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Omission Bias and Decision Making in Pulmonary and Critical Care Medicine*

Scott K. Aberegg, MD, MPH; Edward F. Haponik, MD; and Peter B. Terry, MD, MA

Background: **Pulmonary and critical care physicians routinely make complex decisions, but little is known about cognitive aspects of this process. Omission bias and status quo bias are well-descibed cognitive biases that can cause lay decision makers to prefer inaction that preserves the status quo even when changing the status quo through action is more likely to lead to the best outcomes. It is unknown if these biases influence trained decision makers such as pulmonologists.**
Study objectives: **To determine whether omission bias and status quo bias influence the medical decisions of pulmonologists.**
Design and interventions: **The study was a randomized controlled trial conducted within a cross-sectional survey of pulmonologists' opinions about the relevance of various factors in pulmonary and critical care decision making. We designed case vignettes that presented patient information with an associated patient management choice. The status quo state and the action/omission distinction were varied in two forms of otherwise identical vignettes. One form of each case vignette pair (A and B) was administered randomly to each prospective respondent during the first mailing of the opinion survey.**
Participants: **Five hundred pulmonologists selected randomly from the membership of the American College of Chest Physicians.**
Measurements and results: **There were 125 respondents, including 59 for form A and 66 form B (enrollment rate, 25%). In vignettes involving evaluation of pulmonary embolism and treatment of septic shock, respondents were more likely to choose a suboptimal management strategy when an omission option was present that allowed preservation of the status quo (71% vs 53%, p = 0.048; 50% vs 29%, p = 0.016, respectively). In a vignette involving a hypothetical clinical trial and the decision to prescribe tube feeding, the omission option was not significantly associated with the decision to prescribe tube feeding (54% vs 50%, p = 0.67).**
Conclusion: **Pulmonary and critical care decisions are susceptible to the influence of omission and status quo bias. Because of the great number of decisions that are made each day involving choices between maintaining or changing the status quo, this finding could have far-reaching implications for patient outcomes, cost-effectiveness, resource utilization, clinical practice variability, and medical errors.** ***(CHEST 2005; 128:1497–1505)***

Key words: cognitive aspects; decision making; psychology; randomized controlled trial

Abbreviations: DIC = disseminated intravascular coagulopathy; HCT = hematocrit; INR = international normalized ratio; NSAID = nonsteroidal anti-inflammatory drug; OR = odds ratio; PE = pulmonary embolism; PTT = prothrombin time; RR = relative risk; TNTC = too numerous to count; UA = urinalysis; UTI = urinary tract infection; V/Q = ventilation/perfusion

Little is known about the cognitive aspects of decision making in pulmonary and critical care medicine. In other fields, investigations of decision making[1–7] have revealed cognitive biases that affect the way that decision makers evaluate choices, especially those involving risk under uncertainty. Such uncertainty characterizes many decisions in pulmonary and critical care medicine, and if unrecognized biases exist in this field as well, their identification and description will be crucial to removing barriers to optimal decision making.

Omission bias and the closely related status quo bias are well-described and validated cognitive biases that result from a preference for omission/inaction and preservation of the status quo.[3–6,8–10] This preference can lead decision makers to choose the risks

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and benefits of the status quo even when the relative risks (RRs) and benefits of changing the status quo through action are objectively superior. Similarly, decision makers may inappropriately judge harms due to omission as less severe or blameworthy than harms that result from action. These biases stem from heuristics ("rules of thumb") that guide everyday choices but may be barriers to optimal decision making when applied in contexts such as medicine in which they are not relevant. For example, people often consider it less blameworthy to fail to return money when they are given too much change for a transaction (an omission) than to steal an equivalent amount of money (an action).[8] While ethical and moral considerations often seem to underlie these distinctions, in other contexts they clearly do not. For example, consider a patient with pneumonia who is in the ICU, has convalesced, and is in stable condition for transfer to the medical floor. If the patient is found to have a blood glucose level of 500 mg/dL, some clinicians might opt to keep the patient in the ICU until the hyperglycemia is resolved, whereas they would not transfer an equivalent patient from the medical floor to the ICU as a result of the same finding. In such situations, the risks of acting to change the status quo (a problem arising from hyperglycemia on the medical floor, however unlikely) appear to be worse than the risks associated with maintaining the status quo and not transferring the patient (*ie*, prolonged ICU/hospital stay, bed availability and resource utilization issues). Tendencies toward omission bias may be reinforced by the time-honored clinical dictum "first do no harm," which emphasizes risk avoidance and may serve as a justification for "doing nothing" or "holding course." To avoid such bias, a clinician might mentally reverse the status quo and ask "if the patient were already on the medical floor, would I transfer her to the ICU for this finding?" In order to determine whether pulmonologists' clinical decisions are affected by omission and status quo bias, as decisions by laypersons appear to be, we designed a randomized controlled trial using case vignettes that isolated the status quo and the action/omission distinction as an independent variable.

