Hindsight bias and outcome bias in the social construction of medical negligence: a review

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Journal of law and medicine

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Medical negligence has been the subject of much public debate in recent decades. Although the steep increase in the frequency and size of claims against doctors at the end of the last century appears to have plateaued, in Australia at least, medical indemnity costs and consequences are still a matter of concern for doctors, medical defence organisations and governments in most developed countries. Imprecision in the legal definition of negligence opens the possibility that judgments of this issue at several levels may be subject to hindsight and outcome bias. Hindsight bias relates to the probability of an adverse event perceived by a retrospective observer ("I would have known it was going to happen"), while outcome bias is a largely subconscious cognitive distortion produced by the observer's knowledge of the adverse outcome. This review examines the relevant legal, medical, psychological and sociological literature on the operation of these pervasive and universal biases in the retrospective evaluation of adverse events. A finding of medical negligence is essentially an after-the-event social construction and is invariably affected by hindsight bias and knowledge of the adverse outcome. Such biases obviously pose a threat to the fairness of judgments. A number of debiasing strategies have been suggested but are relatively ineffective because of the universality and strength of these biases and the inherent difficulty of concealing from expert witnesses knowledge of the outcome. Education about the effect of the biases is therefore important for lawyers, medical expert witnesses and the judiciary.

INTRODUCTION

> [H]indsight bias is the greatest obstacle to evaluating the performance of humans in complex systems after bad outcomes.[1]

Medical negligence refers to negligence causing injury in the course of treatment of a patient by a doctor, nurse or other health care worker. In developed countries, prima facie definition by lawyers and medical experts that an injury was due to medical negligence may lead to civil action (usually in tort or contract) and the awarding of damages, disciplinary proceedings or, rarely, criminal prosecution.

There has been a dramatic increase in the cost of medical negligence allegations in the past few decades in countries such as Australia and the United Kingdom: in the latter, annual National Health Service clinical negligence costs rose from £6.33 million in 1975 to £446 million (0.04% of Gross Domestic Product) in 2002.[2] Although the frequency and cost of claims may have plateaued in Australia and the United States in the past five years as a result of tort law reforms, they are still at a

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[1] Cook RI and Woods DD, "Operating at the Sharp End: The Complexity of Human Error" in Bognor MS (ed), *Human Error in Medicine* (Lawrence Erlbaum Associates, Hillsdale, NJ, 1994).

[2] Donaldson L, *Making Amends: A Consultation Paper Setting Out Proposals for Reforming the Approach to Clinical Negligence in the NHS. A Report by the Chief Medical Officer United Kingdom Department of Health* (2003), http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4010641 viewed August 2008.

much higher level than a decade ago. This rise in negligence claims has caused an increase in undesirable "defensive medicine" and has had significant adverse effects on patient safety improvement.[3]

As Dekker[4] points out, the legal characterisation of behaviour as negligent is extremely complex, subject to many judgment calls, and in reality an after-the-event social construction. Those evaluating the behaviour are subject to bias, particularly outcome bias and hindsight bias. There is a low level of awareness of what Dekker describes as the "debilitating effects" of this in most legal systems.[5] The influence of outcome and hindsight bias in the retrospective evaluation of an unintended patient injury extends far beyond the courts. Its all-pervasive effects, eg, may be identified in hospital mortality and morbidity meetings,[6] in quality assurance activities such as root cause analysis, and in pre-trial evaluations of defensibility of negligence claims by medical defence organisations.

METHOD

The present review is confined to examining published evidence about the influence of outcome and hindsight bias in the characterisation of a doctor's role in patient injury in cases where negligence has been alleged in a writ. These biases operate also in criminal prosecution of alleged "gross" medical negligence, but that is not considered in this review. The focus here is on the operation of the Australian judicial system, most specifically in the State of New South Wales, but reference is also made to United Kingdom and United States experience. The authors define (as far as is possible) how "medical negligence" is constructed in a legal setting, identify published data about the nature and effect of hindsight and outcome bias in evaluating medical adverse events and examine, by reference to publicly recorded judgments in specific cases, how these two elements (legal construction and bias) interact at all levels in the assessment of a medical negligence claim.

The evaluation of allegations of negligence against a doctor in a writ usually starts internally in a medical defence organisation with claims handlers and cases committees. After receipt of notification of the writ by a member doctor, defence organisations examine the patient records and interview the defendant doctor, receive expert reports from the plaintiff's lawyers, seek expert reports of their own and make judgments about causation, liability and the probable defensibility of the claim. A confidential negotiated settlement or discontinuance against the defendant is achieved in more than 90% of claims.[7] A similar proportion of closed settlements is reported in the United States.[8] Cases going to trial (and hence subject to public scrutiny and reporting) therefore represent only a small proportion of total claims.

Hindsight and outcome bias are influential in views expressed in medical expert reports[9] but may also directly influence the decisions of claims handlers, plaintiff and defence lawyers, disciplinary tribunals, judges, and other judicial officers, such as coroners and, in the United States, jurors.[10] The biasing effects of hindsight and outcome knowledge must therefore be considered in a wider context than the boundaries of the courtroom. A definition of these biases is necessary.

[3] Hugh TB, "Back to Punishment in New South Wales" (2004) 329 BMJ 1111.

[4] Dekker SWA, *Just Culture. Balancing Safety and Accountability* (Ashgate, Aldershot, 2007).

[5] Hugh TB and Tracy GD, "Hindsight Bias in Medicolegal Expert Reports" (2002) 176 MJA 277.

