoring has been used to monitor symptoms and physiological variables at the patient's home (42). Frequent monitoring may improve self management through identifying early signs of clinical worsening, helping patients appropriately interpret their respiratory symptoms, and fostering appropriate health behaviors (43).

Telemonitoring has been studied in patients with COPD who are enrolled in home healthcare programs that provide home visits by nurses. In one study, patients with COPD using telemonitoring to report spirometry, O₂ saturation, and blood pressure improved their activities of daily living and were less likely to be admitted to a nursing home or hospital (44). In another study, those receiving home healthcare and using telemonitoring that reported peak flow, symptoms, and medication adherence had fewer home visits and fewer hospitalizations (45). In a third study, telemonitoring that included nocturnal oxygen saturation

and pulse monitoring was associated with a reduction in COPD exacerbations (46). Finally, in the previously cited study by Koff and colleagues, the use of a telemonitoring device (the Health Buddy) was associated with positive outcomes across several areas (24).

Another application of ICT is the patient support portal, which is an interactive, web-based instruction program that can be used to provide self-management education. In a study by Lorig and colleagues, an in-person chronic disease self management program was adapted to an interactive web-based instruction program in which there were no face-to-face sessions (47). In this randomized trial of 958 patients, of whom 47% had lung disease, the intervention group had improvement in health status, with decreased health distress and dyspnea, although there were no differences in self-reported health behaviors or healthcare utilization. In another study, Nguyen and colleagues adapted a COPD dyspnea self-management program to the Internet that was provided to 16 patients (36). Similar to the study by Lorig and coworkers, the COPD Internet dyspnea program improved dyspnea and self efficacy for managing shortness of breath, but did not significantly improve self-reported exercise. These studies suggest that web-based self management programs may be useful for patients, although more information is necessary. Internet-based self management programs may be particularly useful when transportation to a healthcare facility is problematic.

ICT may also improve patient outcomes in COPD by facilitating exercise programs. A recent trial studied whether a cell phone-based home exercise program would improve exercise tolerance as measured with the incremental shuttle walk distance test (ISWT) (48). Patients in the intervention group had music software with an individualized tempo and a short questionnaire installed on their cell phone, and were asked to use this daily. Patients in the cell phone group significantly improved their ISWT performance after 8 weeks, as well as their quality of life scores as measured by the SF-12. These studies suggest that ICT can be used to improve patient adherence to health behaviors such as exercise.

Delivery System Design

Many healthcare systems (perhaps all) continue to be a loose array of physician groups, hospitals, and other healthcare professionals and organizations that often operate in isolation, providing care without the benefit of complete information. This process may succeed in meeting the episodic needs of those with acute illness, but fails those with the complex and ongoing needs associated with chronic disease.

Delivery system design includes the following concepts: (1) defining roles and distributing tasks among team members, (2) using planned interactions to support evidence-based care, (3) providing clinical case management services for complex patients, (4) ensuring regular follow-up by the care team, and (5) giving care that patients understand and that fits with their cultural background (49). The system should also be supported by local oversight such as a managed care network or local advisory body of stakeholders (i.e., patients, providers, commissioners, etc.). An approach to delivery system design is given below.

The Guided Care model (50) based on the chronic disease management model first described by Wagner, utilizes several elements of successful interventions (24). In Guided Care, a registered nurse works with two to five primary care physicians to meet the complex needs of 50 to 60 older adults with multimorbidity. At an initial home visit, the nurse performs a thorough assessment of the patient's medical, functional, cognitive, affective, psychosocial, nutritional, and environmental status.

This information is then entered into an electronic medical record, which is merged with evidence-based best practice recommendations. This creates a preliminary care guide that lists medical and behavioral plans for managing and monitoring each of the patient's chronic conditions. The nurse and primary care physician then personalize this preliminary care guide to align it with the unique circumstances, needs, and goals of the individual patient. The personalized guide is further refined after discussion with the patient, then it is distributed to all involved healthcare professionals as a concise summary of the patient's care plan. A patient-friendly version, called *My Action Plan*, written in lay language, is also created and given to the patient. The Guided Care model also includes access to a free local chronic disease management course delivered by trained lay people in coordination with the guided care nurse. Patients are monitored at least monthly by telephone to promptly detect and address problems. Motivational interviewing (51) is used to facilitate the patient's participation in care and adherence to the Action Plan. The guided care nurse also coordinates care among all health professionals and all healthcare sectors and facilitates access to community resources.