Materials and Methods

Study Population

The case vignettes were included as part of a larger cross-sectional survey of 500 practicing US pulmonary specialists who were selected randomly from the membership of the American College of Chest Physicians. The main survey asked respondents for their opinions regarding psychosocial influences on medical decision making. Each prospective respondent was also randomized to receive one of two forms of the case vignette portion of the survey, which varied according to the independent variable in the case vignettes. The larger survey consisted of an initial mailing and two follow-up mailings. The case vignettes were included in the initial mailing only, to maximize the response rates of the opinion survey, since inclusion of the case vignettes increased considerably the length of the survey and the effort required to complete it. The surveys were mailed with a cover letter that explained the purpose of the survey, ensured the confidentiality of the responses, and asked for consent to participate. This investigation was approved by the Johns Hopkins Medicine Institutional Review Board.

Case Vignettes

The case vignettes were designed to portray common pulmonary/critical care patient scenarios and a clinical management dilemma. Content was derived from clinical practice guidelines, relevant research, and witnessed variations in clinical decision making.[11–13] The specific clinical scenarios that we chose allowed us to vary the status quo in each vignette without making clinically relevant changes in the clinical information contained in the vignette. The vignettes were written in board examination format to ensure respondents' familiarity with the presentation approach. Respondents were instructed to choose the option that most closely resembled what they would do if they were caring for a similar patient in their practice.

The case vignettes were created in pairs ("A" and "B"), with each vignette of a pair differing in the status quo state of the patient's management at the time that a decision must be made about further care, and in whether action or omission was required to put that decision into effect. Random number generation was used to assign respondents to receive one of two questionnaires, each consisting of one form (A or B) of each vignette pair. By changing the status quo state of the patient's management between forms, an outcome that came about by omission (*ie*, "doing nothing") in one form required action (*ie*, "doing something") to achieve that same outcome in the other form of that pair. The action/omission distinction and the status quo were therefore necessarily confounded due to difficulty in crafting credible equivalent cases in which action and omission would lead to opposite outcomes if the status quo were held constant. Continuing the aforementioned example, if in form A the status quo was represented by a patient in stable condition in the ICU with a blood glucose level of 500 mg/dL, in form B the status quo was represented by an equivalent patient on the floor. In both forms, the decision facing respondents would be the same, namely, whether the patient should receive treatment in the ICU or on the medical floor. If respondents to form A are more likely to delay transfer to treat the hyperglycemia in the ICU, this is consistent with the influence of status quo and/or omission bias since the clinical data in the forms are otherwise identical.

The Text of Case 1, Form A (Text in Brackets Was Not Present on the Questionnaire, but Was Added Here for Clarity): A 45-year-old man with no medical history presents to the emergency department with 3 days of pleuritic chest pain and mild vague dyspnea. He has no other symptoms. His temperature is 100.2°F, heart rate is 97 beats/min, BP is 135/89 mm Hg, respiratory rate is 21 breaths/min, and oxygen saturation is 95% while breathing room air. The findings of the physical examination are normal. He is given ketorolac (Toradol; Roche Pharmaceuticals; Nutley, NJ) and is started on therapy with IV heparin. The findings of a chest radiograph are normal. The results of a ventilation/perfusion ($\dot{V}/\dot{Q}$) scan yield a low probability for pulmonary embolism (PE), and heparin therapy is discontinued. You are called to consult on the patient's condition. Your recommendation is to do the following:

- Discharge the patient from the hospital receiving therapy with nonsteroidal anti-inflammatory drugs (NSAIDs) with appropriate follow-up [status quo changed through action].
- Restart heparin therapy and perform a contrast-enhanced thoracic CT scan with PE protocol [status quo changed through action].