[6] Henriksen K and Kaplan H, "Hindsight Bias, Outcome Knowledge and Adaptive Learning" (2003) 12 Qual Saf Health Care 46.

[7] Personal communication: MDA National Insurance Ltd, Perth, Australia.

[8] Morris JA, Carillo Y, Jenkins JM et al, "Surgical Adverse Events, Risk Management, and Malpractice Outcome: Morbidity and Mortality Review is Not Enough" (2003) 237 Anns Surg 844.

[9] Hugh and Tracy, n 5.

[10] Lowe DJ and Reckers MJ, "The Effects of Hindsight Bias on Jurors' Evaluations of Auditor Decisions" (1994) 25 *Decision Sciences* 401; Harley EM, "Hindsight Bias in Legal Decision Making" (2007) 25 *Social Cognition* 48.

Hindsight bias

In a landmark study, Fischhoff[11] provided evidence for the pervasive and important cognitive distortion now known as "hindsight bias". It is interesting to note that, although generally credited with drawing attention to the phenomenon, Fischhoff did not use the term "hindsight bias", preferring the description "unperceived creeping determinism". His study demonstrated that finding out that an outcome has occurred increases its perceived likelihood. In other words, a retrospective reviewer, knowing the outcome of an event, may have an exaggerated sense of their own probable ex ante ability to predict it ("I would have known this was going to happen"). Hindsight bias is therefore about the prediction of probabilities of future events. Fischhoff observed that people are usually unaware of this changed perception because they immediately assimilate the outcome knowledge with what they already know about the event in order to make sense of the past. He noted: "[M]aking sense out of what one is told about the past seems so natural and effortless a response that one may be unaware that outcome knowledge has had any effect at all." Subsequent studies in a number of settings have elaborated on these findings.[12] Thirty years later researchers are still investigating hindsight, the most important but incompletely understood bias in psychology.[13]

Berlin[14] suggests secondary gain as a possible partial reason for hindsight bias in medical experts. He attributes the subconscious operation of bias to the expert wanting to appear intelligent and knowledgeable, wanting to be able to accurately predict the future because of a desire to be dogmatic and intolerant to ambiguity, and wanting to maintain a high level of public esteem.

Fischhoff pointed out what he saw to be the undesirable consequences of this bias: "unperceived creeping determinism can seriously impair our ability to judge the past or learn from it."[15] A more sanguine view was expressed by Dekker[16] who, while accepting its effect on event analysis, presented hindsight bias as an advantageous adaptive "ecological utility" which is rational and meaningful not only in helping us make sense of the past but also in preparing for and possibly preventing future failures. This explanation is consistent with the work of Campbell and Tesser,[17] and Hawkins and Hastie,[18] and possibly accounts somewhat for the ubiquitous persistence of hindsight bias in spite of exhortations to reviewers to avoid it.[19] However, notwithstanding any beneficial aspect of hindsight, the closer we approach the rational norm of an uncontaminated ex ante judgment of a past adverse event the more we are likely to assign fairer weights to various factors contributing to the outcome,[20] an obviously desirable aim in deciding whether a doctor's behaviour is deemed negligent.

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[11] Fischhoff B, "Hindsight ≠ Foresight: The Effect of Outcome Knowledge on Judgment under Uncertainty" (1975) 1(3) *Journal of Experimental Psychology: Human Perception and Performance* 288.

[12] Fischhoff B and Beyth R, "'I Knew It Would Happen'– Remembered Probabilities of Once-Future Things" (1975) 13 *Organizational Behavior and Human Performance* 1; Carroll JS, "The Effect of Imagining an Event on Expectations for the Event: An Interpretation in Terms of the Availability Heuristic" (1978) 14 *Journal of Experimental Social Psychology* 88; Hawkins SA and Hastie R, "Hindsight: Biased Judgments of Past Events After the Outcomes are Known" (1990) 107 *Psychological Bulletin* 311; Nario MR and Branscombe NR, "Comparison Processes in Hindsight and Causal Attribution" (1995) 21 *Personality and Social Psychology Bulletin* 1244.

[13] Villejoubert G, "Could They Have Known Better? Review of the Special Issue of *Memory* on the Hindsight Bias" (2005) 19 *Applied Cognitive Psychology* 140.

[14] Berlin L, "Malpractice Issues in Radiology – Hindsight Bias" (2000) 175 Am J Radiol 597.

[15] Fischhoff, n 11.

[16] Dekker SWA, "The Hindsight Bias is Not a Bias and Not about History", *Tech Report 2004-01* (Lund University School of Aviation, 2004), http://www.lusa.lu.se/research/publications viewed June 2008.

[17] Campbell JD and Tesser A, "Motivational Interpretation of Hindsight Bias: An Individual Difference Analysis" (1983) 51 J Personality 605.

[18] Hawkins and Hastie, n 12.

[19] Henriksen and Kaplan, n 6; Smith AC and Greene E, "Conduct and Its Consequences: Attempts at Debiasing Jury Judgments" (2005) 29(5) *Law and Human Behavior* 505; Harley, n 10.

[20] Dekker, n 16.