Decision Support

Decision support includes (1) embedding evidence-based clinical practice guidelines (CPG) into daily clinical practice, (2) sharing evidence-based guidelines and information with patients to encourage their participation, (3) using proven provider education methods, and (4) integrating specialist expertise and primary care (49).

The most important component of decision support is the CPG, but they have limitations in their current application. While disease-specific CPGs provide detailed guidance, they often fall short in patients with multiple morbidities such as most patients with COPD. Trying to implement several disease-specific CPGs can pose an onerous treatment burden and increase the risk of adverse drug events (52). The presence of co-existing diseases may increase or decrease the benefits of disease-specific interventions. In addition, CPG recommendations are based on varying levels of evidence and imply the application of sound clinical judgment and recognition of patient preferences, both of which are difficult to measure. CPGs also do not address health service delivery issues, whereas an integrated care pathway might. Therefore, defining quality of care simply by measuring adherence to CPGs rather than weighing the burden, risks, and benefits of that care is inappropriate.

These problems call for a change in our approach to CPG development (53). Current standards do not require guideline developers to address differences in treatment response, competing disease/treatment interactions in the complex patient, or prioritizing recommendations within a single disease, let alone among diseases. What is needed is a comprehensive set of recommendations to improve the relevance of CPGs to the multimorbid patient.

Community Resources

Community resources complement traditional medical care of the chronically ill patient and can reduce the burden and stress of illness. However, many patients with COPD are unaware of resources available in their community and should be encouraged to utilize them. An example might be a local COPD support group, such as a "Better Breathers' Club" or a senior center that provides exercise classes. Partnerships among healthcare systems and community organizations can be created to develop and support interventions that fill gaps in services. An example of such

a partnership is the American Thoracic Society Public Advisory Roundtable (PAR), a mutually beneficial partnership between a patient and a professional organization to advance shared goals (54). Community and professional organizations can also partner in advocating for policies that improve patient care.

EXAMPLES OF INTEGRATED CARE PROGRAMS FOR PATIENTS WITH COPD

The following section describes several integrated care programs that have been developed worldwide. Each one has a different focus and structure and all have had some measure of success. More importantly, each program provides the reader with novel approaches, valuable insights, and potential guidance in the development of an integrated care model for the patient with COPD.

The Draft National Strategy for COPD in England and the IMPRESS Program for Health Professionals

The National Health Service in the United Kingdom is publicly funded through general taxation and is a free service to patients at the point of need. Care is undertaken by general medical practitioners (GPs) and their staff in a primary care setting. Referrals to hospital-based specialists are made when the GP feels it is necessary or when the patient requires emergency treatment. Although there is a national "health" service, it has in effect operated as a national "illness" service by taking a responsive stance to chronic illness rather than providing comprehensive integrated care. Historically, COPD care has been unstructured, uneven, and largely reactive. Patients were seldom seen by a specialist, and hospital admission was the usual consequence of exacerbation.

England has now developed a draft comprehensive strategy for COPD that should result in dramatic improvements in the quality of care as well as a potential reduction in costs (55, 56). These proposed changes have come about through a government initiative that has already been applied to other chronic conditions and prioritizes care over a 10- to 15-year period. Coincident with this government initiative, the medical profession has become energized to change professional attitudes toward long-term conditions and develop new strategies for dealing with COPD.

The final draft document for this strategy was released early in 2010. Development of this document included the establishment of an expert reference group with clinician and patient representatives. A number of working parties addressed the issues around diagnosis, awareness and prevention, chronic care management, exacerbation management, and end-of-life care. The Strategy makes 22 clear recommendations for improved and integrated care. These recommendations include prevention and awareness, diagnosis, high-quality care, and support that includes self management, rehabilitation, exacerbation management, and care networks, as well as improved access to end-of-life services.

If adopted, this framework will be introduced gradually, but a regional network of clinicians has already begun to draw together the local networks that are envisaged to oversee the construction of high-quality local services. It is expected that stakeholders will form "communities of practice" to promote the highest standards of care. To assist with this task, the Department of Health has developed a number of guidance documents on spirometry (case finding and diagnostic), rehabilitation benchmarking, self management, assessment for oxygen, and acute noninvasive ventilation. Pilot projects are envisaged in the areas of oxygen assessment, admission avoidance, and accurate diagnosis, among others. It is expected that there will be clinical oversight of the commissioning process to ensure that services are integrated and coordinated.

