

## Determining Whether Medical Causation Is Established

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### Using Statistical Analysis

To prove medical malpractice liability, the plaintiff must establish through competent expert testimony that, to a reasonable degree of medical probability, his or her injury was caused by the defendant's negligence. To have evidentiary weight, an expert's medical causation opinion must be supported by an adequate foundation demonstrating why the expert is reasonably certain that probable cause exists. What does this standard of proof mean, and how can we gain a better understanding of statistical analysis help to determine when the standard for proving medical causation has, and has not, been met?

#### 'Medical Certainty' Versus 'Probable Causation'

Medical malpractice is a form of professional negligence. To recover damages for medical malpractice, causation in some jurisdictions must be proved by a preponderance of the evidence; *i.e.*, the plaintiff must present sufficient evidence from which the jury can find there was a "reasonable medical probability" (at least a 51% chance), and that the defendant's breach of his or her duty of care caused the damages the plaintiff seeks to recover. *See, e.g., Nelson v. County of Los Angeles* (2003) 113 Cal.App.4th 783, 792, fn. 7.

Since medical causation is generally beyond the common knowledge of lay jurors, expert testimony is ordinarily required to satisfy this burden of proof. *Jennings v. Palomar Pomerado Health Systems, Inc.* (2003) 114 Cal.App.4th 1108, 1118 ("In a medical malpractice action ... '[t]he law is well settled that ... causation must be proven within a reasonable medical probability based [on] competent expert testimony"). Moreover, some degree of medical certainty must support an expert's opinion testimony, otherwise it has no evidentiary weight. *Id.* at pp. 1117-1118; *see also* Evid. Code, § 801, subd. (b). Thus, even though absolute certainty is not required to prove medical causation (*e.g., Nelson supra*, 113 Cal.App.4th at p.792, fn. 7), the concept of "certainty" is important when an expert is testifying about probable causation. For example, where an expert testifies that medical causation probably exists, the expert must be reasonably certain of that opinion. *Maxwell v. Powers* (1994) 22 Cal.App.4th 1596, 1601 ("[Dr.] Orloff opined *there was a better than 90% probability, to a reasonable medical certainty*, that the kidney could have been saved had kidney surgery been performed on the day Maxwell was admitted to Scripps Hospital" (emphasis added)).

It is therefore important to examine expert witnesses to determine whether their opinions regarding medical causation are supported by an adequate foundation. In particular, an expert's opinion regarding a high degree of probable causation must be founded in reasonable certainty before such testimony has any evidentiary weight.

#### Understanding Statistical Confidence

In statistical terms, "confidence" reflects the degree of certainty that a particular outcome can be predicted. In one case, for example, a plaintiff who suffered a spinal injury sued her treating physician for failing to administer a particular steroid treatment, which allegedly would have prevented her partially transected spinal cord from becoming completely transected. The plaintiff alleged that she would not have been ventilator-dependent (needing 24/7 nursing care) had the steroids been promptly administered. Citing to a particular medical study, the plaintiff's

medical expert testified he was "95% certain" that, had the steroids been administered, the cord would not have completely transected and the plaintiff would not have been ventilator-dependent.

The medical study cited by the plaintiff's expert actually showed, to a statistical confidence of 95%, that there was a 53% likelihood the steroid treatment would be effective for spinal injuries. The expert's testimony, while technically correct, was highly misleading since it suggested there was a 95% chance that steroids would have been helpful when, in fact, there was only a 53% chance that steroids would have made a difference. Effective cross-examination could have clarified this testimony by forcing the expert to admit, based on the very study he cited, that he was only 95% sure that there was a 53% that steroids would have prevented the spinal cord from becoming completely transected.