Outcome bias

Although often conflated with hindsight bias, the term "outcome bias" refers to the influence of outcome knowledge upon evaluations of decision quality,[21] whereas hindsight bias in the strict Fischhoff sense relates to retrospective estimates of the predictability of an event. Outcome bias is particularly likely to occur when physicians make judgments on the appropriateness of care by other physicians, as in the evaluation of simulated outcomes by anaesthesiologists described by Caplan, Posner and Cheney.[22] These authors demonstrated that not only the *harshness* of judgments, but also the *willingness* to make judgments, was increased when there was a severe outcome. Outcome bias is thus the more important bias in relation to medical expert reports in negligence claims. Medical reviewers' judgments are also distorted by hindsight; Arkes et al[23] noted that "[in conducting a retrospective analysis] many clinicians tend to overestimate the magnitude of functional relationships or infer an illusionary correlation".

"NEGLIGENCE" AS A SOCIAL CONSTRUCTION

One needs look no further than the constantly changing nature of the law for evidence that legal definitions are social constructions that vary with time and place. In the United Kingdom and Australia, negligence in any field, including health care, is defined by common law. Statutes modify the common law from time to time and the effect of the statutes in turn is modified by subsequent judicial decisions. In Australia, judgments about whether a doctor has been negligent are usually made in civil cases by a judge under an adversarial system, with plaintiff and defence lawyers calling their own medical expert witnesses. Juries are used in Victoria and in the United States.[24] The legal concept of medical negligence is therefore subject to ongoing modification by judicial precedent and statute modification in response to community and political pressures.[25]

In Australia, each State and Territory has its own set of statutes which further specify the meaning of negligence. Professional negligence (which includes medical negligence) is given a general definition of "failure to exercise reasonable care and skill". As Devlin said: "Negligence in law ranges from inadvertence that is hardly more than accidental to sinful disregard of the safety of others."[26] This definitional imprecision was the basis of the observation of the Negligence Review Panel,[27] chaired by Justice Ipp, that "the common opinion in Australia was that the law of negligence is unclear and unpredictable". Criticism of the "imprecision" of these definitions has also come from judges.[28]

The *Civil Liability Act 2002* (NSW) (the Act), incorporating the recommendations of the New South Wales Negligence Review Panel, appears to define "professional" negligence (including medical negligence) by exception (saying what it is not, rather than what it is) in s 5O of that Act, which states:

> (1) A person practising a profession ("a professional") does not incur a liability in negligence arising from the provision of a professional service if it is established that the professional acted in a manner that (at the time the service was provided) was widely accepted in Australia by peer professional opinion as competent professional practice.
>
> (2) However, peer professional opinion cannot be relied on for the purposes of this section if the court considers that the opinion is irrational.

[21] Baron J and Hershey JC, "Outcome Bias in Decision Evaluation" (1988) 54(4) Journ Pers Soc Psychol 569; LaBine SJ and LaBine G, "Determinations of Negligence and the Hindsight Bias" (1996) 20 *Law and Human Behavior* 501.

[22] Caplan RA, Posner KL and Cheney FW, "Effect of Outcome on Physician Judgments of Appropriateness of Care" (1991) 265 JAMA 1957.

[23] Arkes HR et al, "Hindsight Bias Among Physicians Weighing the Likelihood of Diagnoses" (1981) 66(2) J Appl Psychol 252.

[24] Harley, n 10.

[25] Drabsch T, "Medical Negligence: An Update", *NSW Parliamentary Library Research Service* (2004), http://www.parliament.nsw.gov.au/prod/parlment/publications.nsf/key/ResearchBf022004 viewed July 2008.

[26] Devlin P, *The Enforcement of Morals* (Oxford University Press, Oxford, 1987).

[27] *Final Report of the Negligence Review Panel* (Commonwealth of Australia, Canberra, 2002) p 25.

[28] Goldring J, "The Civil Liability Act 2002 (NSW)" (2003) 6 *Judicial Review* 280.

(3) The fact that there are differing peer professional opinions widely accepted in Australia concerning a matter does not prevent any one or more (or all) of those opinions being relied on for the purposes of this section.

(4) Peer professional opinion does not have to be universally accepted to be considered widely accepted.

It appears that s 5O is intended to operate as a defence and represents a modified *Bolam* principle. That view was expressed by the New South Wales Negligence Review Panel and was affirmed in *Dobler v Halverson* (2007) 70 NSWLR 151; [2007] NSWCA 335.

As in the common law definition of negligence, once again there is, in the New South Wales legislation, not precision but definitional migration, transferring the onus of definition to medical "peers" (how are they defined?) and largely leaving to them the difficult task of interpreting "widely" and "competent". The struggle of the legislators to impart precision seems in vain, an unsurprising outcome: precision will always remain a mirage because of the constructionist nature of the concept of negligence. Demands for more precise definitions of negligence do nothing to advance the fairness of legal outcomes; this is more likely to be achieved by a deeper understanding by medical experts and the judiciary of the inherent biases that operate in the construction of a negligence verdict.

As if in recognition of this imprecision, the Act (and common law) saddle the judge (and in Victoria, juries) with the responsibility for which expert opinion(s) to accept. Section 5O(2) of the Act gives judges freedom to reject medical opinions if they are considered "irrational" and s 5O(3) provides the judge with the ability to cherry-pick among opinions to suit the judge's own views and biases. While it is prudent for the judge to provide reasons for these choices to forestall being overturned on appeal, appellate courts (in Australia at least) are generally reluctant to reject the assessment of witnesses unless the trial judge has patently failed to enter fully into the issues in dispute between the experts.