The vignette appearing on form B contained the omission option. It was otherwise identical except that heparin therapy had not been discontinued and a CT scan had been ordered but not performed. Respondents had a choice of either discontinuing the CT scan and heparin therapy and discharging the patient from the hospital while receiving NSAIDs, or continuing heparin therapy, allowing the CT scan to proceed, and awaiting its results. The full text of case 1, form B, can be found in the Appendix. In this case, the decision is about whether a patient with pleuritic chest pain, a low clinical probability of PE,[11] and a low-probability $\dot{V}/\dot{Q}$ scan finding should be discharged from the hospital while receiving NSAIDs and appropriate follow-up, or whether a CT scan to further rule out PE should be performed. This clinical information should dictate whether or not a CT scan should be performed and heparin should be administered to this patient; whether or not it has been ordered or discontinued by the emergency department physician should be irrelevant. If, as we hypothesized, more physicians chose the omission option and recommended a CT scan in the case in which it was already ordered, it would be consistent with omission bias, wherein decision makers prefer inaction (*ie*, omission) that preserves the status quo. This may occur because the risk of changing the status quo (*ie*, missing a diagnosis of PE) is exaggerated in the mind of the decision maker, while the risks of maintaining the status quo (*ie*, risk of bleeding from heparin, toxicity from IV contrast agent, and costs of the CT scan) are underestimated or undervalued. Likewise, the benefit of preserving the status quo via omission (*ie*, additional certainty in diagnosis) is overestimated relative to the benefits of changing the status quo through action (*ie*, avoidance of toxicity and cost). The design of case 1 is displayed diagrammatically in Figure 1.

Case 2, form A, read as follows: You are called to the emergency department to admit a 53-year-old woman with urosepsis and shock to the ICU. Her only significant medical history is for prior urinary tract infections (UTIs). In the emergency department, a 20-gauge IV was inserted in each hand, and she was treated with ampicillin, gentamicin, and 5 L of normal saline solution. She remained hypotensive (BP, 70/30 mm Hg), and a norepinephrine infusion was started by the emergency department physician. At the time of your evaluation, her physical examination is remarkable for fever (temperature, 102.3°F), diaphoresis, and hyperdynamic circulation. Pertinent results are as follows: urinalysis (UA), WBCs too numerous to count (TNTC); creatinine level, 1.7; WBCs, 17,000; hematocrit (HCT),

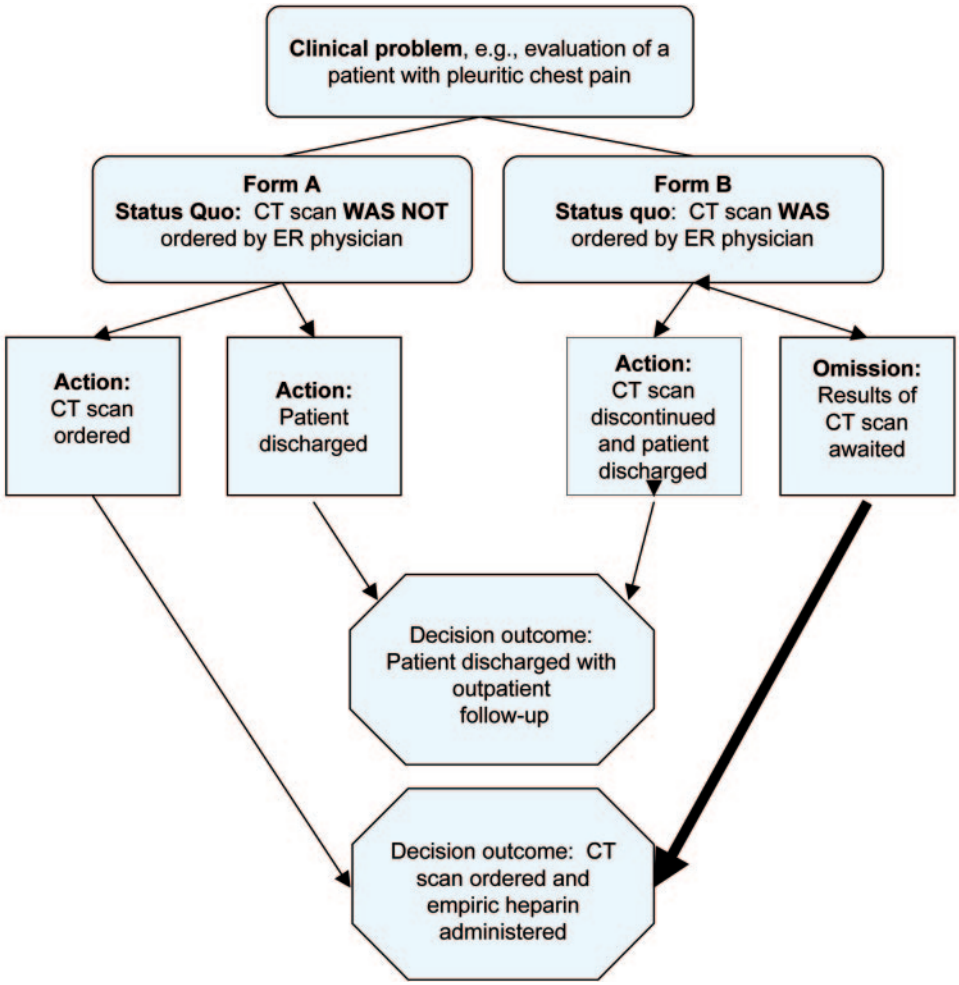

FIGURE 1. Schematic of the design of vignettes for case 1.

