

**Clarifying the distinction between fact and belief probability:
Armstrong, Carol Ann v Quest Laboratories Pte Ltd [2019] SGCA 75**

I. EXECUTIVE SUMMARY

Where medical litigation is concerned, there is likely to be voluminous amounts of scientific and statistical evidence tendered by both parties. In such situations, parties may incorrectly confuse what the evidence shows, with what is required by the legal standard of proof.

Armstrong, Carol Ann v Quest Laboratories Pte Ltd [2019] SGCA 75 was one such case. The deceased, Mr Peter Traynor (“**Mr Traynor**”) had a mole which was initially diagnosed as being benign (i.e. non-malignant). The pathologist who made this finding was Dr Tan Hong Wui (“**Dr Tan**”), a consultant pathologist for Quest Laboratories Pte Ltd (“**Quest**”). However, a few years later, it was discovered that Mr Traynor had metastatic melanoma (i.e. skin cancer that spread through his body). Despite intensive treatment, he succumbed to the disease at the age of 49. He left behind his wife, Ms Carol Ann Armstrong (“**Ms Armstrong**”), and two daughters aged 10 and 12.

Ms Armstrong subsequently sued Quest and Dr Tan (collectively the “**Respondents**”) on behalf of Mr Traynor’s estate and his dependents. Ms Armstrong claimed that the Respondents had breached their duties of care in misdiagnosing her husband’s melanoma, which resulted in the loss of a *complete cure* for Mr Traynor (and subsequently his death). Essentially, she argued that the misdiagnosis caused Mr Traynor to pass away from metastatic cancer at 49, when he would otherwise have lived to 82. She argued that as such, she should receive a full award (i.e. 100%) of her claimed damages.¹ Alternatively, she claimed that the alleged breach resulted in the *reduced prospects* of a cure, which should result in a proportionate award of damages.

The High Court (“**HC**”) agreed with Ms Armstrong that Dr Tan had breached his duty of care in failing to properly diagnose Mr Traynor’s condition. However, it held that the diagnosis had only caused Mr Traynor to lose a “fighting chance” of survival, instead of losing a chance for a complete cure of his cancer. The HC based its ruling on the UK case of *Gregg v Scott* [2005] 2 AC 176 (“**Gregg**”), specifically the minority’s arguments regarding the “loss of chance” doctrine. Damages were accordingly based on the HC’s finding that Mr Traynor would have lived for, at most, another four years.

On appeal by Ms Armstrong, the Court of Appeal (“**CA**”) agreed with the HC that the Respondents had misdiagnosed Mr Traynor, and thus breached their duty of care to him. However, it disagreed with the HC on the second matter, holding that on the balance of probabilities, the Respondents’ negligence had actually deprived Mr Traynor of a *complete cure*. Thus damages should have been assessed based on what Mr Traynor’s full life expectancy would have been. It then directed the HC to reconsider damages on this basis.

II. BACKGROUND

In September 2009, Mr Traynor discovered a bloodstain on his shirt. He consulted his doctor, who took a “shave biopsy” of a mole from his back and sent it to Quest for an examination and preparation of a pathology report. This mole turned out to be the “**primary tumour**” (i.e. the origin of the melanoma).

The mole specimen was duly processed, and four tissue sections were placed on a single glass slide

¹ In cases such as these, damages are generally awarded in full. Damages would be discounted only where the situation involves the claimant’s contributory negligence (i.e. the claimant was partially at fault), or where multiple defendants were involved in causing the injury and the claimant could not prove, on a balance of probabilities, which defendant had actually caused his injury. In the first situation, damages would be proportionately reduced based on the claimant’s fault, while in the second situation, the defendants would be jointly liable for damages.

(“**the Original Slide**”) for examination under a microscope. Dr Tan examined the Original Slide and issued a pathology report (the “**Original Report**”) stating that “[t]here is no malignancy”. Mr Traynor and his doctor took this to mean that the mole was not cancerous, and took no further action.

However, some two years later, Mr Traynor discovered a lump under his right armpit. He underwent further medical tests, which revealed metastatic melanoma in the lymph nodes under his armpits. He then underwent chemotherapy and, subsequently, surgery in April 2012. The surgery involved removing the lymph nodes and the melanoma there, as well as conducting a “wide excision” of the primary site of the primary tumour to remove any residual disease there. The wide excision showed there was no residual tumour in the primary site, and it was undisputed that the 2009 shave biopsy had removed the primary tumour from the primary site of the cancer.

Unfortunately, in 2013, medical scans showed further nodule growths in other parts of Mr Traynor’s body. Despite further treatment, Mr Traynor passed away on 6 December 2013.