The legal standard of proof that negligence has occurred in civil cases is "on the balance of probabilities", a less rigorous requirement than the "beyond reasonable doubt" of criminal matters. The "burden of proof" in common law is on the person alleging negligence. A successful claim for medical negligence in the United Kingdom and Australia requires proof of three elements:[29]

- A duty of care: this is seldom at issue in medical negligence claims and will not be considered further in this review.
- Departure from an accepted standard of care: was the care in accord with the opinion widely held by a significant number of respected practitioners? In weighing this, the court is required by statute to apply the supposed standards in place at the time of the event. In New South Wales the court may reject the expert views if it considers them "irrational".
- Consequent damage (causation): whether the negligence actually caused the harm. This generally relies on the "but for" test – "but for this action (or failure to act) the injury would not have occurred".

THE EFFECT OF OUTCOME BIAS AND HINDSIGHT BIAS IN THE LEGAL DETERMINATION OF LIABILITY

Standard of care

In New South Wales, negligence requires proof that the defendant doctor did not act in a manner that (at the time the service was provided) was widely accepted in Australia by peer professional opinion as competent professional practice. This indicates the pivotal role of peer medical expert opinions in court decisions, but is also the yardstick by which claims handlers, defendant lawyers and defence organisations make decisions about whether to defend a claim of negligence or negotiate a settlement.

Assessment by an expert as to whether medical care met "standards" generally accepted by peers at the time of a past adverse event is therefore the difficult and contestable core of most medical negligence claims and is the arena in which hindsight exerts its most pervasive and unrecognised

[29] Kerridge I, Lowe M and McPhee J, *Ethics and Law for the Health Professions* (Federation Press, Sydney, 2005).

influence. The complexity of the expert's task is increased not only by the requirement to take into account past benchmarks but also the standard appropriate to a particular doctor, a particular level of training, a particular specialty and the particular circumstances of practice in a given case. A general practitioner operating on a patient in a remote rural setting, eg, is likely to be held to a lower standard than a super-specialist surgeon in a teaching hospital. This focus on a case-specific standard was exemplified in *Rogers v Whitaker* (1992) 175 CLR 479, where the duty of care was held to be that of an ophthalmic surgeon specialising in corneal and anterior segment surgery.

Hindsight bias is generally greater in plaintiff expert reports than in defendant ones. This is because of the superimposed effect of *commissioning bias* – the often only partially conscious desire of the expert to support the case of the party paying her or his fee.[30] There is a realistic and resigned acceptance by many judges that commissioning bias is an ineradicable by-product of the adversarial system.[31] The plaintiff expert is therefore influenced to emphasise the role of the defendant doctor in producing the adverse outcome, whereas a defendant expert is more likely to attempt to understand the "sense-making"[32] behind the medical decisions. These biases operate despite court rules which require expert witnesses to sign an undertaking to give an objective opinion.

Are medical expert witnesses objective?

The realities of the role of the expert witness in negligence cases in an adversarial system are far removed from the legal ideal of "objectivity". The Hon Justice HD Sperling, a judge of the New South Wales Supreme Court with long experience at the Bar, described the situation this way:[33]

> [They] … assume that the expert witness is there to help the court. They do not recognise the practicalities of litigation under the adversarial system. Under that system, all evidence is selective, and it is selected on the basis of what will help the party to win, not on the basis of whether it will help the court to find the facts correctly. Indeed, the reliability of expert evidence is antipathetical to the interests of the litigant except where reliability and interest coincide by accident.
>
> Under the adversarial system, the opposing party is relied upon to disclose the falsity of the other side's evidence by cross-examination or evidence to the opposite effect. That sometimes happens but it may not happen, particularly when the other side's case is just as extravagant in the opposite direction.
>
> The actual role of the expert witness, particularly in major litigation, is that the expert is part of the team. He – it usually is a "he" – contributes to the way the case is framed and indirectly to decisions as to what evidence is to be got in to provide a basis for his opinion. His report is honed in consultation with counsel. Then, when it comes to the trial, he is a front line soldier, carrying his side's argument on the technical issues under the fire of cross-examination.
>
> Natural selection ensures that expert witnesses will serve the interests of their clients in this way. If the expert measures up he will be kept on and he will be used again by the same client, the same solicitors and others. If he does not measure up, he will be dropped from the case or never used again by anyone. He then disappears from the forensic scene.

Such partisanship indicates the crucial role of medical experts in the construction of "negligence", and opens wide vistas for the free play of outcome and hindsight bias. It is common to observe in plaintiff expert reports the use of the phrase "it should have been obvious", an expression considered by Cook and Woods[34] to be diagnostic of hindsight bias. Plaintiff experts may even go to the extent of constructing in hindsight what they consider *must have been* the clinical findings which presented to the defendant doctor, despite the absence of a record of any such findings in the clinical notes, as the

[30] Tracy GD, "Commissioning Bias", *Australian Doctor* (7 April 2004).

[31] Sperling HD, "Expert Evidence: The Problem of Bias and Other Things", New South Wales Supreme Court Annual Conference, 1999), http://www.lawlink.nsw.gov.au/lawlink/supreme_court/ll_sc.nsf/pages/SCO_speech_sperling_030999 viewed July 2008.

[32] Weick KE, *Sensemaking in Organizations* (Sage, London, 1995).

[33] Sperling, n 31.

[34] Cook and Woods, n 1.

following extract from a claims summary describes:[35]

> The claimant's expert, Professor M, assumes that the neurological deficiency *must have been observable* under clinical examination of the claimant when our Member examined him at 1400 on 23 February.