Alongside this initiative, the British Thoracic Society and the Primary Care Respiratory Society set up a joint multi-professional committee called IMPRESS (IMProving and Integrating RESpiratory Services) (55). This committee, made up of primary and secondary care health professionals, has produced resources to assist clinicians in understanding integrated care and has also begun to set visible standards for services like rehabilitation so that high quality can be recognized. The IMPRESS initiative has already succeeded in changing attitudes of health professionals and catalyzing political initiatives and professional willingness to provide true integrated services within local communities. As a result of these changing attitudes, there have been several appointments of consultants in integrated respiratory care who work partly in hospitals and partly in the community. It is expected that these posts will expand.

CHRONIC: Emerging Healthcare Services in the Information Society

The objective of the CHRONIC project, which is supported by the European Union, is to provide effective and efficient healthcare services by developing a new model for the care of chronic patients based on the innovative application of an integrated and interactive information technology (IT) platform. The IT platform is a user-friendly, high-quality, personalized, single entry point to health-related content, information, and services. CHRONIC is accessible to specialized centers, rehabilitation providers, primary care providers, community resources, and patients, thereby facilitating communication and providing a seamless transition between healthcare sectors, providers, and patients (57).

The CHRONIC model has two key components: (1) the hospital side and (2) the patient side. The hospital side consists of a Care Management Center (CMC), which provides automated call answer and forwarding, bi-directional communications, and access to the patient's medical record. Interaction between the CMC personnel and the patient at home has an open design to allow access through a choice of technology platforms including Internet, direct videoconferencing, broadcast connectivity, and satellite television.

The patient side of the model is the "Home Hub." Its main function is to serve as a communication portal between the patient and healthcare personnel. Through the Home Hub, the user can attach any monitoring or communication device to the CHRONIC system from simple videoconferencing to advanced web communications, thus allowing the patient to adapt the system to his or her own unique needs and goals. The home hub also serves as receiving station for any monitoring devices in the home. CHRONIC provides affordable technological appliances and services that further enable patients to take a more active role in care.

The CMC and the Home Hub configure a personal health system that communicates with the rest of the health information infrastructure. The use of this personal health system makes it possible to gather information about the clinical condition of the patient, thus introducing an efficient alternative to conventional institutional care for chronic patients.

The CHRONIC project was a prominent component of the 2006 study by Casas and colleagues (22) discussed previously, which reported on the effectiveness of integrated care on subsequent hospitalizations in patients discharged following an exacerbation of COPD. Compared with standard care, this form of integrated care (which included the above-described IT platform) was able to reduce subsequent hospital admissions by about 50%. The patients given this integrated care intervention also scored better in multiple self management areas, including

TABLE 1. PRINCIPLES OF INTEGRATED CARE

Principles of Integrated Care:

- Care should meet the individual's needs with the right care at the right time and the right place
 - The specific form of integrated care will vary between countries and health economies
 - The healthcare delivery system should follow the principle of anticipatory care as described in the Chronic Care Model
 - Care should be planned and managed across the whole spectrum of disease from early detection to end of life
 - Integrated care involves coordinated care from the patient's perspective and integration of services from a provider/commissioner perspective
- Elements of integrated care for COPD
- Knowledge of the size of the problem in terms of true and expected prevalence and treatment variations by primary care and hospital practice
 - Country-wide ongoing education and skills training for primary care staff
 - Community provision of patient education, supported self management, and chronic care plans for the individual patient
 - A coordinated system for unscheduled care to include admission avoidance services
 - Streamlined hospital admission services where necessary (to include early discharge services and comprehensive discharge planning)
 - Oxygen therapy assessment and review services

COPD knowledge, exacerbation identification, exacerbation early treatment, and medication adherence (32).

CIRO+: A Center of Expertise for Chronic Organ Failure

CIRO+, a center of expertise for chronic organ failure in The Netherlands, integrates care around the pulmonary rehabilitation intervention. It is a process-based interdisciplinary program that focuses on the core components of intake/assessment, rehabilitation, outcome assessment, and aftercare (58, 59). It is anticipated that this process-based organization will lead to quality improvement in patient care as well as cost reductions.

All patients with COPD referred to CIRO+ by their chest physician undergo an extensive intake and 3-day assessment to put together an individualized interdisciplinary pulmonary rehabilitation program. The 3-day assessment includes the evaluation of physical functions, psychosocial functions, co-existing morbidities, and health status. All baseline test results, information about the program, patients' goals, and probable outcomes are discussed with each patient with COPD at the end of the assessment to increase the patient's understanding of his or her current health status and to increase the patient's responsibility in healthcare decision making (60).

