

# Expert Witness Blinding Strategies to Mitigate Bias in Radiology Malpractice Cases: A Comprehensive Review of the Literature

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Like all physicians, radiologists in the United States are subject to frequent and costly medical malpractice claims. Legal scholars and physicians concur that the US civil justice system is neither precise nor accurate in determining whether malpractice has truly occurred in cases in which claims are made. Sometimes, this inaccuracy is driven by biases inherent in medical expert-witness opinions. For example, expert-witness testimony involving “missed” radiology findings can be negatively affected by several cognitive biases, such as contextual bias, hindsight bias, and outcome bias. Biases inherent in the US legal system, such as selection bias, compensation bias, and affiliation bias, also play important roles. Fortunately, many of these biases can be significantly mitigated or eliminated through the use of appropriate blinding techniques. This paper reviews the major works on expert-witness blinding in the legal scholarship and the radiology professional literature. Its purpose is to acquaint the reader with the evidence that unblinded expert-witness testimony is tainted by multiple sources of bias and to examine proposed strategies for addressing these biases through blinding.

**Key Words:** Observer performance, observer bias, medical malpractice, expert-witness blinding, blinded peer review

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The burdens of medical malpractice liability, including the cost of insurance, along with the inconvenience, time, and psychological toll of defending claims, remain of primary concern for radiologists [1]. The associated fear drives “defensive” medicine, which inflates medical costs without increasing value [2] and undermines quality by increasing false positives, unnecessary exams, and exposure to radiation [3].

Few radiologists would disagree that compensation should be given to a patient who receives negligent care.

However, the malpractice liability system is subject to error: It pays some patients when no malpractice occurs, and fails to pay other patients when malpractice does occur [4]. Typical reforms, such as damage caps and shorter limitation periods, generally reflect a zero-sum political game rather than any real improvement in systemic accuracy.

Expert witnesses are key to the system of establishing liability, but biases negatively influence the accuracy of expert-witness opinions [5]. Proposals to address this bias through blinding have gained momentum among legal scholars; at the same time, several radiologists and physician defenders have authored strikingly similar proposals [6-8]. The current paper reviews the major works on expert-witness blinding throughout the medical, legal, and scientific literature. Its purpose is to explore the evidence that unblinded expert-witness testimony is tainted by multiple sources of bias and examine proposed strategies for addressing these biases through blinding.

## THE ROLE OF RADIOLOGY EXPERT-WITNESS TESTIMONY IN THE US SYSTEM OF JUSTICE

Malpractice claims in diagnostic radiology can take many forms, including observer errors, interpretation

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errors, failures to recommend appropriate follow-up testing, and failures to properly communicate clinically relevant results [9-11]. So-called “missed findings” [12-14] constitute the majority of claims [11]. The difficult question for the fact-finder in these cases is to determine whether a particular “undetected finding” was in fact negligent, meaning below the standard of care of a reasonably prudent radiologist under similar circumstances [15].

The fact-finder is typically a lay person; thus, they can only render such a decision based on expert testimony. Given the adversarial nature of the current judicial system, the fact-finder sees a battle of partisan experts in almost every case [16]. Each is selected by, affiliated with, compensated by, and apparently biased toward a particular party. The review provided in the current paper focuses primarily on biases that affect the assessment, by an expert witness, of whether failure to detect a given finding constituted negligence.

## SOURCES OF BIAS INHERENT IN STATUS QUO EXPERT-WITNESS TESTIMONY

Although many potential biases may affect expert witnesses, the current discussion is confined to those most relevant to radiology. First, consideration is given to biases affecting the visual and cognitive perception of radiologists; then, systemic biases related to the US legal system’s current methods of procuring expert opinions are explored.

### Informational Biases

At least three biases are caused by the reviewing radiologist having access to information that the defendant radiologist did not have. First, of course, is the fact that the defendant radiologist did not know that the particular case would lead to litigation. Although no consensus term for this bias exists in the literature, here, the term “contextual bias” is used to refer to the unavoidable changes in attention level and diagnostic threshold setting that occur when a reviewer has knowledge that a case is of medicolegal consequence [15]. This point is perhaps most succinctly articulated by one radiology expert witness quoted by Berlin: “I have never had an attorney bring me a normal radiograph” [17].