The relationship between courts and medical expert witnesses has always been an uneasy one. In the United Kingdom and Australia for almost half a century the so-called *Bolam* test[36] was the yardstick for medical negligence – a doctor was not negligent if a body of "responsible" medical opinion (even a minority) approved of her or his actions. Under this principle, the courts generally accepted medical opinion as conclusive, but in the past decade judges have moved to regain their primacy in deciding about negligence (if they had ever lost it) in cases such as *Rogers v Whitaker* (1992) 175 CLR 479, where the Australian High Court rejected medical opinion about the need to warn a patient. Some jurisdictions, including New South Wales, have subsequently enacted statutes to restore weight to medical opinion, but have taken care to exclude from this restoration the question of warnings about possible treatment complications.

In the end, the final decision as to whether there has been medical negligence is made by the judge, who has freedom to choose which expert opinion (sometimes out of many) to favour. In New South Wales judges may exclude altogether what they deem to be "irrational" expert opinion. This freedom allows judges also to be influenced by hindsight, especially in cases with a severe outcome.

It is clear that many judges find the task of evaluating expert evidence difficult. A landmark study of Australian judicial perspectives on expert evidence by Freckelton et al[37] concluded that a majority of judges desired objective and reliable expert help but many saw an ineradicable tendency for expert witnesses to be overtly biased or partisan. Additionally, 70% of judges surveyed had, on occasions, not understood expert evidence in the cases before them.

Judicial choice of which expert opinion to accept was exemplified in *Shead v Hooley* [2000] NSWCA 362. In this case, Dr Shead, a teaching hospital surgeon, did a vagotomy (division of the vagus nerves to reduce acid secretion) and antrectomy (removal of the distal portion of the stomach) on Ms Hooley for intractable symptoms of pain and vomiting due to duodenal ulceration identified on repeated endoscopic examination. The symptoms persisted after operation, although the ulcer was healed, and Ms Hooley was said to have developed gastroparesis (paralysis of the stomach) due to the vagotomy, a complication about which she had not been warned. She later saw a gastroenterologist, Dr Vickers, who advised complete removal of the stomach, which was duly done. She was crippled by nutritional problems after that, was unable to work, and sued Dr Shead for negligence. In the New South Wales District Court Goldring DCJ found that Dr Shead was negligent in not doing an on-table gastroscopy to see if the ulcer had healed, and in failing to warn Ms Hooley of the estimated 1:10,000 chance of prolonged gastroparesis. Damages of $933,363 were awarded against Dr Shead.

No surgical evidence was adduced by the plaintiff. Two surgeons called by the defendant gave evidence that the operation was indicated, that on-table gastroscopy would not have altered the requirement for operation, that antrectomy was sometimes used as a treatment for gastroparesis (when it was due, eg, to diabetes, the most common cause of this rare condition), and that warnings about chronic gastroparesis would not normally be given when vagotomy and antrectomy was to be done for duodenal ulceration. Dr Vickers, who is not a surgeon, but who was a treating doctor who gave the advice to do a total gastrectomy (which had a disastrous outcome) gave evidence (in language later described by the Court of Appeal as "extravagant" and "most unsatisfactory") that Dr Shead's operation should not have been done. The trial judge chose to prefer the evidence of Dr Vickers over that of the surgical experts.

[35] Personal communication: MDA National Insurance Ltd, Perth, Australia (emphasis added). The claims handler noted: "This assumption is unsupported by the clinical records and the general observations of the claimant."

[36] *Bolam v Friern Hospital Management Committee* [1957] 1 WLR 582.

[37] Freckelton I, Reddy P and Selby H, Australian *Judicial Perspectives on Expert Evidence: An Empirical Study* (Australian Institute of Judicial Administration, 1999).

The verdict was appealed by Dr Shead. The Court of Appeal was critical of Dr Vickers' evidence and also rejected the trial judge's acceptance of Dr Vickers' views about on-table endoscopy. However, the Court of Appeal chose to accept the trial evidence of another gastroenterologist (not a surgeon), Dr Ellard, who cited a 3-9% frequency of "delayed gastric emptying" after vagotomy and antrectomy. Written surgical evidence submitted at the trial noted that a distinction should be made between short-term delayed gastric emptying due to temporary anastomotic obstruction, which does occur in a significant number of cases but was never present endoscopically in the plaintiff, and gastroparesis, which is almost unknown when an antrectomy has been done. Dr Ellard did not make this distinction and said that a warning should have been given about gastroparesis. The Court of Appeal accepted her evidence without qualification, rejected the appeal and let the damages award stand.

It would be easy to carry away the impression from this case that the courts, moved by the plaintiff's evident disability and the severe outcome, decided a verdict of negligence had to be constructed one way or another and that the way to do it was to cherry-pick the expert evidence.