Outpatient rehabilitation as well as inpatient programs are available at CIRO+. To increase access to interdisciplinary pulmonary rehabilitation for complex patients with COPD, CIRO+ shares its knowledge with six general hospitals in the southeastern part of The Netherlands. To make pulmonary rehabilitation available near patients' homes, CIRO+ provides fully tailored exercise training facilities in all participating hospitals. Moreover, CIRO+ allocates financial resources to reimburse the hospitals for dedicated interdisciplinary pulmonary rehabilitation teams.

After completion of the pulmonary rehabilitation program (at CIRO+ or in one of the hospitals of the network), all patients undergo an outcome assessment at CIRO+. Baseline test are repeated and the results are discussed with the patient. CIRO+ is committed to external transparency concerning the outcomes of pulmonary rehabilitation within its network. Therefore, all referring chest physicians as well as all general practitioners receive a detailed report on their patients with COPD who underwent rehabilitation at CIRO+ or within its pulmonary rehabilitation network.

Specialized centers such as CIRO+ can increase accessibility of important services such as pulmonary rehabilitation by sharing their expertise with general hospitals through decentralization, resource allocation, collaboration, and information sharing. This should improve patient outcomes and cost efficiency (61). Indeed, healthcare networks must create a virtuous

circle by combining experience, scale, learning, dedicated interdisciplinary teams, and fully tailored facilities to continuously improve the value delivered (62, 63).

Living Well With COPD

The Living Well with COPD program (64), developed at McGill University Health Center (MUHC) in Montreal, Canada, was developed and implemented as an essential component of the Chronic Care Model to achieve high-quality care for patients with COPD. This disease self-management program fosters productive interactions between informed patients who actively participate in their care and experienced providers, resulting in a broadly applicable, higher-quality, and possibly more cost-effective patient care environment.

The program has three essential components: (1) self-management education, (2) behavioral support, and (3) motivational strategies. Self efficacy, which is individuals' belief in their ability to execute necessary actions in response to specific situations, is a key aspect of this program.

This program is administered through weekly visits by trained health professionals ("case managers") over a 2-month period, with monthly telephone follow-up. The continuum of self-management training and support is flexible and can go from self-help approaches to more intensive case management. Case management, the cornerstone of the program, supports continuity, communication, and collaboration among the patient, physicians, and other healthcare providers.

The program includes seven skill-oriented, self-help patient workbook modules that detail COPD management in all facets of the disease (64). The hallmark of the program is the written action plan for acute exacerbations, which includes a symptom monitoring list as well as a contact list that is linked to appropriate therapeutic actions, including self-administration of medication prescriptions. In patients with moderate-to-severe COPD, this disease-specific self-management program with case supervision for 1 year has been shown to decrease hospital admissions, emergency department visits, and unscheduled physician visits as compared with patients on standard care over a 2-year period (31, 65).

The program has more recently expanded in the territory of Montreal as a partnership with primary care practices known as RECAP (Rehabilitation, Education for COPD and Added value to the medical Practice). The objective of the partnership is to implement a novel model of chronic care for the family physician that is supported by an interdisciplinary team. This model includes training the primary care provider, providing access to tertiary care, and creating a centralized registry with integration of an electronic medical reference system. Patients

TABLE 2. IMPORTANT AREAS FOR FUTURE STUDY

- Development of evidence-based clinical practice guidelines for the multi-morbid COPD patient
- Large randomized, controlled trials of integrated care programs compared with standard care
- Further development of information technologies to communicate seamlessly among providers, institutions and patients
- Expansion of community resources to support ongoing education, adherence to regular activity and exercise and social support

admitted to MUHC with COPD are seen prior to discharge to formulate the chronic care plan (discharge planning tool), which includes assessment of barriers to care and identification of selected focus areas that may include smoking cessation intervention, spirometry, optimal pharmacotherapy, self-management education, referral to pulmonary rehabilitation, and COPD follow-up in the community. Patients are then transitioned into the community with support provided to the primary care team. Utilizing resources within the community and maintaining support from the healthcare organization are key elements in this program.

SUMMARY AND CONCLUSIONS: WHERE DO WE GO FROM HERE?