This contextual bias is similar to the concept of “expectation bias” or “experimenter’s bias,” which refers to cases in which readers who are interpreting images in scenarios in which prevalence expectations are higher, such as in research studies [18], are unable to resist unconsciously adjusting their internal diagnostic thresholds to ensure detection. Regardless of what it is called, the result of this sort of bias is to increase observer sensitivity at the cost of specificity [19,20]. Contextual bias may thus increase the likelihood that an expert will determine that an undetected finding was negligent.

Likewise, of course, the defendant radiologist did not know that the specific finding in question was present. “Hindsight bias” describes the tendency of radiologists to overestimate the conspicuity of specific findings once they are aware of their presence, despite conscious attempts to discount the impact of their knowledge and review the case “with fresh eyes.” For example, a recent study by Erly et al [21] showed that radiologists were significantly more likely to detect strokes via CT when they had a priori knowledge that an MRI had already shown evidence of a stroke [21].

Decades of earlier studies on the impact of hindsight bias on radiographic misses resulted in similar conclusions [17]. For example, dedicated thoracic radiologists interpreting chest radiographs as part of an early lung cancer screening trial found that 75% of newly diagnosed perihilar cancers could be retrospectively identified on early radiographs but had initially gone undetected [22]. Similarly, in cases of proven head and neck cancers, an academic neuroradiologist with full access to recent multidisciplinary clinical records retrospectively identified “misses” in 41% of original CT and MRI interpretations [23]. In fact, the issue of radiology malpractice was a motivating factor for a landmark study of visual hindsight bias in the cognitive science literature by Harley et al [24], who verified across disciplines that observers consistently both underestimate the effect of hindsight bias and overestimate the conspicuity of visual signals to naive observers.

The defendant radiologist also did not know ahead of time that the patient would have a poor outcome, possibly including death. “Outcome bias” refers to the impact of a priori knowledge of the severity of injury sustained as a result of the undetected finding [25]. For example, although juries are explicitly instructed to ignore the outcome of the case, evidence shows that damages are more likely to be awarded in cases in which outcomes are worse [26]. Similarly, expert witnesses are more likely to conclude that negligence occurred when they are told that the patient had a poor outcome [27].

### Litigation Biases

Four types of bias arise from the current way in which expert witnesses are selected, paid, and affiliated. “Selection bias” is the most important source of expert-witness bias inherent within an adversarial system. As one scholar explains, attorneys “can ‘informally consult’ with a dozen experts (a non-discoverable activity), retain the five experts who seem most promising (a generally non-discoverable activity), and, finally, at the last available date, designate the one of these five whose opinion is most favorable as an expert witness” [16]. These “scouting” conversations are protected by attorney/client privilege, and a related “attorney work product” privilege, and thus are not disclosed to the other side or admissible in court [28]. The other less-favorable

opinions then never come to the attention of the fact-finders. The attorneys typically coach the expert, and even script their answers to difficult questions, for this performance.

A related type of bias, termed “undersampling bias,” results from the fact-finder making a decision based on the testimony of only 2 experts, a number which may poorly represent the field of expert opinion. Suppose that for a given case, just 10% of radiologists would state that missing the finding constitutes negligence (or vice versa). At trial, the jury will hear from experts hand-picked by both the plaintiff and the defense, and thus receive a 50–50 signal rather than the 90–10 distribution of true opinions. The selection bias inherent within an adversarial system thus assures that minority expert opinions have the potential to be profoundly overweighted.

“Compensation bias” acknowledges that receipt of payment from a known, interested party likely causes some expert opinions to shift toward the preferences of the sponsor. Although expert witnesses are not paid based on the outcome of the case, they do understand that an unfavorable opinion is less likely to result in additional expert-witness work [29]. An unfavorable opinion eliminates the possibility that the expert will be designated for deposition testimony in the given case, and reduces the likelihood that the attorney may call again for future cases.

