

## An Official Research Policy Statement of the American Thoracic Society: Pay-for-Performance in Pulmonary, Critical Care, and Sleep Medicine

Jeremy M. Kahn, Damon C. Scales, David H. Au, Shannon S. Carson, J. Randall Curtis, R. Adams Dudley Theodore J. Iwashyna, Jerry A. Krishnan, Janet R. Maurer, Richard Mularski, John Popovich, Jr., Gordon D. Rubenfeld, and John E. Heffner, on behalf of the American Thoracic Society pay-for-performance working group

**1** THIS OFFICIAL STATEMENT OF THE AMERICAN THORACIC SOCIETY (ATS) WAS APPROVED BY THE ATS BOARD OF DIRECTORS, ■■■.

**3** *Rationale:* Pay-for-performance is a model for health care financing that seeks to link reimbursement to quality. The American Thoracic Society and its members have a significant stake in the development of pay-for-performance programs.

*Objectives:* To develop an official ATS policy statement addressing the role of pay-for-performance in pulmonary, critical care and sleep medicine.

*Methods:* The statement was developed by the ATS Health Policy Committee using an iterative consensus process including an expert workshop and review by ATS committees and assemblies.

*Measurements and Main Results:* Pay-for-performance is increasingly utilized by health care purchasers including the United States government. Published studies generally show that programs result in small but measurable gains in quality, although the data are heterogeneous. Pay-for-performance may result in several negative consequences, including the potential to increase costs, worsen health outcomes, and widen health disparities, among others. Future research should be directed at developing reliable and valid performance measures, increasing the efficacy of pay-for-performance programs, minimizing negative unintended consequences, and examining issues of costs and cost-effectiveness. The ATS and its members can play a key role in the design and evaluation of these programs by advancing the science of performance measurement, regularly developing quality metrics alongside clinical practice guidelines, and working with payors to make performance improvement a routine part of clinical practice.

*Conclusions:* Pay-for-performance programs will expand in the coming years. Pulmonary, critical care and sleep practitioners can use these programs as an opportunity to partner with purchasers to improve health care quality.

**4** *Keywords:* quality indicators; quality assurance; health insurance reimbursement; incentives; Medicare; health care disparities

### CONTENTS

Introduction  
Methods

**2** (Received in original form March 24, 2009; accepted in final form ■■■)

The views expressed in the manuscript are those of the authors and do not necessarily reflect those of the Department of Veterans Affairs.

Correspondence and requests for reprints should be addressed to Jeremy M. Kahn, M.D., M.S., Assistant Professor of Medicine, Division of Pulmonary, Allergy and Critical Care, University of Pennsylvania School of Medicine, 723 Blockley Hall, 423 Guardian Drive, Philadelphia, PA 19104. E-mail: jmkahn@mail.med.upenn.edu

Am J Respir Crit Care Med Vol 181, pp 1–9, 2010  
DOI: 10.1164/rccm.200903-0450ST  
Internet address: www.atsjournals.org

Review of pay-for-performance

Financial incentives in health care

The structure of pay-for-performance programs

Does pay-for-performance work?

Unintended consequences of pay-for-performance

Clinician perspectives on pay-for-performance

Program costs and cost-effectiveness

Special issues in pulmonary, critical care and sleep medicine

Impact to public health

Evolving evidence base

Team-based care

Areas for future research

Recommendations

Considerable evidence suggests that health care professionals and organizations frequently do not adhere to best clinical practices (1). In response, strategies are needed to speed translation of research into daily practice and improve health care quality. Pay-for-performance (P4P) is a method for improving health care quality through financial incentives (2). In the United States over 100 private health plans have adopted performance-based reimbursement programs, and the Centers for Medicare and Medicaid Services (CMS) has incorporated P4P programs into Medicare (3). Many other countries are using or experimenting with P4P for hospital and physician reimbursement, including the United Kingdom, Canada, and Australia (4–6).

The goal of P4P is to stimulate quality improvement, reward high-quality providers, and overcome limitations of existing health care reimbursement schemes that provide financial incentives only for the volume and complexity of care (7). Yet concerns have been raised about the effectiveness, costs, and unintended consequences of performance reporting and P4P, including the potential to widen health care disparities and actually reduce quality of care in some areas (8, 9). These issues will grow in importance as governments and third-party payors expand P4P programs in the coming years.

The American Thoracic Society (ATS) is a leading international specialty organization representing clinicians, researchers, and other health care professionals in pulmonary, critical care, and sleep medicine. A primary goal of the ATS is to improve the quality of care for patients with respiratory and related diseases, and the Society has worked toward the development and implementation of clinical practice guidelines to translate best clinical evidence into improved patient care. Consequently the ATS and its members have a significant stake in the development of P4P programs. In 2008, the ATS Health Policy Committee initiated a process to comprehensively

examine P4P in the context of pulmonary, critical care, and sleep medicine. The goals were to synthesize the evidence regarding P4P, identify issues unique to respiratory medicine, highlight areas for future research, and develop a framework for the ATS to contribute to reimbursement-based quality improvement programs. This document represents the official position of the ATS on P4P and is intended as a guide for clinicians, administrators, researchers, and policy makers.

## METHODS

The policy statement was developed using an iterative consensus process. We first formed an *ad hoc* subcommittee of the Health Policy Committee composed of experts in pulmonary, critical care, and sleep medicine, hospital and outpatient practice administration, health care quality measurement, health economics, and health services research (see list at end of document). We sought input and representation from related ATS committees and assemblies, including the Clinical Practice Committee, the Documents Development and Implementation Committee, the Behavioral Science Assembly, the Nursing Assembly, the Clinical Problems Assembly, and the Quality Improvement Taskforce.

To develop a conceptual and practical foundation for the policy statement, the subcommittee convened a one-day workshop, held in Toronto, Canada on May 17, 2008. Workshop participants included the subcommittee members and national experts in pay-for-performance, public reporting, and quality improvement. Before the workshop, we searched the English-language literature using Medline and Google Scholar search engines with the search terms “pay-for-performance” and “value-based-purchasing”. A summary and bibliography of the relevant literature was circulated to the workshop participants.

The workshop consisted of presentations by content experts followed by breakout discussion sessions focused on three distinct topics: P4P programs in pulmonary and sleep medicine, P4P programs in critical care medicine, and the role of the ATS in developing health policy related to P4P. A writing committee drafted the policy statement based on a workshop executive summary. The draft was then circulated to members of the subcommittee and to each of the sponsoring ATS committees and assemblies in an iterative consensus process, with revisions at each step. The policy statement was further modified based upon feedback from the ATS Documents Editor, the ATS Executive Committee, and anonymous peer reviewers. The final document was approved by the ATS Board of Directors as an Official ATS Document.