A chronic, complex disease such as COPD requires an integrated approach to its management. There is general agreement that inadequate coordination between primary and specialist care and between community and hospital care may be one of the main reasons for the poor outcomes observed in patients with long-term progressive disease such as COPD (66). A growing body of health service research points to the design of care delivery, not to the specialty of the physician, as the main determinant of effective chronic illness management. Integrated care in this context refers to the global, patient-focused, and interdisciplinary delivery of high-quality care that addresses the disease, its systemic manifestations, and its comorbidities. It encompasses disease prevention, promotion of a healthy lifestyle, early disease recognition and enhanced case finding, optimization of pharmacologic and nonpharmacologic therapy with the help of evidence-based guidelines, self management education, and coordination of hospital and community services. The integrated care of the patient with COPD aims to improve processes and outcomes by making more efficient use of scant healthcare resources (67, 68). This will require a rethinking of traditional organizational boundaries.

Integrated care and the chronic disease model are overlapping concepts. In a systematic review, Adams and colleagues (16) evaluated the impact of applying the chronic care model to COPD management, and concluded that this approach resulted in fewer emergency department visits, hospital admissions, and hospital-days. These positive outcomes were only realized in those programs that included at least two of the following: advanced access to knowledgeable healthcare providers, self-management education and support including individualized action plans, guideline-based therapy, and a clinical registry system. The combination of interventions defining the optimal model of integrated care and yielding the best and most cost-effective outcomes has not been fully elucidated (69). In all likelihood, the optimal approach will vary, depending on local demographics, resources and needs. A summary can be seen in Table 1.

Comorbidity impacts significantly on COPD progression, healthcare utilization and mortality (6, 70). Therefore, it follows that integrated care programs must also address the problem of

the complex patient with COPD. Single disease guidelines are woefully inadequate in the patient with multiple comorbidities. Considerable effort must be devoted to making guidelines more relevant for these patients. More research is needed in this area to better support guideline development.

Fundamental shifts in the international organization of healthcare are already in progress to meet these challenges (71), reaching out to both the public and to general practitioners to stress the diverse presentations of COPD. The implementation of integrated care for the patient with COPD is in its infancy. More high-quality research is needed. A summary of important areas for future study can be seen in Table 2. This will only be possible through a multidisciplinary approach and meaningful partnerships. We have described several ongoing projects in this regard. As an enormous public health burden, COPD requires a coordinated effort and commitment from all stakeholders—patients, their families and loved ones, primary care clinicians, industry, and the pulmonary community—to manage it optimally. Achieving this goal will require fortitude, perseverance, and strong commitments from all the above. We must bring together the best and brightest minds with diverse backgrounds and talents to meet this challenge.

This Workshop Report was prepared by an *ad hoc* subcommittee of the Assembly on Pulmonary Rehabilitation.

Members of the Writing Committee:

LINDA NICI, M.D.
RICHARD ZUWALLACK, M.D.

Author Disclosure: L.N. reported she had no commercial interests or noncommercial, nongovernmental support relevant to subject matter. R.Z. reported serving on an advisory committee of Boehringer Ingelheim (\$1,000–\$9,999), receiving lecture fees from Boehringer Ingelheim (\$1,000–\$9,999), and receiving lecture fees paid to institution from GlaxoSmithKline (\$10,000–\$49,999).

Workshop Participants:

SANDRA G. ADAMS, M.D.
JEAN BOURBEAU, M.D.
CYNTHIA M. BOYD, M.D., M.P.H.
CLAUDIO F. DONNER, M.D.
VINCENT S. FAN, M.D., M.P.H.
ROGER S. GOLDSTEIN, M.D.
CARME HERNANDEZ, R.N.
SUZANNE C. LAREAU, R.N., M.S.
MICHAEL D. L. MORGAN, M.D.
JOSEP ROCA, M.D., PH.D.
SALLY J. SINGH, PH.D.
MARTIJN A. SPRUIT, PH.D.
JADWIGA A. WEDZICHA, M.D.
EMIEL F. M. WOUTERS, M.D., PH.D.

References

1. McGhan R, Radcliff T, Fish R, Sutherland ER, Welsh C. Predictors of rehospitalisation and death after a severe exacerbation of COPD. *Chest* 2007;132:1748–1755.
2. Rodriguez Roisin R, Vestbo J, chairs. Global strategy for diagnosis, management, and prevention of COPD (accessed December 2011). Available from: <http://www.goldcopd.com>
3. American Thoracic Society/European Respiratory Society task force. Standards for the diagnosis and management of patients with COPD [internet]. Version 1.2. New York: American Thoracic Society; 2004 [updated 2005 September 8]. Available from: <http://www.thoracic.org/go/copd>
4. Fabbri LM, Luppi F, Beghe B, Rabe KF. Complex chronic comorbidities of COPD. *Eur Respir J* 2008;31:204–212.
5. Watz H, Waschki B, Kirsten A, Muller KC, Kretschmar G, Meyer T, Holz O, Magnussen H. The metabolic syndrome in patients with chronic bronchitis and COPD. *Chest* 2009;136:1039–1046.
6. Sin DD, Anthonisen NR, Soriano JB, Agusti AG. Mortality in COPD: role of comorbidities. *Eur Respir J* 2006;28:1245–1257.