23%; platelets, 37,000; international normalized ratio (INR), 2.4; prothrombin time (PTT), 47; fibrinogen level, 28. You interpret these results as being consistent with urosepsis and disseminated intravascular coagulopathy (DIC). For religious reasons, she refuses transfusions of any kind. At this point you would:

- Continue current therapy and admit the patient to the ICU [status quo preserved through omission].
- Place a central venous catheter and admit the patient to the ICU while receiving current therapy [status quo changed through action].

Case 2, form B, did not contain an omission option. It was otherwise identical except that a norepinephrine infusion had not yet been started by the emergency department physician. Respondents had to choose either to start norepinephrine therapy peripherally and admit the patient to the ICU, or to place a central venous catheter, begin norepinephrine therapy, and admit the patient to the ICU. The full text of case 2, form B, can be found in the Appendix. In this case, the decision hinges on whether or not a central venous catheter should be used to infuse a vasopressor medication in a patient with severe septic shock. Whether to insert a central venous catheter should be dictated by the available clinical data[12,13] and should not depend on whether or not the emergency department physician has already started a vasopressor infusion peripherally. If, as we hypothesized, physicians are more likely to choose the omission option and forego central venous catheter placement when vasopressor therapy has already been initiated peripherally by the emergency department physician, this is consistent with status quo and/or omission bias. When decision makers balance the risks and benefits of the central venous catheter, the risk/benefit set that results from preservation of the status quo through omission (*ie*, risk of vasopressor extravasation, and the benefit of avoiding risk of bleeding during catheter insertion) may appear to be preferable to the set that results from changing the status quo through action (*ie*, risk of bleeding during catheter insertion, and the benefit of monitoring central venous pressure and avoidance of the risk of vasopressor extravasation). This may occur even when the objectively preferable choice is to act to change the status quo, because omission bias causes a distortion of the perceived risks and benefits of each option.

Appendix 1 contains the full text of case 3. Here, respondents had to decide whether to administer tube feedings to a patient in light of a newly published study suggesting net harm from tube feedings. The status quo varied in whether tube feeding had already been initiated at the time that a decision had to be made. This case was included to determine whether status quo and omission bias would occur in the context of a hypothetical study showing both the risks and benefits of this commonly used but unproved therapy. The hypothetical study showing both risks and benefits was necessary to increase the uncertainty surrounding the decision, which is a prerequisite for omission bias.

Statistical Analysis

We analyzed the results based on differences in decisional outcomes between forms of each vignette due to experimental manipulation of the status quo state and the action/omission distinction as the independent variable. A fractional factorial design to separate status quo and omission effects was not employed. χ^2 tests were used for all comparisons of proportions and a p value of < 0.05 was considered to be significant. A statistical software package (Stata, version 8.0; Stata Corp; College Station, TX) was used for all statistical analyses.

Results

Respondents

There were 125 respondents to the first survey mailing, including 59 for form A and 66 for form B, with data missing for two respondents. The mean ($\pm$ SD) age of respondents was 47.8 $\pm$ 10 years. Most of the respondents were men (86.3%) and white (82.8%). A total of 67.2% of respondents listed "private practice" as their primary practice setting, and the remainder list "academic." Most patients (78.2%) were born in the United States. There were no differences in any demographic variables between respondents who returned form A of the survey and those who returned form B (Table 1).

For case 1 (pleuritic chest pain), respondents were nearly twice as likely to recommend CT scanning when it was the omission option (odds ratio [OR], 2.11; RR, 1.59; p = 0.048) [Table 2]. In case 2, respondents were again nearly twice as likely to choose the omission option, to forego the placement of a central venous catheter, and to accept the risk of adverse reaction to peripherally administered vasopressor therapy when that risk had already been initiated by the emergency department physician (OR, 2.47; RR, 1.71; p = 0.016) [Table 3]. In case 3, there was no difference in the prescription of tube feedings between forms (OR, 1.17; RR, 1.08; p = 0.67) [Table 4]. Physicians were not more likely to prescribe or to continue tube feedings depending on whether the patient was or was not already receiving them in light of new evidence of potential net harm.