Retrospective micro-matching

Another manifestation of hindsight bias is what Dekker[38] describes as "micro-matching" – assessing performance after-the-fact by holding it up against a world you *now* know to be true. Medical expert reviewers frequently do this in reports by citing (sometimes out of context) published protocols or guidelines for managing a particular clinical condition and comparing them with the defendant doctor's actions in order to construct negligence.[39]

The application of protocols and guidelines in medical negligence cases is fraught with difficulties. Guidelines that are comprehensive, workable and up-to-date are readily available for only a few selected clinical conditions. Even so, to assume that clinical guidelines can be mapped one-on-one onto clinical situations is premised on a deeply flawed model of the relationship between written protocol and actual practice. There is always a gap between the two. Guidelines cannot dictate their own application. The coding in guidelines for the implicit normative standard against which real performance is contrasted is either underspecified (too vague to use for evaluation) or overspecified (citing the exact situation in which to apply them, which will almost never be the precise one confronting the clinician). As a result, when asked about the policy of the institution regarding the care for emergency Caesarean sections, one senior anaesthetist replied, "our policy is to do the right thing".[40] This seemingly curious phrase sums up the problem confronting those at the sharp end of clinical practice. Clinical work is not "painting-by-numbers". It must be tailored to the conditions of each case. The anaesthetist's remark recognises that it is impossible to comprehensively list all possible situations and appropriate responses because the world is too complex and fluid.[41]

Written guidance is, at best, a resource for action, and a limited one at that.[42] It is never the action itself. The gap can be bridged only by interpretation and local judgment, which has to be made by expert practitioners in situ. Applying written guidance retrospectively in individual cases ignores the reality of clinical decision-making and only serves to amplify the misconceptions. The following example of inappropriate retrospective micro-matching in a medical negligence claim (a case in which one of the present authors gave an expert opinion) illustrates this.

A diabetic patient had recurrent infections associated with an ingrown toenail and had an operation under local anaesthetic to remove the nail-bed. He was given prophylactic postoperative

[38] Dekker SWA, *The Field Guide to Understanding Human Error* (Ashgate, Aldershot, 2006).

[39] Samanta A, Mello CF, Foster C, Tingle J and Samanta J, "The Role of Clinical Guidelines in Medical Negligence Litigation" (2006) 14 *Medical Law Review* 321.

[40] Woods DD, Johannesen LJ, Cook RI and Sarter NB, *Behind Human Error: Cognitive Systems, Computers and Hindsight* (CSERIAC, Dayton, 1994) p 186.

[41] Woods et al, n 40.

[42] Suchman LA, *Plans and Situated Actions: The Problem of Human-Machine Communication* (Cambridge University Press, Cambridge, 1987).

antibiotics but developed an aggressive infection which progressed in spite of multiple operations. He eventually required below-knee amputation. A microbiologist plaintiff expert said the surgeon was negligent in giving the patient only flucloxacillin (a broad-spectrum penicillin) and a broad-spectrum cephalosporin post-operatively whereas (the expert said) he should have also given metronidazole, which acts against anaerobic organisms, although such organisms were not grown in cultures from the infected foot. The defendant surgeon added metronidazole one week after infection became manifest.

The microbiological expert quoted the *Australian Antibiotic Guidelines Handbook*, which states that anaerobic organisms "are almost always involved in diabetic foot infections" and metronidazole should be given. This statement is true for the later stages of such infections, but a number of studies show that the initiating organisms are usually staphylococci, not anaerobes, and initial flucloxacillin and a cephalosporin was therefore quite appropriate. A confidential settlement of the case was made by the surgeon's medical defence organisation on a commercial basis.

Standards of care in medical specialties

The role of hindsight and outcome bias in the construction of negligence comes into particularly sharp focus in two medical specialties: radiology and anatomical pathology.

Radiology

Allegations of negligence are often made against radiologists for failure to recognise an abnormality on x-rays, most commonly a bony fracture or an early cancer. The outcomes may be severe; eg, failure to report a fracture of the odontoid process of the axis (a cervical vertebra), a notoriously difficult abnormality to detect, may lead to the patient becoming quadriplegic merely by nodding the head if the neck is not stabilised by a cervical collar.

Hindsight bias ensures that the seeking of a retrospective expert opinion on x-ray films in such a case makes the reviewer more alert than if the films were being reported on in routine fashion. Hindsight alertness is further heightened if the reviewer knows there has been a severe outcome. In such cases, claims handlers, defence and plaintiff lawyers and judges also may be united in their view that "it must have been obvious".

Defence lawyers may attempt to minimise bias by keeping the radiologist expert reviewer in ignorance about the nature of the outcome, but it is almost never possible to simulate the ex ante situation exactly – that can only be achieved by slipping the films unannounced into a stack of routine x-rays for the reviewer to assess. As one radiological expert said, "Whenever an attorney sends me radiographs, the first and only question that comes to my mind is, what was missed on these films?"[43]

The additional problem of *conspicuity* is usually overlooked in judgments about whether a radiologist should have seen an abnormality that is apparently easily seen in a retrospective review. Berlin[44] notes how one expert explained this problem:

> [In radiology] conspicuity is determined by a combination of factors such as size, density, location, and overlying structures, not by any one of the factors alone. The defense expert used the analogy of a night sky to explain conspicuity: If the air is clear and the sky is totally black because the moon is not visible, even the smallest star will be readily visible to the eye. However, if the sky is partially illuminated by the moon, or if there are small clouds present, the tiniest stars will no longer be seen but the medium and large ones will. If the sky is further illuminated or thicker clouds emerge, then even the largest stars will not be discernible.

One might add that hindsight conspicuity is greater if a reviewer is alerted (by knowledge of outcome) that an abnormality is present, and especially if the outcome knowledge tells the reviewer the nature of the abnormality (eg that the patient is quadriplegic from a high cervical fracture).

Pathology

Negligence allegations against anatomical pathologists usually relate to missing a diagnosis of cancer due to misinterpreting the microscopic appearances of a biopsy specimen. Cytopathology, in which

[43] Berlin, n 14.