Statistical analysis can be used to test the certainty of an expert's testimony. For example, suppose an expert testifies he or she is 99% sure there is at least a 75% chance that a particular test or therapy would lead to a particular result. Statistical analysis — using the formula for calculating the number of observations required for a 99% confidence interval (where there is only a small random sample of a large population) — suggests that the expert's testimony may not be credible if his or her opinion is based on fewer than 1875 observed cases. (The formula for determining the standard error of a proportion (for a small random sample of a large population) is  $\sigma_p = (pq/n)^{1/2}$  where  $\sigma_p$  is the standard error of the population,  $p$  is the probability of a success,  $q$  is the probability of a failure, and  $n$  is the number of observations. Plugging this testimony into the above formula:  $0.01 = (0.75*0.25/n)^{1/2}$  and solving for  $n$  yields 1875 observations. This means that, if the expert has observed fewer than 1875 cases, then his or her testimony about being 99% confident may not be credible — though a more precise statistical analysis (by an appropriate expert) is needed to determine the actual confidence level under the circumstances.)

Proving that the expert's causation opinion is not credible based on the foundation for that opinion may require the testimony of a statistician. However, as shown in the examples below, subjecting expert testimony to rigorous foundational examination and statistical analysis may be critical to establishing a causation defense, especially in cases involving a series of statistically dependent events linking the alleged malpractice and the plaintiff's injury.

### **The Joint Probability of Statistically Dependent Events**

Many malpractice cases involve a series of statistically dependent events, such as delayed diagnosis cases where the defendant was allegedly negligent for failing to administer a test that could have lead to an earlier diagnosis and treatment of a disease when the odds of successful treatment were greater. The event of "treatment" is statistically dependent on the event of "diagnosis," since a patient would not receive treatment for a disease until that disease has been diagnosed. In such cases, an analysis of the joint probability of statistically-dependent events (*i.e.*, diagnosis and treatment) is an important tool for countering proof of medical causation.

The rule for determining the joint probability of statistically dependent events is stated as follows: The probability that statistically dependent events A and B will happen in succession is determined by multiplying the probability that event A will happen by the probability that event B will happen, given that event A has already happened. *See, e.g.*, Levin & Rubin, *A Short Course in Business Statistics* (1983) pp. 106-107; Aczel & Sounderpandian, *Complete Business Statistics* (5th ed. 2002), p. 85; *Brzoska v. Olson* (Del. 1995) 668 A.2d 1355, 1361, fn. 6.)

As shown in the following examples, application of this rule may demonstrate that there is no credible proof of medical causation in a given case.

#### ***Example 1: Patient v. Efficient Medical Group***

Suppose the patient alleges he would have had a better outcome if the defendants had not negligently failed to diagnose his cancer when it was at stage one. The patient's expert testifies that the defendant's physicians "probably" would have diagnosed the patient's stage-one cancer if they had ordered additional chest x-rays as required by the standard of care. This testimony supports a jury finding that there was a 51% likelihood of a stage-one diagnosis, but it does not support a finding of a greater than 51% chance of a better treatment outcome. The reason this is so is that the patient's expert testified that, had the patient received treatment when his cancer was in stage one, "he had a roughly 60% chance of living five years or longer." Thus, the evidence actually establishes only that the patient lost a 30.6% chance of survival as a result of the defendants' alleged negligence (a 51% chance of a stage one diagnosis times a 60% chance of a better outcome with treatment beginning in stage one).

In jurisdictions like California, where causation must be proved by a preponderance of the evidence, this case should never get to the jury because the plaintiff cannot prove causation. In jurisdictions like Nevada, where plaintiffs may recover damages for the "lost chance" of a better outcome, application of the joint probability of statistically dependent events rule should result in a greatly diminished recovery.

Graphically, the causation analysis for this scenario appears as shown in the first chart below.

### ***Example 2: Plaintiff v. Friendly Medical Group***

As shown in the following example, causation becomes even harder to prove when there are multiple statistically dependent events in the causal chain.

The plaintiff in this example filed a lawsuit alleging that a physician's negligence caused a delay in the diagnosis of cancer, delaying diagnosis until it was no longer treatable. However, the alleged causal chain of events in this case was even longer than in the prior example. The plaintiff alleged that her physician negligently failed to administer a pap smear, which probably would have been abnormal. She further alleged that an abnormal pap smear result would probably have led to a colposcopy, the results of the colposcopy probably would have been unsatisfactory and led to a biopsy, and the biopsy probably would have led to a diagnosis of the plaintiff's cancer at a time when she had a 65% chance of being cured. The plaintiff eventually died of cancer.