## REVIEW OF PAY-FOR-PERFORMANCE

### Financial Incentives in Health Care

Financial incentives in health care are ubiquitous and unavoidable. Most health care systems provide financial incentives to clinicians for providing care based on the patient's diagnoses, the complexity of work or time required to render the service, or the procedures performed. These incentives may be either based on individual episodes of care (as in fee-for-service) or for all care for a patient for a specified period of time (as in capitation) (10). P4P is an alternative and complementary approach that adds explicit financial incentives for perceived quality.

The financial incentives in P4P are designed to serve two major purposes. First, the incentives create an economic stimulus for quality improvement and adoption of evidence-based practices (11). Financial incentives represent one of multiple approaches to change provider practice behavior (12). Second, P4P seeks to correct the negative consequences of reimbursement schemes that link payments to volume or complexity of services rather than quality. Higher expenditures under traditional reimbursement systems do not necessarily generate better health outcomes (13, 14). P4P reflects interests of health care purchasers and the public to reimburse services contingent on the quality of care (15).

P4P programs can also reduce financial disincentives to providing high-quality care. Hospitals under a fee-for-service

model receive increased reimbursement when patients experience a complication or medical error, a strategy that does not provide incentives to eliminate errors. In turn, Medicare and many private health plans have implemented nonpayment rules for conditions they deem avoidable when evidence-based practices are followed (i.e., “never events”) (16). Primary care providers currently receive inadequate reimbursement for outpatient management of complex patients with multiple chronic conditions (17). Proposals for the advanced patient-centered home provide increased reimbursement for physicians with practices that incorporate comprehensive systems of care and demonstrate improved outcomes for complex patients (18).

### The Structure of Pay-for-Performance Programs

P4P models can take on many forms (Table 1) (19). Programs can be *reward-based*, in which providers receive bonus payments for meeting performance standards, or *penalty-based*, in which payments are reduced or withheld for low performers. P4P can also be based on *absolute performance*, such as when payments are made for meeting pre-defined goals, or *relative performance*, where quality is compared between similar providers and payments made to the highest performers, or when payments are made for improving over baseline. Programs can also vary according to the targeted level of health care—individual physicians, physician groups, hospitals, health systems, or combinations of the above (20). The level selected depends on practicalities of reimbursement and of the nature of the quality issue under review. Programs typically target the provider level that has the most direct influence over the quality measure within the constraints of the existing payment structures.

The quality measures used to determine reimbursement are distinct from the reimbursement component of P4P. Quality is not an overt attribute of health care but an underlying concept that is difficult to measure directly (21). Existing performance indicators typically measure either the process or outcome of care based on the idea that these domains reflect a single underlying construct (22). Some quality measures, however, lack reliability or have weak linkages to patient-centered outcomes (23–25). Frequently, performance is inconsistent across different domains of quality, such as when improvements in the process of care may not be associated with improvements in outcome (26, 27). This problem may result from unreliable measures, but may also reflect inherent limitations in the conceptualization of “quality” as a single, uniform, and measurable construct, particularly across diverse domains of a clinician's or organization's practice. P4P programs need to account for inherent difficulties in measuring quality of care, which remain poorly understood with varying typologies.

Measures of cost of care per episode, referred to as “efficiency measures,” represent another category of indicators used by P4P programs. Since these cost estimates often do not incorporate outcomes of care, they do not actually measure efficiency, which should measure cost to produce a specified level of quality (28). For example, labeling a pulmonologist as more or less efficient based on cost per episode in managing asthma exacerbations is misleading. The efficiency measure should incorporate the value of care in terms of time until return to work, time to any future exacerbations, and other quality measures. Unfortunately, most “efficiency” measures used in P4P take the purchasers' perspective of cost per episode of illness without incorporating patient or society perspectives of quality outcomes (29).

P4P programs are increasingly incorporating penalty-based reimbursement elements that limit or deny payment for potentially preventable hospital-acquired complications (30). These programs appeal to purchasers and patients, since they offer

**TABLE 1. KEY CHARACTERISTICS OF PAY-FOR-PERFORMANCE PROGRAMS**

Characteristic	Description
Incentive structure	
Reward-based	Bonus payments for providers meeting performance goals
Penalty-based	Withholding reimbursement if performance goals are not met
Benchmarking structure	
Absolute performance	Incentives are provided when performance exceeds a set threshold
Relative performance	Incentives are provided when performance is high compared to other providers or when performance improves relative to past performance
Quality measure structure	
Process-based	Performance is measured based on delivery of evidence-based care practices
Structure-based	Performance is measured based on implementation of evidence-based health care structures
Outcome-based	Performance is measured based on the health care outcomes such as complication rates, survival, or value

opportunities to minimize preventable complications and preclude providers from financially benefiting if such complications occur. Many providers question the appropriateness of programs that deny reimbursement for complications that may not be entirely preventable, such as patient falls, ventilator-associated pneumonia, and venous thromboembolism (31, 32). Although reducing complications and medical errors represents a laudable goal, clinicians are unlikely to support never-event reimbursement programs if the elimination of such is beyond the clinician's control.

Opportunities exist to strengthen the process for performance measure development. Currently most quality measures are endorsed by nonprofit quality improvement organizations such as the National Quality Forum or the National Committee for Quality Assurance (33). These organizations use a multi-stakeholder consensus process informed by expert opinion and existing clinical practice guidelines. Yet this process runs the risk of basing performance measures on poorly developed guidelines, especially when the guideline process is not transparent, or when guideline recommendations do not account for resource utilization or variation in patient values (34). Newer guideline development strategies, such as the GRADE approach that rates both the quality of evidence and the strength of the recommendation, can improve performance measure development by linking measures to the evidence base that supports the recommended care (35). However, even strong recommendations from well-developed guidelines must still be reliable, actionable, and relevant to both patients and policy makers to serve as quality measures.

### Does Pay-for-Performance Work?

Research evaluating the impact of P4P on the quality of health care is heterogeneous, making broad conclusions difficult (7). Most published studies suggest that P4P programs result in modest improvements in the quality of care, although the quality of the evidence varies (36). In Table 2 we highlight several notable programs relevant to pulmonary, critical care, and sleep medicine, including some that have resulted in measurable quality gains and others that failed to impact quality (37–40). These and other studies show wide variation in the structure of P4P programs, and no general answer about which type of program (i.e., reward or penalty based, absolute, or relative

performance) is most effective (2). A majority of the studies examining P4P at the physician level showed some positive effect on quality measures (41–46). Typically groups with the lowest baseline performance improved the most (6, 37, 46, 47). Not all data show a benefit from P4P, and some high-profile programs have been ineffective at improving outcomes (38).