7. McGarvey LP, Matthias J, Anderson JA, Zvarich M, Wise R. Ascertainment of cause-specific mortality in COPD: operations of the TORCH Clinical Endpoint Committee. *Thorax* 2007;62:411–415.
8. Upshur REG, Tracy S. Chronicity and complexity: is what's good for the diseases always good for the patients? *Can Fam Physician* 2008;54:1655–1658.
9. Holman H, Lorig K. Patients as partners in managing chronic disease: partnership is a prerequisite for effective and efficient health care. *BMJ* 2000;320:526–527.
10. Simpson AC, Rucker GM. Advanced chronic obstructive pulmonary disease: rethinking models of care. *Q J Med* 2008;101:697–704.
11. World Health Organization. The world health report 1998. Life in the 21st century: a vision of all. Geneva: World Health Organization; 1998.
12. Mur-Veeman I, Hardy B, Steenbergen M, Wistow G. Development of integrated care in England and the Netherlands: management across public boundaries. *Health Policy* 2003;65:227–241.
13. Ouwens M, Wollersheim H, Hermens R, Hulscher M, Grol R. Integrated care programmes for chronically ill patients: a review of systemic reviews. *Int J Qual Health Care* 2005;17:141–146.
14. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA* 2002;288:1775–1779.
15. Nolte E, McKee M. Integration and chronic care: a review. In: Caring for people with chronic conditions. New York: European Observatory on Health Care Systems and Policies, Open University Press; 2008. pp. 64–89.
16. Adams SG, Smith PK, Allan PF, Anzueto A, Pugh JA, Cornell JE. Systematic review of the chronic care model in chronic obstructive pulmonary disease prevention and management. *Arch Intern Med* 2007;167:551–561.
17. Stange KC, Ferrer RL. The paradox of primary care. *Ann Fam Med* 2009;7:293–299.
18. Lanken PN, Terry PB, Delisser HM, Fahy BF, Hansen-Flaschen J, Heffner JE, Levy M, Mularski RA, Osborne ML, Prendergast TJ, et al. An official American Thoracic Society clinical policy statement: palliative care for patients with respiratory diseases and critical illnesses. *Am J Respir Crit Care Med* 2008;177:912–927.
19. Howard R, Sanders R, Lydall-Smith SM. The implementation of Restoring Health: a chronic disease model of care to decrease acute health care utilization. *Chron Respir Dis* 2008;5:133–141.
20. American Thoracic Society/European Respiratory Society. American Thoracic Society/European Respiratory Society statement on pulmonary rehabilitation. *Am J Respir Crit Care Med* 2006;173:1390–1413.
21. Bourbeau J, Julien M, Maltais F, Rouleau M, Beupre A, Begin R, Renzi P, Nault D, Borycki E, Schwartzman K, et al. Reduction of hospital utilization in patients with COPD. *Arch Intern Med* 2003;163:585–591.
22. Casas A, Troosters T, Garcia-Aymerich J, Roca J, Hernandez C, Alonso A, del Pozo F, de Toldeo P, Anto JM, Rodriguez-Roisin R, et al. Integrated care prevents hospitalizations for exacerbations in COPD patients. *Eur Respir J* 2006;28:123–130.
23. Garcia-Aymerich J, Hernandez C, Alonso A, Casas A, Rodriguez-Roisin R, Anto JM, Roca J. Effects of an integrated care intervention on risk factors of COPD readmission. *Respir Med* 2007;101:1462–1469.
24. Koff PB, Jones RH, Cashman JM, Voelkel NF, Vandivier RW. Proactive integrated care improves quality of life in patients with COPD. *Eur Respir J* 2009;33:1031–1038.
25. Rice KL, Dewan N, Bloomfield HE, Grill J, Schult TM, Nelson DB, Kumari S, Thomas M, Geist LJ, Beaner C, et al. Disease management program for chronic obstructive pulmonary disease: a randomized controlled trial. *Am J Respir Crit Care Med* 2010;182:890–896.
26. Bourbeau J, van der Palen J. Promoting effective self-management programmes to improve COPD. *Eur Respir J* 2009;33:461–463.
27. Bandura A. Social learning theory. Englewood Cliffs, NJ: Prentice Hall; 1977.
28. Bandura A. The assessment and predictive generality of self-percepts of efficacy. *J Behav Ther Exp Psychiatry* 1982;13:195–199.
29. Bourbeau J, Nault D, Dang-Tan T. Self-management and behaviour modification in COPD. *Patient Educ Couns* 2004;53:271–277.
30. Soler-Cataluña JJ, Martínez-García MA, Román S, Salcedo E, Navarro M, Ochando R. Severe acute exacerbations and mortality in patients with chronic obstructive pulmonary disease. *Thorax* 2005;60:925–931.