Using the doctrine of statistically dependent events to analyze causation, the odds of the plaintiff surviving if she had had a pap smear are determined by multiplying the odds that such a pap smear would have been abnormal times the odds of a follow-up colposcopy being unsuccessful times the odds of her surviving once her disease was diagnosed and treated.

The testimony of the plaintiff's expert that a "pap smear would probably have been abnormal" proves only that 51% of pap smears would have been abnormal. And her expert's testimony that the colposcopy required by an abnormal pap smear "more likely than not" would have been unsatisfactory and led to a biopsy is proof that a biopsy would have been required in 51% of the cases where the pap smear was abnormal, *i.e.*, only 26% ( $.51 \times .51$ ) of the time.

Assuming a biopsy performed in all 26% of such cases would have led to diagnosis and treatment, then 65% of the 26% of biopsy patients would have survived. This means a patient in the plaintiff's condition when the pap smear was allegedly required would survive only 17% ( $.26 \times .65$ ) of the time.

Viewed from another perspective, the plaintiff's causation evidence established that 49% of women in her condition would have had a normal pap smear and received no further treatment. In addition, 49% of the women with abnormal pap smears would have had a satisfactory colposcopy, so no further diagnostic procedures would have occurred. Finally, 35% of those undergoing biopsy procedures and receiving cancer treatment, would have died anyway. In other words, according to plaintiffs' evidence, 83% ( $.49 + .25 + .09$ ) of the time, a patient's having a pap smear would not change that patient's survival outcome.

Graphically, the causation analysis for this scenario appears as shown in the second chart below.