There are also few data to suggest the amount of financial incentive that is necessary to stimulate quality improvement. More money likely motivates greater behavior change, and, although no study has directly compared two amounts, existing negative studies have typically involved smaller bonus payments than positive studies (36). A qualitative study of health maintenance organization managers' opinions suggested that payments equal to 5% of capitated income would be necessary to meaningfully impact care (48). Only about one half of existing programs in commercial HMOs use incentives above that amount (15). There may also be a threshold above which financial incentives are more likely to have negative or unintended consequences, but this issue has not been examined empirically. Moreover, no data exist to determine if P4P is more effective when new money is added for incentives to reimbursement programs (as occurred in the UK family medicine experience [39]) or existing money is redistributed (as planned by CMS in the United States [49]).

The lack of robust effectiveness data for P4P frustrates many providers, as payors are increasingly implementing these programs without convincing evidence. Yet purchasers' enthusiasm for P4P programs is understandable, considering public interests for improving quality, greater expectations for accountability of healthcare providers, and the unsustainable growth of healthcare expenditures with evidence of waste. Proponents of P4P have made a powerful appeal to policy makers and health care administrators based on the common sense notion that applying the "plan-do-study-act" of quality improvement to payment reform is more tenable than maintaining a flawed status quo.

### Unintended Consequences of Pay-for-Performance

There are several ways in which P4P programs could fail to improve quality or even decrease the quality of care through unintended consequences (Table 3). P4P may distract providers from directing appropriate attention to other areas of care that are not measurable or are not tied to bonus payments, yet make important contributions to outcomes (50). These concerns are especially salient in complex patients with multiple medical problems. Focusing on one condition may adversely affect the treatment and prognosis of other conditions that are equally important. P4P programs based on absolute performance might simply reward already high performers without increasing performance among low performers (47). P4P might also only improve the quality and quantity of documentation rather than the quality of care (40). P4P might also encourage misuse of unnecessary therapies. For example, if a hospital is benchmarked on the proportion of patients with pneumonia given antibiotics within a certain time period, providers might be motivated to give antibiotics for patients who do not need them (51, 52). Finally, providers may increase patient injury by overmanaging one aspect of care, such as fall prevention restraints, while limiting other aspects of quality care, such as efforts to increase mobility (32).

Another concern is that financial incentives for quality may result in widening of health care disparities based on sex, race, ethnicity, language, or economic status (53). For example, P4P could encourage "patient dumping," where providers exclude high-risk or socially challenging patients from their practices, or "cream skimming," where providers intentionally seek patients

**TABLE 2. SELECTED EXAMPLES OF PAY-FOR-PERFORMANCE PROGRAMS RELEVANT TO PRACTITIONERS OF PULMONARY, CRITICAL CARE, AND SLEEP MEDICINE**

Citation	Setting	Provider Level	Clinical Domain	Study Design	Quality Domain	Source of Quality Metrics	Program Structure	Results	Lessons
Lindenauer, 2007 (37)	United States, 2003–2005	Hospital	Patients admitted with acute myocardial infarction, heart failure or pneumonia	Observational	Process	Payor and hospital stakeholder collaboration	Reward-based, relative performance: hospitals in top decile or second decile of performance each year received 2% or 1% bonus payments, respectively. All hospitals concurrently participated in a public-reporting initiative.	Performance on 13 standardized process measures increased in hospitals participating in the P4P program compared to control hospitals. Hospitals with the lowest baseline performance improved the most.	P4P offers small improvements over public reporting of quality information alone.
Glickman, 2007 (38)	United States, 2003–2006	Hospital	Patients admitted with acute myocardial infarction	Observational	Process	Payor and hospital stakeholder collaboration, clinical practice guideline	Reward-based, relative performance: hospitals in top decile or second decile of performance for a given year received 2% or 1% bonus payments, respectively. All hospitals concurrently participated in an internal quality improvement registry.	Quality increased over time in all hospitals. There were no differences in performance scores over time between hospitals participating in the P4P program and control hospitals, including scores for care tied to bonus payments and care not tied to bonus payments.	P4P did not impact measured care in the setting of a large internal quality improvement initiative, but neither was care not subject to incentives adversely affected.
Doran, 2006 (39)	UK, 2004–2005	Physician group	Outpatients within 10 clinical domains, including asthma and COPD	Observational	Process	Payor with stakeholder input	Reward-based, absolute performance: physician groups awarded bonus payments based on the proportion of eligible patients receiving selected practices.	Performance was excellent across a range of performance metrics in the P4P hospitals, although a number of practices appeared to achieve high performance by classifying large numbers of patients as ineligible.	Providers can appear to increase their performance through “exception reporting,” which may increase health disparities in some settings.
Roski, 2003 (40)	United States, 1999–2003	Physician group	Outpatient smokers	Cluster RCT	Process and outcome	Clinical practice guideline	Reward-based, absolute performance: physician groups awarded bonus payments based on predetermined proportion of eligible patients receiving selected care practices.	Patients seen in the practices in the P4P practices were more likely to receive smoking assessment and smoking cessation therapy but were no more likely to quit smoking compared to patients in control practices	Despite drawing quality metrics from evidence-based guidelines, improving care process did not affect outcomes. This experience may represent a limitation of the guideline development process.

*Definition of abbreviations:* COPD = chronic obstructive pulmonary disease; P4P = pay-for-performance; RCT = randomized controlled trial.

who are likely to result in good performance reviews (54). Although instances of dumping or cream skimming have seldom been documented in existing P4P programs, patient profiling has occurred in at least one major public reporting initiative (55). P4P programs might also disadvantage health care providers who treat poor and underserved patients, since these patients may be at higher risk for bad outcomes and their providers might not have the resources to invest in quality improvement (56).

Several strategies have been proposed to minimize adverse consequences of P4P (57). Validated measures that tap the full range of quality care are essential. Basing performance measures on methodologically sound clinical practice guidelines will promote confidence that measured aspects of care assess important patient-centered processes and outcomes. Using performance measurement sets that include a large number of quality indicators and rotating indicators might prevent providers from focusing on only a few aspects of care at the

expense of others. To avoid simply rewarding already high performers without actually stimulating quality improvement, programs could provide incentives for relative increases in quality and achieving “bands” of quality relative to peers (58). To limit patient profiling, programs could pay more for achieving the same level of quality in highly challenging patients, such as patients with multiple comorbidities. Programs could also specifically target underserved groups in P4P initiatives, such as by singling out at-risk populations, emphasizing conditions of high prevalence in minorities, or providing specific financial rewards for providers that take on high-risk and underserved patients.