[44] Berlin, n 14 at 599.

smears of cells, devoid of tissue architecture, are examined (as in fine-needle aspiration of breast lumps or Papanicolaou smears from the uterine cervix) presents particular difficulties for the defendant pathologist, who has had to rely on intracellular abnormalities alone for diagnosis. Austin[45] summarised the effect of outcome bias in this situation:

> Review of Papanicolaou smear cases that are the focus of litigation typically takes place in a biased setting with foreknowledge of an adverse patient outcome (outcome bias) or litigation and with more time allotted for slide review than is available in normal screening situations. Factors that normally militate against overly aggressive slide interpretation, such as concern about false-positive diagnoses and possible unnecessary surgical procedures and expense, are absent. This results in a tendency toward overly aggressive interpretation of questionable or uncertain cytologic abnormalities.

These factors can be minimised by a variety of blinded slide review formats with the goal of simulating normal, on-the-job, prospective screening as in actual practice. Austin recommended that

> slides being assessed … should be reviewed blindly, as one of a larger number of normal and abnormal slides, by "reasonable cytologists" without knowledge of the clinical outcome or the existence of possible litigation.[46]

This utopian practice is a very difficult scenario to create and in Australian medico-legal practice, regrettably, is almost never followed.

CONSEQUENT INJURY (CAUSATION)

In some cases of alleged medical negligence, causation is undisputed; eg, in amputation of the wrong limb, there is usually agreement that the action of the surgeon caused the injury. But many cases are not so clear cut. Untangling the closely intertwined contributions of disease, patient susceptibility or compliance with treatment, the actions (or inaction) of a doctor, and system factors in causing patient injury or death is often extremely difficult, involves value judgments, and is susceptible to hindsight bias.

There is recognition among the judiciary that causation in common law is usually a construction dependent on value judgments and "policy". Sir Anthony Mason, former Chief Justice of the High Court of Australia, said:[47]

> Many hard issues have been hidden beneath the beguiling veneer of causation… *March v E & MH Stramare Pty Ltd* (1991) 171 CLR 506 is the Australian authority still often cited for the glib submission that causation is a question of fact and a matter of common sense … But this misrepresents *March* … The judgments in *March* acknowledge that the attribution of responsibility is a value-laden exercise even if the language of causation is used … There is no formula.

In making causation determinations, judges legitimately consider concepts such as foreseeability and proximal cause but these notions are particularly susceptible to hindsight bias. Decisions about proximal cause also risk the "fundamental attribution error", well-known to psychologists: a tendency for people to over-emphasise personality-based explanations for adverse events (the nearest clinician) while under-emphasising situational explanations. Mason CJ's obiter dicta about the "last opportunity rule" in his judgment in *March* are encouraging in their apparent recognition of the fundamental attribution error in some causation rulings.

Medical experts also contribute to value-laden legal judgments of causation. Hayward and Hofer[48] demonstrated that retrospective medical reviewers were consistently over-optimistic about the preventability of hospital in-patient deaths. This retrospective optimism biased medical experts

[45] Austin RM, "Results of Blinded Rescreening of Papanicolaou Smears Versus Biased Retrospective Review" (1997) 121 Arch Path & Lab Med 311 at 312.

[46] Austin, n 45 at 313.

[47] Mason, Sir Anthony, "Fault, Causation and Responsibility: Is Tort Law Just an Instrument of Corrective Justice?" *NSW Supreme Court Bulletin*, http://www.lawlink.nsw.gov.au/lawlink/supreme_court/ll_sc.nsf/pages/SCO_speech_mason_271199 viewed July 2008.

[48] Hayward RA and Hofer TP, "Estimating Hospital Deaths Due to Medical Errors – Preventability is in the Eye of the Beholder" (2001) 286 JAMA 415.

towards attribution of deaths and other severe outcomes to the actions (or failure to act) of a treating doctor. Their reports, influenced by hindsight bias, may lead a court to accept that the causal chain between the doctor's actions and the outcome is intact, when in fact the outcome was due to natural disease processes.

The conclusion that a given injury was a consequence of the actions (or inaction) of a doctor is a part of the construction of negligence in which outcome bias influences claims handlers, plaintiff and defence lawyers and judges. A severe outcome, such as a brain-damaged or quadriplegic patient, is widely recognised as likely to elicit sympathy in medical evaluators, lawyers and judges, especially if the injured party is brought into the courtroom to display the tragic effects of the disaster. Judges may then lean towards distributive justice and focus with hindsight on any shred of evidence that allows a plausible attribution of the injury to (and therefore damages against) the defendant doctor. As Khoury[49] pointed out:

> Reluctant to leave patients without compensation, courts have in some cases challenged their traditional approach to causation through recourse to such techniques as reliance on factual presumptions and inferences, the concept of loss of chance, and reversal of the burden of proof [*ie making the defendant prove negligence had not occurred*].

Recognising this reality, acknowledging an ethical responsibility to justly compensate injured patients and taking into account the potentially damaging effect on the doctor of outcome bias in the media, claims handlers will often seek an early settlement without trial and with a confidentiality agreement in cases of severe injury. The majority of these claims are therefore dealt with behind closed doors, thus losing the opportunity to test the negligence issues in the legal arena and generally extinguishing an opportunity for the health care system to learn from the event.

In some cases, the defendant doctor (under legal advice) will admit liability, but a trial will take place on the issue of quantum (the amount of damages), if this is disputed. The decision to admit liability is driven not only by the circumstances of the adverse event but also by the probable defensibility, costs of trial, possible adverse media exposure (if liability is admitted, the doctor does not have to appear in court) and in some cases by an often guilt-laden retrospective re-assessment of her or his own culpability on the part of the defendant doctor. In *Simpson v Diamond* [2001] NSWSC 925, where liability for a birth injury was admitted by the defendant obstetrician, this process resulted in the award of A$10.9 million, the highest verdict to date in Australian medical negligence proceedings.