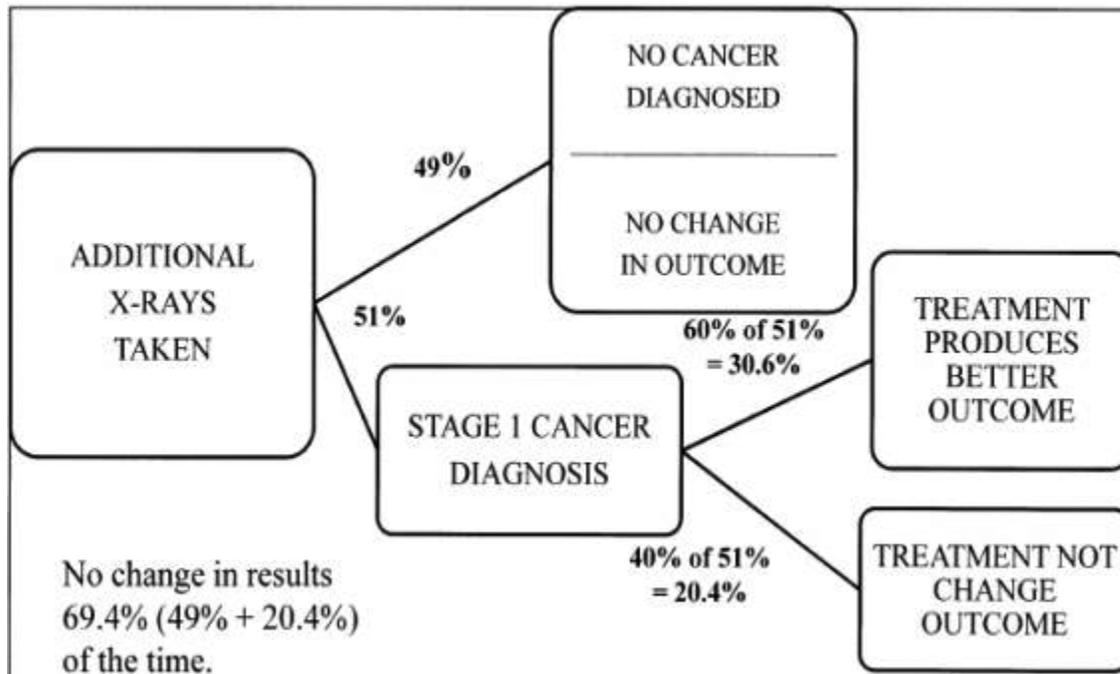
### **Conclusion**

Litigation trends indicate that medical causation issues are becoming more common. Medical institutions are becoming increasingly complex, with many different specialists and other health care providers commonly involved in patient care. System failures, where different participants in the patient's health care fail to communicate effectively or efficiently, are increasing as health care systems become more complex and diversified (while, at the same time, budgets are tightening and patient loads are increasing). In addition, the cost of medical testing continues to increase, which reduces the likelihood of redundant and prophylactic tests. Together, these circumstances may result in medical causation issues in delayed diagnoses cases becoming more common and more complex. Defense counsel must be prepared to confront the statistical aspects of expert testimony when such cases arise.

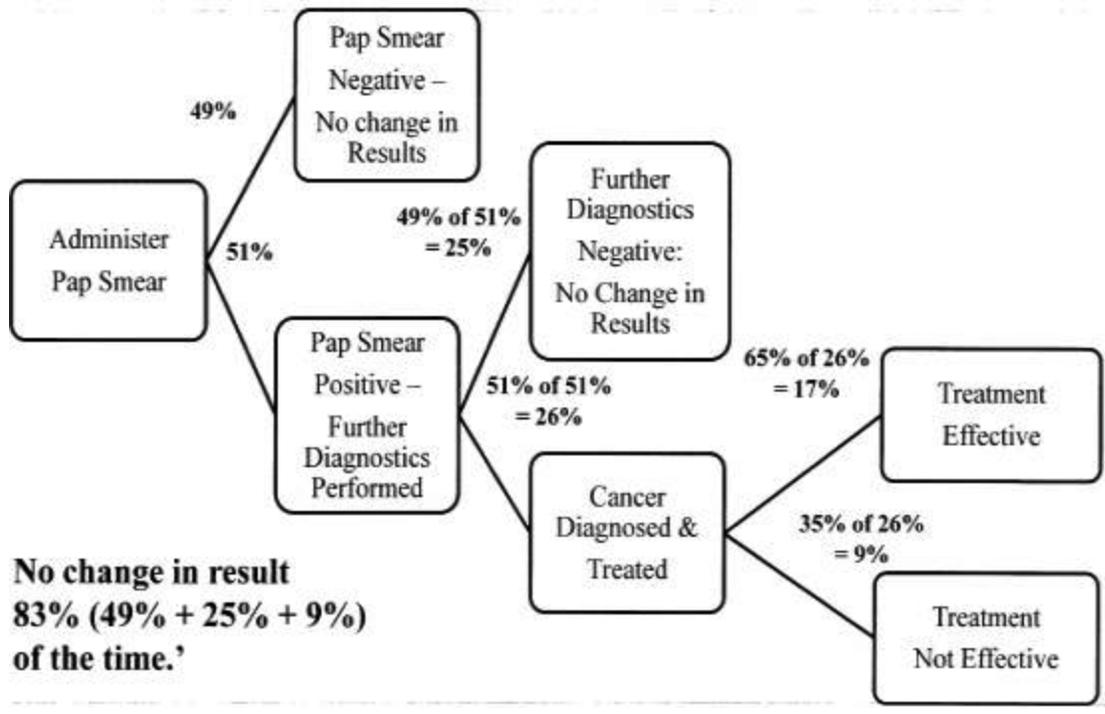
Consequently, counsel defending against medical causation claims should consider doing all of the following:

- Vigorously examine plaintiff's experts on the issue of medical causation, and the foundation for their opinions (including specific medical studies);
- Work with defense experts (including medical experts and, if needed, a statistician) to fully understand whether the plaintiff's causation theory is medically, factually, and statistically sound;
- If appropriate, move for summary judgment on the issue of medical causation, and/or file a motion *in limine* to bar speculative evidence of causation; and
- If appropriate, request a pre-trial hearing to test the validity of plaintiff's medical causation evidence.

**Patient v. Efficient Medical Group**



**Plaintiff v. Friendly Medical Group**



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