#### Clinician Perspectives on Pay-for-Performance

The notion that reimbursement should be tied to value in health care is natural and intuitive, and in general physicians have expressed support for P4P as a conceptual model of healthcare reimbursement. In a 2005 survey of general in-



**12** **TABLE 3. POTENTIAL UNINTENDED CONSEQUENCES OF PAY-FOR-PERFORMANCE**

Consequences in which P4P might not improve quality
Only rewarding already high performers without improving performance
Improving the quality of documentation without improving the quality of care
Increasing use of unnecessary therapies
Encouraging inappropriate exclusions of high-risk patients or inclusions of low-risk patients
Consequences in which P4P might worsen quality
Improving measured care at the expense of unmeasured care
Widening health care disparities

*Definition of abbreviation: P4P = pay-for-performance.*

ternists, about three quarters of respondents agreed with the concept of financial incentives for quality if the measures are accurate (59). However, only about one third of respondents felt that existing measures were accurate enough for widespread use. Over 80% feared that routine quality measurement would lead physicians to avoid high-risk patients. In other surveys, financial incentives that specifically reward cost minimization rather than quality, as in the case of managed care, are less supported by physicians (60). Although current incentives in the United States are typically small, physician groups report that they are increasingly reliant on the income from P4P (61).

#### Program Costs and Cost-effectiveness

Health care costs are rapidly increasing, making the overall cost of P4P an important consideration when evaluating these programs. The costs of P4P can be examined from several perspectives. From the provider's perspective, the costs associated with the staff and technology necessary to abstract quality data from medical charts are high. Existing studies have not routinely assessed the costs of quality improvement. Programs will likely not be successful if the costs exceed the rewards, as providers may be less likely to implement changes in care that are inadequately reimbursed relative to their costs. Demonstration projects suggest that routine quality measurement is less costly to implement in larger physician groups with electronic medical records (62). Smaller hospitals, small provider groups, and physicians in single-provider practices may find it more difficult to institute these programs. If participation in P4P programs requires large investment in information technology infrastructure, resource-poor providers may be at a significant disadvantage.

From the payor perspective, the costs associated with P4P include the costs of administering the program and the financial rewards themselves. These payouts can be unexpectedly large, as was the case with the introduction of P4P in the United Kingdom (4). An important consideration for payors is whether or not P4P programs can be implemented without new money entering the system. In theory P4P could be cost neutral for payors if they obtain the money for incentives from either lower reimbursements to poor performers or savings from increased efficiency. However, implementing such programs will involve costs, even for penalty-based programs.

From the societal perspective, P4P could improve quality while decreasing overall health care costs by increasing efficiency (63). There is some evidence that P4P programs can be designed to decrease overuse of unnecessary medical services (64). Yet for P4P to produce measurable gains in quality, it likely will require significant capital investment. Rarely are health care innovations more effective and less costly than the alternative, and P4P is no exception. Currently there are no published

systematic evaluations of the cost effectiveness of P4P to inform whether or not gains in quality justify the added expense.

#### SPECIAL ISSUES RELATING TO PULMONARY, CRITICAL CARE, AND SLEEP MEDICINE

The evolution of P4P programs is likely to affect all practicing clinicians. Whether or not practitioners of pulmonary, critical care, and sleep medicine are uniquely affected by P4P is uncertain. However, several issues related to P4P programs are of particular importance to the membership of the American Thoracic Society, including the impact of respiratory disease on public health, the evolving evidence base within ATS specialties, and the team-based nature of pulmonary, critical care, and sleep medicine

##### Impact on Public Health

The ATS can play a key role in informing the design and implementation of P4P programs that target clinical problems with high impact on overall public health. Pulmonary disease, critical illness syndromes, and sleep disorders are common, associated with high morbidity, and costly, making them of particular interest to payors and policy makers. Examples are numerous. Chronic obstructive pulmonary disease (COPD) affects 10 to 24 million Americans at direct costs of over \$60 to \$120 billion per year (65). Worldwide, COPD is the fourth leading cause of death and is expected to increase over the next decade (66). An estimated four to seven million intensive care unit (ICU) admissions occur annually in the United States, and overall nearly one in five Americans will die in an ICU (67, 68). Critical care represents approximately 15% of all hospital costs, and in the United States the total cost of critical care services approaches 1% of the gross national product (69, 70). Up to 5% of adults in industrialized countries have obstructive sleep apnea, resulting in significant preventable morbidity and mortality (71).

The high cost of these diseases, both in lives and in dollars, means that patients with lung disease, critical illness, and sleep disorders are of significant importance to health care payors and policy makers. As P4P programs expand they will target diseases with the highest costs and highest potential for impact (72). Respiratory, critical illness, and sleep-related diseases are and will continue to be a high priority.

##### Evolving Evidence Base

Compared with some other specialties, such as cardiology, relatively few therapies are definitively proven to reduce mortality and improve health-related quality of life in pulmonary, sleep, and critical care. This creates a tension between the desire to provide financial incentives for quality and a paucity of care practices that have been definitively shown to improve clinically important outcomes. Moreover, there is surprisingly little published data about the validity of performance measures for pulmonary, critical care, and sleep disorders, including the sensitivity and specificity of identifying the appropriate patients and use of quality of care indicators in these patient populations. These issues are particularly problematic because many conditions in our field are syndromes rather than specific diseases, and as such are difficult to reliably diagnose. Even when high-quality evidence exists, it may be impossible to reliably identify the eligible population in a way that results in a useful quality measure. For example, several evidence-based practices are known to reduce the incidence of ventilator-associated pneumonia (VAP), yet difficulties in diagnosis create a significant challenge to the use of VAP as a quality measure

for P4P (73, 74). The ATS can contribute to the design, evaluation, and implementation of P4P programs by ensuring that reliable and valid quality measures are used (75). Systematic and transparent development of ATS clinical practice guidelines can lead to creation of appropriate performance measures based on treatment recommendations. Extension of the GRADE guideline development approach to performance measure development is one such strategy. Just as GRADE makes explicit the strength of clinical practice recommendations, performance measurement developers can explicitly rate the strength of individual quality metrics based on both the underlying evidence, costs, and value to patients (76). This approach will facilitate creation of quality metrics that are important to patients and purchasers even in the absence of randomized controlled trials.

### Team-based Care

A great deal of health care is provided by multidisciplinary teams rather than single providers. Multidisciplinary care is particularly important in respiratory disease and critical illness, which frequently span multiple organ systems and require a holistic approach. For example, outcomes in cystic fibrosis are improved when care is provided by a multidisciplinary team including physicians, advanced-practice nurses, nutritionists, and respiratory therapists (77). In the ICU, team-based care is associated with shorter length of stay, fewer adverse events, and improved survival (78–81). The need for multidisciplinary care creates an important challenge to P4P programs. The structure of health care reimbursement necessitates that P4P programs reward care through established payment systems to hospitals and physicians, potentially neglecting the role of other care providers. In addition, it is difficult to attribute health care to a specific provider when multiple physicians are involved (82). Even attributing care to a single hospital can be difficult in the ICU, in which interhospital transfers are common (83), and ICU telemedicine is increasingly used to provide critical care in multiple hospitals across large distances (84). As P4P programs evolve it will be necessary to develop innovative ways to reward all essential members of the health care team.