“Affiliation bias” arises from the expert effectively joining the litigation team of one side, adopting its priorities, values, and frame of mind. The mechanism for this bias lies in the many unseen and undocumented interactions between a partisan lawyer and an expert, which can have the collective effect of biasing the expert’s opinion, sometimes undetectably. The attorney who calls upon the radiological expert will often state her own view on the case, asking the expert to confirm or disconfirm her hypothesis. Plausibly, such an elicitation method causes experts to “ignore information that does not support their hypotheses, interpret ambiguous information as supporting their hypotheses, or . . . not consider whether information supports alternative hypotheses” [30]. In a survey of expert witnesses, 77% agreed with the statement that “[l]awyers manipulate their experts to weaken unfavorable testimony and strengthen favorable testimony” [31]. In addition, some experts and court rules allow the attorneys to actually write the expert’s report, and attorneys typically coach their experts prior to deposition and trial testimony, and even script answers to difficult questions, for this performance.

#### **METHODS FOR EXPERT-WITNESS BLINDING FROM THE RADIOLOGY AND LEGAL LITERATURE**

Within the current litigation system, professionalism, cross-examination of experts, and even judicial exclusion

of the worst experts, are all partial solutions, which have been discussed elsewhere. Court-appointment of neutral experts is another option, which has been proposed often but rarely used, perhaps because it runs contrary to the incentives of an adversarial system.

In recent years, radiologists [6,7], practicing physician defense lawyers [8], and legal scholars [5,32–34] have converged on the idea of blinding expert witnesses to the information that creates the biases discussed earlier. For simplicity, the current discussion of proposed blinding strategies was organized by grouping them together with the classes of bias that each is intended to address.

#### **Case History Blinding to Address Hindsight Bias and Outcome Bias**

Perhaps the most intuitive form of blinding is to withhold from the expert information on the relevant finding and case outcome. Indeed, this is the subject of the majority of blinding proposals from the radiology literature that seek to mitigate the impact of hindsight bias and/or outcome bias [6–8]. The argument could be made that one of the ACR’s guidelines for expert witnesses reflects this insight [35]: “images and other relevant materials reviewed by the expert witness should be original images and other relevant materials utilized by the interpreting or treating physician in the case.” However, whether expert witnesses are actually blinded to the relevant finding and case outcome in practice is unclear.

#### **Context Blinding to Address Contextual Bias**

A more challenging task is that of rendering the expert blind to the medicolegal context of the case in question. Context blinding could involve embedding cases into a radiology workflow resembling the clinical context of the original case. The expert reviewer in this case would be a radiologist who had previously consented to the procedure without being alerted to the presence of each case. Although this form of blinding has not been explicitly suggested as a solution to radiology malpractice, it has been proposed as a form of improved internal quality control in radiology [36]. Elsewhere, context blinding has been successfully applied to the question of medicolegal review within the field of surgical pathology [37].

A potentially more pragmatic solution, previously proposed and demonstrated by Semelka et al [6], would be to have one or more experts review the study in question in the context of reviewing a larger set of studies containing both positive and negative controls. Although this method reduces external validity, it avoids many of the ethical difficulties and logistic hurdles associated with the workflow-integrated blinding.

#### **Panel Review to Address Selection and Undersampling Bias**

Several radiologists have suggested that, rather than relying on 2 hand-picked experts, a more meaningful

test for the standard of care would be to have a panel of expert witnesses furnish blind interpretations of a case [6,7]. The results of the radiologist panel could then be expressed to the jurors in aggregate, eg, as the fraction of radiologists who successfully identified the finding(s) of interest.

The reviewing radiologists may not themselves need to testify. Their opinions could be presented by a single expert-witness radiologist—or even by an expert in cognitive science or visual perception—who expresses an opinion on the standard of care for that particular case as revealed by his multiple-reviewer study. For example, in a proof-on-concept paper published by Semelka et al [6], a panel of 31 radiologists with various levels of specialization interpreted images from a medicolegal case that had resulted in judgment against a radiologist. A panel of negative and positive controls also interpreted the images, without knowledge that any of the cases were of medicolegal interest. The authors found that although the independent reader panel performed well on the control images, very few (<10%) of the radiologists detected image findings in the medicolegal case in which liability had been imposed.

### Intermediaries to Address Selection, Affiliation, and Compensation Bias

Legal scholars have advocated the use of an “intermediary” who would prevent direct contact between partisan lawyers and potential expert witnesses until a formal opinion on the case has been rendered [5]. Using this model, the expert reviewers could be blinded to the source of their payment. The attorney specifies the expert’s qualifications and provides the relevant radiological images. The intermediary locates the reviewer or reviewers who meet the criteria and agree to testify for either side, depending on the merits

of the case. Ideally, the intermediary would use an unbiased selection method, such as random draws from a pool of experts.