DEBIASING STRATEGIES

Hindsight bias appears particularly resistant to debiasing, according to Arkes,[50] because of its universal, automatic and largely unconscious nature. The intractability of this bias may account for the scanty literature on debiasing strategies, especially in a legal context, where the few published studies relate mostly to jury decision-making, an irrelevant issue in most Australian medico-legal cases.

In experimental studies using simulated scenarios, exhorting evaluators to avoid hindsight bias alone is not effective.[51] A more successful strategy is to ask evaluators to consider alternative outcomes.[52] After application of this "consider-alternatives" approach, Arkes[53] said:

> new causal skids are greased: if the occurring event cued its own causal chains then considering the non-occurring event ought to accomplish the analogous result, thereby reducing the bias.

[49] Khoury L, *Uncertain Causation in Medical Liability* (Hart, Oxford, 2006) p 15.

[50] Arkes HR, "Costs and Benefits of Judgment Errors: Implications for Debiasing" (1991) 110 *Psychological Bulletin* 486.

[51] Fischhoff B, "Perceived Informativeness of Facts" (1977) 3(2) *Journal of Experimental Psychology* 349; Wood G, "The Knew-It-All-Along Effect" (1978) 4 *Journal of Experimental Psychology: Human Perception and Performance* 345; Kamin KA and Rachlinski JJ, "Ex Post ≠ Ex Ante. Determining Liability in Hindsight" (1995) 19 *Law and Human Behavior* 89.

[52] Slovic P and Fischhoff B, "On the Psychology of Experimental Surprises" (1977) 3(4) *Journal of Experimental Psychology* 544; Arkes et al, n 23 at 253; Harley, n 10.

[53] Arkes, n 50 at 487.

For example, it should be feasible, in briefing medical experts in cases where there is an allegation of misdiagnosis, specifically to request them to consider possible alternative diagnoses and to provide reasons why each of the other diagnoses might have been correct. Unfortunately, it appears the "consider alternatives" approach may not be as effective with judges as it is with juries.[54]

Another effective method for reducing bias in mock jurors was demonstrated by Clarkson et al,[55] who asked them to consider the consequences of their judgment for the personal and professional life of the defendant in a simulated negligence action against commercial auditors. While this approach might appeal to jurors, it is difficult to envisage its successful application in Australia, where medical negligence cases are heard by judges alone, who seem unlikely to be receptive to such arguments in tort litigation.

Given the pervasive and persistent nature of hindsight bias, it must be accepted that it can never be eliminated. Education about hindsight and outcome bias, and how this affects evaluations of negligence, directed at medical expert witnesses and at the judiciary, who seem receptive to the idea, may allow these biases to be taken more into account in judicial decisions.[56] Harley[57] suggests that it may be useful for a "human factors" expert witness to be called to testify in court about hindsight bias, just as it has been accepted that experts may provide opinions on eyewitness testimony or memory.

CONCLUSIONS

The tort of medical negligence is a social and legal construction defined anew in response to each individual allegation. This construction is strongly influenced by the pervasive and unavoidable outcome and hindsight biases. In the majority of cases, settlement is sought by medical defence organisations by negotiation without trial because of an ethical commitment to provide just compensation to injured patients, consideration of the costs of defence and, most importantly, because of foreknowledge of the biases inherent in plaintiff expert reports and court proceedings.

Contrary to views sometimes expressed by plaintiff lawyers, most medical negligence claims are unhelpful to patient safety improvement. This is because damages verdicts, influenced by hindsight and outcome bias, usually reflect the severity of the outcome, not the magnitude of the error. Additionally, only a small proportion of clinical errors involve a claim[58] so that the great majority of errors are untested by the judicial process.

A court finding of medical negligence that is arrived at because of hindsight bias is likely to be perceived by many medical professionals as a miscarriage of justice. This view, and the increasing frequency of negligence claims and large damages verdicts, impairs safe medical practice because it stimulates defensive medicine and alienates clinicians from getting involved in quality improvement activities.

More research is needed into understanding the mechanisms and effects of hindsight and outcome bias in a clinical setting and to evaluate possible debiasing strategies for medical reviewers. Promulgation of information about hindsight to lawyers and the judiciary may improve the fairness of medical negligence trials. This will require increased dialogue between human factors experts and the law.

[54] Anderson JC, Jennings MM, Lowe DJ and Reckers PM, "The Mitigation of Hindsight Bias in Judges' Evaluation of Auditor Decisions" (1997) 16(2) *Auditing: A Journal of Practice and Theory* 20.

[55] Clarkson PM, Emby C and Watt VWS, "Debiasing the Outcome Effect: The Role of Instructions in an Audit Litigation Setting" (2002) 21(2) *Auditing: A Journal of Practice and Theory* 7.

[56] Hugh TB, "Hindsight Bias in Expert Reports", address to the National Judicial College of Australia, 4 November. 2006, http://www.njca.anu.edu.au/Professional%20Development/programs%20by%20year/2006/Science%20and%20courts/Hugh.pdf viewed July 2008.

[57] Harley, n 10.

[58] Studdert DM et al, "Claims, Errors and Compensation Payments in Medical Malpractice Litigation" (2006) 354 NEJM 2024.