### AREAS FOR FUTURE RESEARCH

Ongoing evaluation is essential as P4P programs develop. The first main area for research is program efficacy. Although use of P4P is rapidly expanding, limited data exist demonstrating the effect of these programs on multidimensional quality of care, or on how programs should be structured to maximize the quality benefits while minimizing unintended consequences. Specifically, research is needed comparing reward-based versus penalty-based programs, and programs that reward absolute performance, relative performance, or a combination of the two. Other key unknowns include the optimal way to target quality improvement at multiple levels in the health care system, the overall cost-effectiveness of these programs, and the role of health information technology in implementing P4P. Such research should complement the research agenda surrounding general implementation of evidence-based practice.

A second key area for research is to develop and improve quality measures. Reliable and valid measures of performance are essential to a fair and successful P4P system. A greater understanding of what constitutes health care quality, improved methods to measure performance and identify patients for quality improvement, and knowledge about effective use of information technology will increase the impact of P4P. Innovative methods to grade performance measures will aid policy makers in designing P4P programs that are most likely

to improve health outcomes and minimize health care disparities and costs. Professional societies such as the ATS will play a key role in both developing and implementing clinical practice guidelines and should participate in the development and testing of performance measures. Research into more effective guideline development and implementation strategies is needed, and the ATS has been a leader in this area (35). In the future, specific performance measures will become essential components of guideline documents, allowing policy makers to derive performance measures from a guideline's list of strong recommendations.

A third area for research is patient perceptions of P4P. Patients and their advocates may have strong opinions about which providers to target, how incentives should be structured, and the effects of P4P on the doctor–patient relationship. The success of some public reporting programs and the public fascination with quality reporting demonstrate that patients care deeply about health care quality and value, yet data regarding how patients would like to see P4P implemented are at this time absent. For P4P and other health care reform efforts to succeed, a comprehensive, patient-centered strategy is needed. For complex patients, clinical practice guidelines and performance measures need to consider the use of patient-centered (rather than only disease-specific) approaches to improve care.

Despite these knowledge gaps, P4P programs are certain to become more common over the coming years. Although existing programs are imperfect, payors and policy makers are not waiting for better quality measures or more effective and validated programs before expanding their efforts. Payors, regulatory agencies and patients are demanding greater accountability in health care and view P4P as a tool toward that end. An important strategy for ATS membership is to study these programs in conjunction with, as well as before, their implementation. Each new program should provide an opportunity to study the impact of P4P on quality and efficiency in health care, and therefore help payors design these programs to have maximal impact with minimal unintended negative effects. The ATS should become actively involved in developing these research agendas to ensure that proposed P4P programs will be relevant to ATS membership and their patients.

### RECOMMENDATIONS

#### Health Policy Recommendations

1. The American Thoracic Society supports efforts to link reimbursement to the quality of health care. Pay-for-performance is an opportunity to align payor and provider incentives and improve the structure, process, and outcome of health care for patients with lung disease, sleep disorders, and critical illness.
2. The primary goals of pay-for-performance should be to improve health outcomes, reduce disparities, decrease waste, and expand access to high-quality health care. Cost reduction from the payor's perspective is an appropriate secondary goal, but efforts must be taken to ensure that programs designed purely to minimize costs do not adversely impact quality of care or have other unintended negative consequences. P4P programs designed improve efficiency should use measures that incorporate cost relative to a specified level of quality to be achieved.
3. Pay-for-performance programs should use quality measures that are valid, reliable, relevant to practice, and based on the best available evidence. Process measures, when used, should be strongly linked to important and

preventable outcomes. To accomplish these goals, it is essential that ATS members, including clinicians, behavioral scientists, and health services researchers, be involved in developing and evaluating performance measures that will be used for quality reporting and pay-for-performance.

4. Clinical guidelines and statements from the ATS should include recommendations for quality performance metrics that could be used in pay-for-performance programs. Alternatively, guidelines and statements should explicitly defend why such metrics are scientifically or practically infeasible. The ATS will work through its Documents Development and Implementation and Quality Improvement Committees to integrate the GRADE guideline development process with performance measurement development. Likewise, those who develop and endorse quality measures should refer to the GRADE score to alert physicians as to the strength of the underlying guideline recommendation upon which the measure is based.
5. Not all health care complications and adverse events are preventable, particularly in acute and complex syndromes that characterize pulmonary and critical care. P4P programs that seek to restrict reimbursement for health-care-acquired complications should recognize that zero occurrences may not be obtainable, and there may be some conditions that cannot be defined with adequate precision to be used as a “no-pay” condition. Evidence-based exceptions to specific quality measures and rational thresholds should be included in incentive programs, particularly those involving penalties rather than rewards.
6. Pay-for-performance programs must not widen health care disparities or adversely impact vulnerable patient groups. To prevent these unintended consequences, programs should stratify performance measures by high-risk group, specifically targeting underserved and at-risk populations, and provide financial rewards for clinicians that provide care to high-risk patients. P4P programs should also account for variation in practice size and resources, to avoid unfairly punishing small and rural practices. Outcome-based quality measures should be used only in cases in which valid risk-adjustment ensures that providers are not punished for caring for high-risk patients.
7. Pay-for-performance programs must not adversely impact the quality of care, as might occur if they encourage gaming, or disproportionately increase comprehensiveness of documentation, or reward measured care at the expense of equally important care that is difficult to measure. To avoid these pitfalls, programs should reward multiple measurable domains of quality (structure, process, and outcome), and reward both relative quality improvement as well as absolute performance. At the same time, it must be recognized that failure to link payment and quality performance also adversely affects patients, and the relative harm from each approach must be balanced.

#### Clinical Policy Recommendations

1. Pulmonary, critical care, and sleep clinicians are encouraged to participate in pay-for-performance programs. The ATS Vision includes serving our patients and community by providing highest quality care possible. Participation in well-designed P4P programs should be welcomed as an

opportunity to partner with health care payors to improve quality, rather than viewed as a threat to autonomy and independence.