31. Wilkinson T, Donaldson G, Hurst J, Seemungal T, Wedzicha J. Early therapy improves outcomes of exacerbations of chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2004;169:1298–1303.
32. Bischoff EW, Hamd DH, Sedeno M, Benedetti A, Schermer TR, Bernard S, Maltais F, Bourbeau J. Effects of written action plan adherence on COPD exacerbation recovery. *Thorax* 2011;66:26–31.
33. Efang T, Monninkhof EEM, van der Valk PP, Zielhuis GGA, Walters EH, van der Palen JJ, Zwerink M. Self-management education for patients with chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2007;CD002990.
34. Marchibroda JM. The impact of health information technology on collaborative chronic care management. *J Manag Care Pharm* 2008;14(2, Suppl):S3–S11.
35. Young AS, Chaney E, Shoai R, Bonner L, Cohen AN, Doebbeling B, Dorr D, Goldstein MK, Kerr E, Nichol P, Perrin R. Information technology to support improved care for chronic illness. *J Gen Intern Med* 2007;22:425–430.
36. Nguyen H, Donesky-Cuenco D, Wolpin S, Reinke L, Benditt J, Paul S, Carrieri-Kohlman V. Randomized controlled trial of an internet-based versus face-to-face dyspnea self-management program for patients with chronic obstructive pulmonary disease: pilot study. *J Med Internet Res* 2008;10:e9.
37. Committee on Data Standards for Patient Safety Board on Health Care Services. Key capabilities of an electronic health record system. Washington, DC: Institute of Medicine: Committee on Data Standards for Patient Safety Board on Health Care Services; 2003.
38. Dorr D. Informatics systems to promote improved care for chronic illness: a literature review. *J Am Med Inform Assoc* 2007;14:156–163.
39. Green CJ, Fortin P, Maclure M, Macgregor A, Robinson S. Information system support as a critical success factor for chronic disease management: necessary but not sufficient. *Int J Med Inform* 2006;75:818–828.
40. Shea S, Weinstock R, Starren J. A randomized trial comparing telemedicine case management with usual care in older, ethnically diverse, medically underserved patients with diabetes mellitus. *J Am Med Inform Assoc* 2006;13:40–51.
41. Cleland JGF, Louis AA, Rigby AS. Noninvasive home telemonitoring for patients with heart failure at high risk of recurrent admission and death: the Trans-European Network-Home-Care Management System (TEN-HMS) study. *J Am Coll Cardiol* 2005;45:1654–1664.
42. Hersh WR, Hickam DH, Severance SM, Dana TL, Pyle Krages K, Helfand M. Diagnosis, access and outcomes: update of a systematic review of telemedicine services. *J Telemed Telecare* 2006;12:S3–S31.
43. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH. Collaborative management of chronic illness. *Ann Intern Med* 1997;127:1097–1102.
44. Finkelstein SM, Speedie SM, Potthoff S. Home telehealth improves clinical outcomes at lower cost for home healthcare. *Telemed J E Health* 2006;12:128–136.
45. Pare G, Sicotte C, St-Jules D, Gauthier R. Cost-minimization analysis of a telehomecare program for patients with chronic obstructive pulmonary disease. *Telemed J E Health* 2006;12:114–121.
46. Maiolo C, Mohamed EI, Fiorani CM, De Lorenzo A. Home telemonitoring for patients with severe respiratory illness: the Italian experience. *J Telemed Telecare* 2003;9:67–71.
47. Lorig KR, Ritter PL, Laurent DD, Plant K. Internet-based chronic disease self-management: a randomized trial. *Med Care* 2006;44:964–971.
48. Liu WT, Wang CH, Lin HC, Lin SM, Lee KY, Lo YL, Hung SH, Chang YM, Chung KF, Kuo HP. Efficacy of a cell phone-based exercise programme for COPD. *Eur Respir J* 2008;32:651–659.
49. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract* 1998;1:2–4.
50. Boyd CM, Boulton C, Shadmi E, Leff B, Brager R, Dunbar L, Wolff JL, Wegener S. Guided care for multimorbid older adults. *Gerontologist* 2007;47:697–704.
51. Bennett JA, Perrin NA, Hanson G, Bennett D, Gaynor W, Flaherty-Robb M, Joseph C, Butterworth S, Potempa K. Healthy aging demonstration project: nurse coaching for behavior change in older adults. *Res Nurs Health* 2005;28:187–197.
52. Boyd CM, Darer J, Boulton C, Fried LP, Boulton L, Wu AW. Clinical practice guidelines and quality of care for older patients with multiple comorbid diseases. *JAMA* 2005;294:716–724.