We sought correlations between the tendency to choose the omission option and respondents' demographic characteristics such as age, race, gender, practice affiliation (academic vs private), and father's education (a surrogate for socioeconomic status of family of origin). No significant interactions were identified, but the statistical power was limited by

Table 1—*Demographic Characteristics of Respondents

Respondent Demographics*	Form A (n = 59)	Form B (n = 66)
Age, yr	47.3 $\pm$ 10.3	48.4 $\pm$ 10.0
Male gender	57 (86.5)	51 (86.5)
Hispanic	5 (8)	9 (15)
Race, white vs other	53 (81.5)	49 (84.5)
Father's highest completed educational level college or greater	49 (74)	38 (64)
Practice affiliation (private vs academic)	42 (64)	41 (69)

*Values are given as mean $\pm$ SD or No. (%). Differences in demographic variables were nonsignificant.

Table 2—*Results of Case Vignette 1, Involving Evaluation for Pleuritic Chest Pain

Decision Outcome	Form A	Form B
Patient discharged from hospital with outpatient follow-up	27 (46.5) [action; status quo changed]	19 (29.2) [action; status quo changed]
Empiric heparin administered during additional testing with CT scan	31 (53.5) [action; status quo changed]	45 (70.8) [omission; status quo preserved]

*Values are given as No. of respondents choosing each option for each form (%). p = 0.048 for the comparison between form A and form B.

the sample size and the fact that each respondent received only two case vignettes allowing the omission option.

Discussion

We found evidence of omission bias and status quo bias in pulmonologists' decisions relating to commonly occurring clinical dilemmas such as the evaluation of pleuritic chest pain, and the decision to place a central venous catheter for the treatment of septic shock requiring vasopressor support. Pulmonologists are outcome-oriented, expert decision makers, but our results suggest that they are not immune to cognitive biases that may contribute to suboptimal decisions. To our knowledge, this is the first documentation of the potential role of such biases in pulmonary and critical care medicine. Our results are consistent with psychological studies of lay persons,[3,4,10] as well as the only two previous investigations[14,15] that have addressed omission bias in medical decision making. The latter studies[14,15] showed that some physicians seem to inappropriately weigh the risks and benefits of therapies in a manner that is consistent with omission bias. The current study directly shows that pulmonologists choose different management strategies when the status quo state and the action/omission distinction are manipulated as an independent variable. Such decision making is considered to be "nonnormative" or suboptimal.[16] If we are concerned primarily with patient outcomes, it should not matter whether those are achieved through our actions or our omissions. To the contrary, our results suggest that decision making in pulmonary and critical care medicine is influenced by this distinction.

The extent of the influence of omission and status quo bias cannot be determined from our data but could be quite wide in scope because status quo states of uncertain significance are commonplace in pulmonary and critical care medicine. Transition to the ICU often reflects the culmination of multisystem illnesses and complex therapies, often guided by multiple previous decision makers. Patients may be receiving therapies that were initiated by less specialized physicians or when incomplete data were available to guide the decision making. Sometimes, patients receive therapies that are outdated, for which there is no longer a valid indication, or were initiated erroneously. It is even possible that status quo and omission bias are reinforced in critical care medicine, in which the provision of supportive care is often a primary focus and successful management is often defined by the avoidance of decompensation and complications.

In our vignettes, preservation of the status quo through inaction increased the proportion of patients who received care that is not consistent with clinical practice guidelines. We designed case 1 to represent a patient with a low likelihood of PE in whom additional testing was not warranted based on some recommendations.[11,17,18] We found that the proportion of physicians ordering unnecessary testing (*ie*, CT scan with PE protocol) increased by a factor of 1.6 when such testing was the status quo. Similarly, optimal care of the patient in case 2 required a central venous catheter,[12,13] but physicians were 1.7 times more likely to forego its placement if vasopressors were being administered through a peripheral IV line as the status quo. These results, which are displayed in Figure 2, demonstrate that omission and status quo bias can lead to decisions involving un-

Table 3—*Results of Case Vignette 2, Involving Placement of a Central Venous Catheter for Septic Shock

Decision Outcome	Form A	Form B
Patient admitted to ICU with vasopressor infusion but no central venous catheter	29 (50) [omission; status quo preserved]	19 (28.8) [action; status quo changed]
Patient admitted to ICU with vasopressor infusion and central venous catheter	29 (50) [action; status quo changed]	47 (71.2) [action; status quo changed]

*Values are given as No. (%) of respondents choosing each option for each form. p = 0.016 for the comparison between form A and form B.