2. Performance improvement is a central tenet of the American Thoracic Society. Accordingly, the ATS has established a Quality Improvement Committee with a specific charge to develop opportunities for ATS participation in performance improvement at the local, regional, and national levels. The ATS will work through its Quality Improvement Committee, Documents Development and Implementation Committee, Clinical Practice Committee and Health Policy Committee, as well as ATS assemblies, to advance the science and practice of performance improvement and P4P.
3. Hospitals and physicians should acknowledge that high-quality pulmonary, critical care, and sleep medicine is typically provided by multidisciplinary teams, rather than by individual physicians. Whenever possible, hospitals and physicians should establish mechanisms to reward nurses, respiratory therapists, pharmacists, nutritionists, and other health care professionals who might not benefit from rewards for high performance under existing reimbursement structures.

#### Research Policy Recommendations

1. Research is needed into the effectiveness of pay-for-performance and the organizational, structural, and cultural factors that may influence program success. As health care reform efforts proceed, private health plans, the Centers for Medicare and Medicaid Services, and other third-party payors should continue to fund and conduct demonstration projects of pay-for-performance in both the outpatient and hospital setting. Such demonstration projects should strive to measure both the intended and unintended consequences of P4P programs.
2. The United States National Institutes of Health (NIH) and Agency for Healthcare Research and Quality (AHRQ), and other health care research agencies should fund research into the effect of pay-for-performance on health outcomes and access to health care, including vulnerable populations. In particular, the funding agencies should support through its comparative clinical effectiveness programs necessary research to study P4P as a mechanism for translating new evidence into clinical practice and reducing healthcare disparities. The ATS should take an active role in developing these research agendas and ATS members should be encouraged to participate in these ATS-driven research initiatives.
3. Research is needed into the cost-effectiveness of pay-for-performance programs. Although programs may improve quality, they might do so at considerable cost, both to the payors who must fund the programs and the providers who must develop the infrastructure for measuring and reporting quality. Cost-effectiveness research, conducted in a variety of settings, can determine whether the costs of pay-for-performance are commensurate with the benefits and how to implement programs in the most efficient way possible.

This statement was prepared by an *ad hoc* subcommittee of the ATS Health Policy Committee.



Members of the ad hoc subcommittee are as follows:

JEREMY M. KAHN, M.D., M.Sc. (Chair)  
 DAMON C. SCALES, M.D., Ph.D. (Co-chair)  
 ANDREA APTER, M.D., M.Sc.  
 DAVID H AU, M.D., M.Sc.  
 SHANNON S. CARSON, M.D.  
 J. RANDALL CURTIS, M.D., M.P.H.  
 R. ADAMS DUDLEY, M.D., M.B.A.  
 ARMIN ERNST, M.D.  
 GARY W. EWART, MHS  
 VINCENT FAN, M.D., M.P.H.  
 ANN C. HALBOWER, M.D.  
 JOHN E. HEFFNER, M.D.  
 THEODORE J. IWASHYNA, M.D., Ph.D.  
 JERRY A. KRISHNAN, M.D., Ph.D.  
 LOUIS S. LIBBY, M.D.  
 KATHLEEN O. LINDELL, RN, Ph.D.  
 SCOTT MANAKER, M.D., Ph.D.  
 ANTHONY M. MARINELLI, M.D.  
 JANET R. MAURER, M.D.  
 JUSTINE MEDINA, RN, M.S.  
 MARK L. METERSKY, M.D.  
 RICHARD MULARSKI, M.D., MSHS, MCR  
 JOHN POPOVICH, Jr., M.D.  
 GORDON D. RUBENFELD, M.D., M.Sc.  
 TASNIM SINUFF, M.D., Ph.D.  
 BRIAN STEIN, M.D.

**Acknowledgment:** The subcommittee members express their appreciation to the following advisors and consultants for their contributions to the development of this document: Lee K. Brown, Ann C. Halbower, Timothy P. Hofer, Peter K. Lindenauer, Nuala Moore, Holger J. Schünemann, Rachel M. Werner, and the members of the ATS Health Policy Committee.