53. Schunemann HJ, Woodhead M, Anzueto A, Buist S, MacNee W, Rabe K, Heffner J. A vision statement on guideline development for respiratory disease: the example of COPD. *Lancet* 2009;373:774–779.
54. American Thoracic Society. Patient education and the ATS public advisory roundtable (accessed May 2011). Available from: <http://patients.thoracic.org/>
55. British Thoracic Society/The Primary Care Respiratory Society UK. Improving and Integrating Respiratory Services in the NHS (accessed March 2011). Available from: <http://www.impressresp.com/>.
56. Department of Health. Consultation on a strategy for services for chronic obstructive pulmonary disease (COPD) in England [accessed April 8, 2010]. Available from: http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_113279.pdf.
57. Roca J, Hernandez C, Alonso A. Home management of exacerbations of chronic obstructive pulmonary disease. In: Siafakas NM, Anthonisen NR, Georgopoulos D, editors. Acute exacerbations of chronic obstructive pulmonary disease. New York: Marcel Dekker; 2004. pp. 531–550.
58. Vera A, Kuntz L. Process-based organization design and hospital efficiency. *Health Care Manage Rev* 2007;32:55–65.
59. Spruit MA, Vanderhoven-Augustin I, Janssen PP, Wouters EF. Integration of pulmonary rehabilitation in COPD. *Lancet* 2008;371:12–13.
60. Grol R, de Maeseneer J, Whitfield M, Mookink H. Disease-centred versus patient-centred attitudes: comparison of general practitioners in Belgium, Britain and The Netherlands. *Fam Pract* 1990;7:100–103.
61. Green A, Ali B, Naeem A, Ross D. Resource allocation and budgetary mechanisms for decentralized health systems: experiences from Balochistan, Pakistan. *Bull World Health Organ* 2000;78:1024–1035.
62. Porter ME, Teisberg EO. Redefining health care: creating value-based competition on results. Boston: Harvard Business School Press; 2006.
63. Whitehouse FA. The utilization of human resources: a philosophic approach to rehabilitation. *Dis Chest* 1956;30:606–627.
64. The Montreal Chest Institute of McGill University/Respiratory Health Network of Quebec/Boehringer Ingelheim Canada. Living well with COPD (accessed December 2010). Available from: <http://livingwellwithCOPD.com>
65. Gadoury MA, Schwartzman K, Rouleau M, Maltais F, Julien M, Beaupre A, Renzi P, Begin R, Nault D, Bourbeau J. Self-management reduces both short-term and long-term hospitalization in COPD. *Eur Respir J* 2005;26:853–857.
66. Bodenheimer T. Coordinating care: a perilous journey through the healthcare system. *N Engl J Med* 2008;358:1064–1071.
67. Morgan M. Integrated respiratory care: what exactly do we mean? *Chron Respir Dis* 2008;5:131–132.
68. Seemungal TAR, Wedzicha JA. Integrated care: a new model for COPD management? *Eur Respir J* 2006;28:4–6.
69. Stuart M, Weinrich M. Integrated health system for chronic disease management; lessons learned from France. *Chest* 2004;125:695–703.
70. Simon-Tuval T, Scharf SM, Maimon N, Bernard-Scharf BJ, Reuveni H, Tarasiuk A. Determinants of elevated healthcare utilization in patients with COPD. *Respir Res* 2011;12:1–8.
71. Bolibar I, Plaza V, Llauger M, Amado E, Anton PA, Espinosa A, Dominguez L, Fraga M, Freixas M, de la Fuente JA, et al. Assessment of a primary and tertiary care integrated management model for COPD. *BMC Public Health* 2009;9:68.