Table 4—*Results of Case Vignette 3, Involving a Hypothetical Tube Feeding Study

Decision Outcome	Form A	Form B
Patient gets tube feeding	29 (50) [omission; status quo preserved]	30 (46.2) [action; status quo changed]
Patient does not get tube feeding	29 (50) [action; status quo changed]	35 (53.9) [omission; status quo preserved]

*Values are given as No. (%) of respondents choosing each option for each form. p = 0.67 for the comparison between form A and form B.

necessary testing, cost, and patient risk, as well as potentially harmful omission of indicated treatment.

A degree of uncertainty is required in order for omission bias and other cognitive biases to influence decisions.[19] When dealing with clinical circumstances in which the likelihood of a diagnosis or side effect is known with near certainty, expert decision makers such as pulmonologists would not be expected to show omission bias. Nor would omission bias occur when there are only risks or only benefits of a course of action; the choices here are clear-cut. However, when there is greater uncertainty, especially when there is a trade-off between risks and benefits with unknown exact probabilities, omission bias can influence decision making. The degree of uncertainty that is necessary for omission bias to occur is not known and is a potential topic for future study. We designed our cases with a degree of uncertainty and a risk/benefit set that we expected to make the decision difficult. That our respondents seemed to "overtest" in both forms of case 1 and to "undertreat" in both forms of case 2 may be due to this intentional uncertainty or may reflect a general tendency toward conservative diagnostic and therapeutic strategies on written questions or in real-world scenarios. Alternatively, unfamiliarity with or disagreement with the clinical practice guidelines that we used to design the cases[11–13,17,18,20] might have influenced these findings.

Case 3 did not show a significant difference in outcomes that were dependent on the status quo state and the action/omission distinction. An important difference between case 3 and the other cases might be the perceived psychological burden of the decision it involved. One might surmise that physicians would labor more over a decision involving the diagnosis of PE or the placement of a central venous catheter in a coagulopathic patient than over a decision about tube feeding. Perhaps the risks described in the hypothetical trial were insufficient for omission bias, lacked credibility for the respondents, or there was insufficient statistical power to detect a smaller difference between forms in this case.

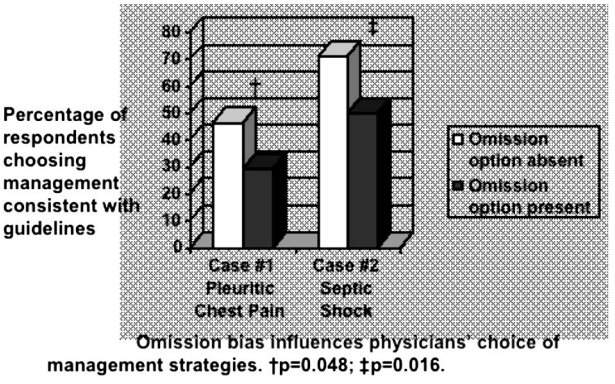

FIGURE 2. Omission bias influences physicians' choice of management strategies. † = p = 0.048; ‡ = p = 0.016.

The reasons for the existence of omission and status quo bias, and indeed whether they are biases at all, have been the subjects of much speculation and study. Potential explanations for the biases include the time and effort required to change the status quo ("transaction costs"),[21] loss aversion (from the prospect theory of Kahneman and Tversky),[3,22] increased anticipation of regret, blame,[1] or legal consequences[23] for adverse outcomes that result from action as opposed to omission, ambiguity associated with change and missing information,[10,24] and the belief that action more than omission implies causality or intent for outcomes.[6] The status quo and the action/omission distinction are difficult to separate because, in natural conditions, a status quo state usually exists that can be changed through action. Attempts to unconfound the two biases have had mixed results, with some but not all studies showing independent effects.[4,8,21] It was not our goal to separate the effects in the present study, and indeed we found it difficult to create credible medical case vignettes that allowed the isolation of the action/omission distinction from the status quo.

If omission bias were confirmed to be a prevalent characteristic of decision making by pulmonary and critical care physicians, several clinically important consequences may be readily envisioned. On the one hand, a deliberately more passive approach favoring the status quo might enhance risk avoidance and promote patient safety through a reduction in iatrogenic complications. Alternatively, one potentially deleterious effect might include a delay of critical action until further confirmatory (albeit excessive) data become available. This approach, seen in our first patient scenario, could amplify the costs of care

and/or result in "clinical cascades," which culminate in worse patient outcomes.[25] Perhaps of even more concern, time-critical decisions might be delayed, losing narrow windows for potentially life-saving interventions. The latter may prove especially relevant to the care of the rapidly expanding population of elderly patients in whom providers' omission biases might interact with other factors, culminating in lost opportunities for high-utility therapy. Hamel et al[26] observed that clinicians were more likely to withhold potentially live-saving therapy (*eg*, mechanical ventilation, dialysis, or surgery) in elderly patients, often in contrast to patients' wishes for more vigorous support. The extent to which omission bias influences this and other critical decisions requires further clarification.