## References

- McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, Kerr EA. The quality of health care delivered to adults in the United States. *N Engl J Med* 2003;348:2635–2645.
- Rosenthal MB, Dudley RA. Pay-for-performance: will the latest payment trend improve care? *JAMA* 2007;297:740–744.
- Epstein AM. Pay for performance at the tipping point. *N Engl J Med* 2007;356:515–517.
- Campbell S, Reeves D, Kontopantelis E, Middleton E, Sibbald B, Roland M. Quality of primary care in England with the introduction of pay for performance. *N Engl J Med* 2007;357:181–190.
- Scott IA. Pay for performance in health care: strategic issues for Australian experiments. *Med J Aust* 2007;187:31–35.
- Millett C, Gray J, Saxena S, Netuveli G, Majeed A. Impact of a pay-for-performance incentive on support for smoking cessation and on smoking prevalence among people with diabetes. *CMAJ* 2007;176:1705–1710.
- Rosenthal MB, Frank RG. What is the empirical basis for paying for quality in health care? *Med Care Res Rev* 2006;63:135–157.
- Snyder L, Neubauer RL. Pay-for-performance principles that promote patient-centered care: an ethics manifesto. *Ann Intern Med* 2007;147:792–794.
- Hayward RA, Kent DM. 6 EZ steps to improving your performance: (or how to make P4P pay 4U!). *JAMA* 2008;300:255–256.
- Wodchis WP, Ross JS, Detsky AS. Is P4P really FFS? *JAMA* 2007;298:1797–1799.
- Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington: National Academy Press; 2001.
- Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, Rubin HR. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA* 1999;282:1458–1465.
- Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. Part 1: the content, quality, and accessibility of care. *Ann Intern Med* 2003;138:273–287.
- Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. Part 2: health outcomes and satisfaction with care. *Ann Intern Med* 2003;138:288–298.
- Rosenthal MB, Landon BE, Normand SL, Frank RG, Epstein AM. Pay for performance in commercial HMOs. *N Engl J Med* 2006;355:1895–1902.
- Wachter RM, Foster NE, Dudley RA. Medicare's decision to withhold payment for hospital errors: the devil is in the details. *Jt Comm J Qual Patient Saf* 2008;34:116–123.
- Lasser KE, Woolhandler S, Himmelstein DU. Sources of US physician income: the contribution of government payments to the specialist-generalist income gap. *J Gen Intern Med* 2008;23:1477–1481.
- Barr M, Ginsburg J. The advanced medical home: a patient-centered, physician guided model of health care [accessed ■■■■]. *American College of Physicians* 2006. Available from: <http://www.acponline.org>.
- Christianson JB, Knutson DJ, Mazze RS. Physician pay-for-performance: implementation and research issues. *J Gen Intern Med* 2006;21:S9–S13.
- Young GJ. Can multi-level research help us design pay-for-performance programs? *Med Care* 2008;46:109–111.
- Donabedian A. The quality of medical care. *Science* 1978;200:856–864.
- Kerr EA, Hofer TP, Hayward RA, Adams JL, Hogan MM, McGlynn EA, Asch SM. Quality by any other name? A comparison of three profiling systems for assessing health care quality. *Health Serv Res* 2007;42:2070–2087.
- Downing A, Rudge G, Cheng Y, Tu YK, Keen J, Gilthorpe MS. Do the UK government's new Quality and Outcomes Framework (QOF) scores adequately measure primary care performance? A cross-sectional survey of routine healthcare data. *BMC Health Serv Res* 2007;7:166.
- Kerr EA, Smith DM, Hogan MM, Hofer TP, Krein SL, Bermann M, Hayward RA. Building a better quality measure: are some patients with 'poor quality' actually getting good care? *Med Care* 2003;41:1173–1182.
- Glickman SW, Schulman KA, Peterson ED, Hocker MB, Cairns CB. Evidence-based perspectives on pay for performance and quality of patient care and outcomes in emergency medicine. *Ann Emerg Med* 2008;51:622–631.
- Werner RM, Bradlow ET. Relationship between Medicare's hospital compare performance measures and mortality rates. *JAMA* 2006;296:2694–2702.
- Fonarow GC, Abraham WT, Albert NM, Stough WG, Gheorghiadu M, Greenberg BH, O'Connor CM, Pieper K, Sun JL, Yancy C, et al. Association between performance measures and clinical outcomes for patients hospitalized with heart failure. *JAMA* 2007;297:61–70.
- Milstein A, Lee TH. Comparing physicians on efficiency. *N Engl J Med* 2007;357:2649–2652.
- Hussey PS, de Vries H, Romley J, Wang MC, Chen SS, Shekelle PG, McGlynn EA. A systematic review of health care efficiency measures. *Health Serv Res* 2009.
- Milstein A. Ending extra payment for "never events"—stronger incentives for patients' safety. *N Engl J Med* 2009;360:2388–2390.
- Pronovost PJ, Goeschel CA, Wachter RM. The wisdom and justice of not paying for "preventable complications". *JAMA* 2008;299:2197–2199.
- Inouye SK, Brown CJ, Tinetti ME. Medicare nonpayment, hospital falls, and unintended consequences. *N Engl J Med* 2009;360:2390–2393.
- Kizer KW. Establishing health care performance standards in an era of consumerism. *JAMA* 2001;286:1213–1217.
- 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: implications for pay for performance. *JAMA* 2005;294:716–724.
- Schunemann HJ, Woodhead M, Anzueto A, Buist S, Macnee W, Rabe KF, Heffner J. A vision statement on guideline development for respiratory disease: the example of COPD. *Lancet* 2008;■■■■.
- Petersen LA, Woodard LD, Urech T, Daw C, Sookanant S. Does pay-for-performance improve the quality of health care? *Ann Intern Med* 2006;145:265–272.
- Lindenauer PK, Remus D, Roman S, Rothberg MB, Benjamin EM, Ma A, Brazler DW. Public reporting and pay for performance in hospital quality improvement. *N Engl J Med* 2007;356:486–496.
- Glickman SW, Ou FS, DeLong ER, Roe MT, Lytle BL, Mulgund J, Rumsfeld JS, Gibler WB, Ohman EM, Schulman KA, et al. Pay for performance, quality of care, and outcomes in acute myocardial infarction. *JAMA* 2007;297:2373–2380.