The intermediary then provides the case facts to the expert, without divulging the identity of the client. The expert confirms that she has all necessary information and produces a written report of her opinions, which is returned via the intermediary to the attorney. The attorney chooses whether to disclose and proceed with the blinded expert. If so, because the core opinion is “locked down” in writing, the attorney can prepare the expert for deposition without affecting that opinion, paying for additional expert time per normal procedures.

### Mandatory Nondisclosure Waivers to Address Selection Bias

What prevents an attorney from showing a case with a subtle undetected finding to 20 blinded experts, selecting the one who saw the finding, and presenting that “blinded” opinion to the jury? Fortunately, within the doctrines of attorney-client privilege and work-product protection, a legal device called “waiver doctrine” precludes such gamesmanship [28]. In short, litigants cannot claim that the expert was immune from selection bias while at the same time hiding the facts that would be necessary to test that claim.

Thus, litigants remain free to use unblinded experts (thus making the procedure riskless), but hand-picked experts cannot be paraded as if they were blinded. Any litigant presenting expert-witness testimony would be forced to either concede that their witness selection method was prone to selection bias or—if they maintained it was not—disclose the result of all other blinded expert consultations (including unfavorable ones). This doctrine has already been recognized in many similar legal contexts [28].

**Table 1.** Major forms of bias that affect expert-witness testimony in radiology malpractice cases, along with blinding strategies suggested to address each of them

Bias type	Definition	Relevant blinding strategies
<b>Legal systemic</b>		
Selection and undersampling bias	Bias introduced by the selection of single expert opinions by a partisan attorney who may be “shopping” for a specific opinion	Use of an intermediary Waiver doctrine Panel review
Compensation bias	Bias introduced by the act of being paid by the claimant or defendant	Use of an intermediary
Affiliation bias	Bias introduced by the cumulative effect of many small interactions and exchanges between the expert and the partisan attorney	Use of an intermediary
<b>Observer</b>		
Contextual bias (a.k.a. expectation bias, experimenter’s bias)	Bias introduced by the expert knowing that the case likely has a positive finding	Context blinding
Hindsight bias	Bias introduced by knowing that a specific finding is present	Case-history blinding
Outcome bias	Bias introduced by knowing the severity of the injury sustained as a result of a missed finding	Case-history blinding

## FEASIBILITY OF PROPOSED BLINDING STRATEGIES

Some methods of blinding, such as withholding information about the severity of the outcome, are relatively easy. Others may require more planning and investment. Legally, no changes are necessary, because fact-finders are already instructed to consider the credibility of expert witnesses and the potential for bias, and blinding is just an enhancement along that dimension.

Financially, there will be a cost for intermediaries (say a few hundred dollars per case), and an even greater cost for panel reviews. Panel review may be feasible, if the opinions are rendered in regular clinical workflows. Standard relative value unit–based rates are quite low, compared to expert-witness hourly fees.

On the benefits side of the ledger, randomized experiments with mock jurors suggest that blinded experts are more persuasive than traditional “hired gun” experts, increasing the odds of the side with a blinded expert winning the case [38]. So, in a case with hundreds of thousands of dollars on the line, if it shifts the chance of winning by only a few percent, and thereby shifts settlement values, blinding may offset its costs. Unlike court-appointment, blinding may also serve as a rational strategy in an adversarial system for self-interested litigants, and thus may see greater use.

## TAKE-HOME POINTS

- Expert-witness testimony regarding “missed” radiology findings is tainted by cognitive biases as well as biases inherent in the US legal system (see Table 1).
- Cognitive biases result from the expert having access to information that the original radiologist did not possess, and can be mitigated by blinding the expert to this information prior to their rendering an opinion.
- Biases inherent in the US legal system relate chiefly to its adversarial nature and can be overcome through the use of an intermediary who prevents direct affiliation between the expert and the partisan attorney of either side prior to the rendering of an expert opinion.
- Undersampling bias relates to the overweighting of certain opinions and can potentially be addressed by having panels of radiologists render opinions on each case.
- All of the blinding methods reviewed here are compatible with existing laws and have no known legal barriers to immediate use, although from a feasibility standpoint, some methods are easier to implement than others.

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