Some potential limitations of our investigation must be addressed. The assumption that the status quo state was irrelevant to decision making in our cases could be challenged. In case 1, it might be argued that the fact that the emergency department physician had already ordered the CT scan in form A is important and changes the probability of PE occurring, perhaps because respondents inferred that the emergency department physician was aware of information that was not presented in the case. The status quo has sometimes been established for good reasons.[21] However, in the absence of evidence that the ordering of the CT scan by the emergency department physician changes the probability of disease, considering this fact in a diagnostic workup is just as likely to decrease the accuracy, efficiency, and cost-effectiveness of the workup as it is to increase it. Another possibility is that respondents preferred the status quo out of deference to decisions already made by their colleagues. We believe that the available evidence suggests that such deference only exacerbates an underlying bias, rather than causes it.

A randomized case vignette approach to investigate medical decision making, while useful to control independent variables (making it a decision-making analog of the randomized controlled trial), is by its nature artificial and has uncertain external validity. However, it has been shown that physician responses to written case vignettes are reasonably representative of decision making in actual practice,[27] and this remains the method for assessing physician specialists' competencies using written board examinations. Because physician specialists are accustomed to answering clinical management questions based on case vignettes for these examinations, we believe that there is justification for the assumption of external validity.

The response/enrollment rate of 25% of the original mailing sample might be considered to be a limitation of our study. The investigation was not a survey in the traditional sense because the forms of the case vignettes were assigned randomly, and consequently there is no reason to expect that the observed results occurred because of responder bias. Moreover, there were no significant demographic differences between the respondents of form A and form B, suggesting that randomization was successful.

Despite such limitations, the importance of addressing these biases cannot be overstated given the vast number of decisions made each day that may be susceptible to their influence. Beyond their relevance to patient-specific decisions, omission and status quo bias may also help to explain the relatively slow diffusion and implementation of newly validated therapeutic advances such as lung-protective ventilation strategies,[28–30] and drugs such as drotrecogin-alfa for sepsis.[12,31,32] Before such therapies become the status quo, omission bias might cause some decision makers to undervalue their benefits and overestimate their risks, leading to reduced implementation and missed opportunities to confer their benefits on patients.[32] Omission bias may also perpetuate cascades of medical errors, due to the reluctance to act to change the status quo. Most importantly, these cognitive barriers to the delivery of optimal care might be easily avoided through greater awareness of their potential effects or through simple debiasing techniques.[16]

Conclusions

Pulmonologists are expert decision makers but, nonetheless, may be susceptible to cognitive biases such as omission and status quo bias, which can lead to suboptimal decisions. Because of the great number of decisions that are made each day involving choices between maintaining or changing the status quo, this finding could have far-reaching implications for patient outcomes, cost-effectiveness, clinical practice variability, and medical errors.

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Appendix: Survey Instructions and Full Text of Cases

Instructions

Relatively little is known about how physicians use information during medical decision making, especially in cases involving a high degree of uncertainty. Please answer the questions pertaining to each case vignette below based on what you would do if

you were in a similar situation. If a hypothetical drug, study, or test described in a vignette bears resemblance to a drug, study, or test in current use, this resemblance is unintentional, and no inferences based on this resemblance should be made. If there is a piece of information that you believe is necessary but has been omitted, assume that that information is unavailable at the time that the decision must be made. Assume also that any clinical trials that are described are from respected, peer-reviewed journals. Please mark the box next to your chosen answer.

Case 1, Form A

A 45-year-old man with no past medical history presents to the emergency department with 3 days of pleuritic chest pain and mild vague dyspnea. He has no other symptoms. His temperature is 100.2°F, heart rate is 97, BP is 135/89, respiratory rate is 21, oxygen saturation 95% on room air. The physical examination is normal. He is given Toradol (ketorolac) and was started on heparin intravenously. A chest radiograph was normal. A $\dot{V}/\dot{Q}$ scan is reported as low probability for pulmonary embolism, and heparin is discontinued. You are called to consult on the patient. Your recommendation is to:

□ Discharge the patient on NSAIDs with appropriate follow-up.