39. Doran T, Fullwood C, Gravelle H, Reeves D, Kontopantelis E, Hiroeh U, Roland M. Pay-for-performance programs in family practices in the UK. *N Engl J Med* 2006;355:375–384.
40. Roski J, Jeddeloh R, An L, Lando H, Hannan P, Hall C, Zhu SH. The impact of financial incentives and a patient registry on preventive care quality: increasing provider adherence to evidence-based smoking cessation practice guidelines. *Prev Med* 2003;36:291–299.
41. Grady KE, Lemkau JP, Lee NR, Caddell C. Enhancing mammography referral in primary care. *Prev Med* 1997;26:791–800.
42. Fairbrother G, Hanson KL, Friedman S, Butts GC. The impact of physician bonuses, enhanced fees, and feedback on childhood immunization coverage rates. *Am J Public Health* 1999;89:171–175.
43. Safran DG, Rogers WH, Tarlov AR, Inui T, Taira DA, Montgomery JE, Ware JE, Slavin CP. Organizational and financial characteristics of health plans: are they related to primary care performance? *Arch Intern Med* 2000;160:69–76.
44. Fairbrother G, Siegel MJ, Friedman S, Kory PD, Butts GC. Impact of financial incentives on documented immunization rates in the inner city: results of a randomized controlled trial. *Ambul Pediatr* 2001;1:206–212.
45. Pourat N, Rice T, Tai-Seale M, Bolan G, Nihalani J. Association between physician compensation methods and delivery of guideline-concordant STD care: is there a link? *Am J Manag Care* 2005;11:426–432.
46. Beaulieu ND, Horrigan DR. Putting smart money to work for quality improvement. *Health Serv Res* 2005;40:1318–1334.
47. Rosenthal MB, Frank RG, Li Z, Epstein AM. Early experience with pay-for-performance: from concept to practice. *JAMA* 2005;294:1788–1793.
48. Hillman AL, Pauly MV, Kerman K, Martinek CR. HMO managers' views on financial incentives and quality. *Health Aff (Millwood)* 1991;10:207–219.
49. Epstein AM. Paying for performance in the United States and abroad. *N Engl J Med* 2006;355:406–408.
50. Werner RM, Konetzka RT, Kruse GB. Impact of public reporting on unreported quality of care. *Health Serv Res* 2009;44:379–398.
51. Welker JA, Huston M, McCue JD. Antibiotic timing and errors in diagnosing pneumonia. *Arch Intern Med* 2008;168:351–356.
52. Drake DE, Cohen A, Cohn J. National hospital antibiotic timing measures for pneumonia and antibiotic overuse. *Qual Manag Health Care* 2007;16:113–122.
53. Fiscella K, Franks P, Gold MR, Clancy CM. Inequality in quality: addressing socioeconomic, racial, and ethnic disparities in health care. *JAMA* 2000;283:2579–2584.
54. Chien AT, Chin MH, Davis AM, Casalino LP. Pay for performance, public reporting, and racial disparities in health care: how are programs being designed? *Med Care Res Rev* 2007;64:283S–304S.
55. Werner RM, Asch DA, Polsky D. Racial profiling: the unintended consequences of coronary artery bypass graft report cards. *Circulation* 2005;111:1257–1263.
56. Werner RM, Goldman LE, Dudley RA. Comparison of change in quality of care between safety-net and non-safety-net hospitals. *JAMA* 2008;299:2180–2187.
57. Casalino LP, Elster A, Eisenberg A, Lewis E, Montgomery J, Ramos D. Will pay-for-performance and quality reporting affect health care disparities? *Health Aff (Millwood)* 2007;26:w405–w414.
58. Metersky ML, Sweeney TA, Getzow MB, Siddiqui F, Nsa W, Bratzler DW. Antibiotic timing and diagnostic uncertainty in Medicare patients with pneumonia: is it reasonable to expect all patients to receive antibiotics within 4 hours? *Chest* 2006;130:16–21.
59. Casalino LP, Alexander GC, Jin L, Konetzka RT. General internists' views on pay-for-performance and public reporting of quality scores: a national survey. *Health Aff (Millwood)* 2007;26:492–499.
60. Grumbach K, Osmond D, Vranizan K, Jaffe D, Bindman AB. Primary care physicians' experience of financial incentives in managed-care systems. *N Engl J Med* 1998;339:1516–1521.
61. Mehrotra A, Pearson SD, Coltin KL, Kleinman KP, Singer JA, Rabson B, Schneider EC. The response of physician groups to P4P incentives. *Am J Manag Care* 2007;13:249–255.
62. The Commonwealth Fund. Quality matters: pay-for-performance in Medicare. 2006;20.
63. Mongan JJ, Ferris TG, Lee TH. Options for slowing the growth of health care costs. *N Engl J Med* 2008;358:1509–1514.
64. Greene RA, Beckman HB, Mahoney T. Beyond the efficiency index: finding a better way to reduce overuse and increase efficiency in physician care. *Health Aff (Millwood)* 2008;27:1111–1118.
65. Mannino DM, Braman S. The epidemiology and economics of chronic obstructive pulmonary disease. *Proc Am Thorac Soc* 2007;4:502–506.
66. Pauwels RA, Buist AS, Calverley PM, Jenkins CR, Hurd SS. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) Workshop summary. *Am J Respir Crit Care Med* 2001;163:1256–1276.
67. Halpern NA, Pastores SM, Greenstein RJ. Critical care medicine in the United States 1985–2000: an analysis of bed numbers, use, and costs. *Crit Care Med* 2004;32:1254–1259.
68. Angus DC, Barnato AE, Linde-Zwirble WT, Weissfeld LA, Watson RS, Rickert T, Rubenfeld GD. Use of intensive care at the end of life in the United States: an epidemiologic study. *Crit Care Med* 2004;32:638–643.
69. Jacobs P, Noseworthy TW. National estimates of intensive care utilization and costs: Canada and the United States. *Crit Care Med* 1990;18:1282–1286.
70. Halpern NA, Bettles L, Greenstein R. Federal and nationwide intensive care units and healthcare costs: 1986–1992. *Crit Care Med* 1994;22:2001–2007.
71. Young T, Peppard PE, Gottlieb DJ. Epidemiology of obstructive sleep apnea: a population health perspective. *Am J Respir Crit Care Med* 2002;165:1217–1239.
72. Hayward RA. Performance measurement in search of a path. *N Engl J Med* 2007;356:951–953.
73. Dodek P, Keenan S, Cook D, Heyland D, Jacka M, Hand L, Muscedere J, Foster D, Mehta N, Hall R, et al. Evidence-based clinical practice guideline for the prevention of ventilator-associated pneumonia. *Ann Intern Med* 2004;141:305–313.
74. Marquette CH, Copin MC, Wallet F, Neviere R, Saulnier F, Mathieu D, Durocher A, Ramon P, Tonnel AB. Diagnostic tests for pneumonia in ventilated patients: prospective evaluation of diagnostic accuracy using histology as a diagnostic gold standard. *Am J Respir Crit Care Med* 1995;151:1878–1888.
75. Schunemann HJ, Heffner JE. A new ATS Committee: competing in the marketplace of ideas. *Am J Respir Crit Care Med* 2005;172:1067–1068.
76. Guyatt GH, Oxman AD, Kunz R, Falck-Ytter Y, Vist GE, Liberati A, Schunemann HJ. Going from evidence to recommendations. *BMJ* 2008;336:1049–1051.
77. Mahadeva R, Webb K, Westerbeek RC, Carroll NR, Dodd ME, Bilton D, Lomas DA. Clinical outcome in relation to care in centres specialising in cystic fibrosis: cross sectional study. *BMJ* 1998;316:1771–1775.
78. Young MP, Goode VJ, Oltermann MH, Bohman CB, French TK, James BC. The impact of a multidisciplinary approach on caring for ventilator-dependent patients. *Int J Qual Health Care* 1998;10:15–26.
79. Burns SM, Earven S, Fisher C, Lewis R, Merrell P, Schubart JR, Truitt JD, Bleck TP. Implementation of an institutional program to improve clinical and financial outcomes of mechanically ventilated patients: one-year outcomes and lessons learned. *Crit Care Med* 2003;31:2752–2763.
80. Leape LL, Cullen DJ, Clapp MD, Burdick E, Demonaco HJ, Erickson JI, Bates DW. Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. *JAMA* 1999;282:267–270.
81. Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremiszov TT, Young TL. Physician staffing patterns and clinical outcomes in critically ill patients: a systematic review. *JAMA* 2002;288:2151–2162.
82. Pham HH, Schrag D, O'Malley AS, Wu B, Bach PB. Care patterns in Medicare and their implications for pay for performance. *N Engl J Med* 2007;356:1130–1139.
83. Iwashyna TJ, Christie JD, Moody J, Kahn JM, Asch DA. The structure of critical care transfer networks. *Med Care* 2009;47:787–793.
84. Breslow MJ. Remote ICU care programs: current status. *J Crit Care* 2007;22:66–76.

## AUTHOR QUERIES

- 1 Au: please provide date of ATS Board approval.
- 2 Au: please provide acceptance date.
- 3 Au: both “health care” and “healthcare” appear in this document—please indicate which is preferred and make consistent throughout.
- 4 Au: up to five keywords permitted; please reduce number.
- 5 Au: should be “value-based purchasing” (no second hyphen), but have left as is because text indicates that it was used as a specific search term—please verify that the term was used as it appears here.
- 6 Au: edit as meant?
- 7 Au: please provide date accessed for Ref. 18. Also, confirm that this reference is only available electronically, or provide volume number and page range for print version.
- 8 Au: please provide volume number and page range for Ref. 29; if not yet published, delete year and add “(In press)” after journal abbreviation.
- 9 Au: please provide volume number and page range for Ref. 35.
- 10 Au: please check/clarify publication information for Ref. 62. If this is an article in a journal, please provide the journal abbreviation, as well as the complete volume number and page range. If this is a book, please provide the name and location of the publisher.
- 11 Au: please provide volume number and page range for Ref. 64.
- 12 Au: rephrase “consequences in which” in both instances in this table?