□ Restart heparin therapy and perform a contrast-enhanced thoracic CT scan with PE protocol.

Case 1, Form B

A 45-year-old man with no past medical history presents to the emergency department with 3 days of pleuritic chest pain and mild vague dyspnea. He has no other symptoms. His temperature is 100.2°F, heart rate is 97, BP is 135/89, respiratory rate is 21, and oxygen saturation 95% on room air. The physical examination is normal. He is given Toradol (ketorolac) and is started on heparin intravenously. A chest radiograph is normal. A $\dot{V}/\dot{Q}$ scan is reported as low probability for pulmonary embolism. A contrast-enhanced thoracic CT scan with PE protocol has been ordered but not yet performed. You are called to consult on the patient. Your recommendation is to:

□ Discontinue heparin, cancel the CT scan, and discharge the patient on NSAIDs with appropriate follow-up.

□ Await results of the CT scan.

Case 2, Form A

You are called to the emergency department to admit a 53-year-old woman with urosepsis and shock to the ICU. Her only significant medical history is for prior UTIs. In the emergency department, a 20-gauge IV line was inserted in each hand, and ampicillin, gentamicin, and 5 L of normal saline solution were administered. She remained hypotensive (BP, 70/30), and a norepinephrine infusion was started by the emergency department physician. At the time of your evaluation, her physical examination is remarkable for fever (temperature, 102.3°F), diaphoresis, and hyperdynamic circulation. Pertinent laboratory results are as follows: UA, WBCs TNTC; creatinine, 1.7; WBCs, 17,000; HCT, 23%; platelets, 37,000; INR, 2.4; PTT, 47; and fibrinogen, 28. You interpret these results as being consistent with urosepsis and DIC. For religious reasons, she refuses transfusions of any kind. At this point you would:

□ Continue current therapy and admit the patient to the ICU.

□ Place a central venous catheter and admit the patient to the ICU while receiving current therapy.

Case 2, Form B

You are called to the emergency department to admit a 53-year-old woman with urosepsis and shock to the ICU. Her only significant medical history is for prior UTIs. In the emergency department, a 20-gauge IV line was inserted in each hand, and therapy with ampicillin, gentamicin, and 5 L of normal saline solution was administered. At the time of your evaluation, she remains hypotensive (BP, 70/30), and her physical examination is remarkable for fever (temperature, 102.3°F), diaphoresis, and a hyperdynamic circulation. Pertinent laboratory results are as follows: UA, WBCs TNTC; creatinine, 1.7; WBCs, 17,000; HCT, 23%; platelets, 37,000; INR, 2.4; PTT, 47; fibrinogen, 28. You interpret these results as being consistent with urosepsis and DIC. For religious reasons, she refuses transfusions of any kind. At this point you would:

□ Begin a norepinephrine infusion and admit the patient to the ICU.

□ Place a central venous catheter, begin a norepinephrine infusion, and admit the patient to the ICU.

Case 3, Form A

You are rounding on a 43-year-old woman with sepsis and respiratory failure who has been in the ICU for 1 day. She is receiving enteral feeding by means of a small-caliber orogastric tube. You have recently become aware of a randomized controlled trial that enrolled 300 patients with sepsis to receive either tube feeding or placebo (a sham feeding tube that ends blindly in the pharynx) during their ICU stay. In this trial, there was a 10% absolute increase in mortality in the group randomized to receive true tube feeding. This difference was statistically significant ($p = 0.045$). The placebo (sham tube feeding) group had a statistically significant 8% absolute increase in the rate of nonfatal sepsis. Your current patient was similar to patients in this trial and would have met the inclusion criteria. Regarding the current patient you would:

□ Continue tube feeding.

□ Discontinue the tube feeding.

Case 3, Form B

You are rounding on a 43-year-old woman with sepsis and respiratory failure who has been in the ICU for 1 day. You are trying to decide whether to initiate enteral feeding via small-caliber orogastric tube. You have recently become aware of a randomized controlled trial that enrolled 300 patients with sepsis to receive either tube feeding or placebo (a sham feeding tube that ends blindly in the pharynx) during their ICU stay. In this trial, there was a 10% absolute increase in mortality in the group randomized to receive true tube feeding. This difference was statistically significant ($p = 0.045$). The placebo (sham tube feeding) group had a statistically significant 8% absolute increase in the rate of nonfatal sepsis. Your current patient was similar to patients in this trial and would have met the inclusion criteria. Regarding the current patient you would:

□ Initiate tube feeding.

□ Not initiate tube feeding.

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