Re-examining the Original Slide

In 2012, when Mr Traynor’s further test results revealed metastatic melanoma, the Original Slide was recalled and re-examined by another pathologist, Dr Fong Chee Meng (“**Dr Fong**”). His report stated: “Malignant melanoma with ulceration.”

Upon learning that the Original Slide had been recalled, Dr Tan requested another slide containing deeper levels of the tumour specimen. He then issued a supplementary report stating “lesion, suggestive of a melanoma.” He claimed that this diagnosis was only apparent on hindsight, with the knowledge of the cancer recurrence. A third opinion was sought from two other experts, who reviewed the Original Slide and diagnosed it as an “atypical spitz tumour.”

Ms Armstrong’s expert pathologist, Dr Nigel Kirkham (“**Dr Kirkham**”), stated that the specimen was “consistent with an invasive melanoma” and that Dr Tan’s original diagnosis of “no malignancy” was incorrect. The Respondents’ expert pathologist, Dr Joyce Lee (“**Dr Lee**”), acknowledged that the correct finding was one of malignant melanoma with ulceration, but considered that Dr Tan’s initial diagnosis of “no malignancy” was one that he had made “in his professional judgment”, and that a “good proportion of reasonable pathologists” would also have failed to arrive at the correct finding because of the specimen’s intrinsic limitations as a shave biopsy (as compared to a more complete wide excision).

III. ISSUES ON APPEAL

The CA considered the following issues:

- (a) whether the Respondents had breached their respective duties of care (“**the Breach Question**”);
- (b) whether such breach caused Mr Traynor to pass away at 49, rather than 82 (“**the Causation Question**”);²
- (c) the appropriate amount of damages for the negligence (“**the Damages Question**”).

A. The Breach Question

The CA’s analysis focused on Dr Tan’s actions: it agreed with the HC that Dr Tan had breached his duty of care. Applying what is known as the *Bolam* test,³ the CA stated that Dr Tan was held to the standard of a “reasonable and competent pathologist”, and thus that he should have diagnosed Mr

² To prove negligence by a defendant, a claimant must prove: a duty of care owed to the claimant by the defendant, breach of such duty by the defendant, and that the breach caused harm to the claimant.

³ Under the *Bolam* test, the court determines both the applicable standard of care for a doctor and whether that standard has been breached. Generally, the court will judge the appropriate standard of care based on whether the act of the doctor in question (Doctor A) is supported by other respected doctors. So long as those other doctors’ opinions are internally consistent and logical, the court will accept that Doctor A’s conduct was reasonable.

Traynor in a way that “at least some responsible body” of pathologists would have done. And a reasonable and competent pathologist would at least have concluded that this was an atypical lesion suggestive of melanoma, if not one that was actually malignant.

The CA further agreed with the HC that the Respondents’ misdiagnosis was a straightforward breach. If Mr Traynor had been informed that the mole was not benign, it would have resulted in a completely different course of action. At the very least, Mr Traynor and his doctor would have sought a second opinion. Instead, Mr Traynor did not seek further medical treatment.

The CA rejected the Respondents’ argument that Dr Tan’s actions should have been judged by a different standard, i.e. through applying what is known as the *Bolitho* addendum to the *Bolam* test.⁴ It stated that the *Bolitho* addendum should be used only where it is clear that there is a genuine difference of opinion within the medical community as to what the doctor ought to have done. Here, there was no material difference in opinion between any of the pathologists or experts regarding the state of the primary tumour in the Original Slide – none of them was prepared to conclusively state that the tumour was benign. And yet this was exactly what Dr Tan had stated in his Original Report, by saying there was “no malignancy”. Indeed, he had revised his view in 2012; this was the diagnosis that should have been provided in 2009.

The CA also disagreed with the Respondents’ argument that the later expert diagnoses (including Dr Tan’s own subsequent diagnosis) of the Original Slide were made with the benefit of hindsight. First, except for their own expert Dr Lee, none of the experts had been cross-examined on this point. Moreover, Dr Lee herself testified that, looking at the Original Slide *without the benefit of hindsight*, she would not have called it a benign specimen, but rather an “atypical melanocytic lesion”.

The CA rejected the Respondents’ argument that this was a case with reasonable variance in interpretation, such that Dr Tan did not breach his duty of care. Crucial features of the Original Slide were unequivocally observable, and these features were indicative of malignancy. Dr Tan accepted that he had seen features such as “ulceration” and “spindled naevus cells”. Dr Kirkham and Dr Lee agreed that ulceration was clearly present and extensive, that “spindled cells” were present, and that there was “increased cellularity”. At a minimum, it was *suggestive* of melanoma.

In any event, Dr Tan’s Original Report did not give an equivocal analysis, but clearly said there was “no malignancy”. But the Original Slide could not have indicated such a finding. The Respondents’ own expert accepted that, as a responsible and competent pathologist, she would have sent the sample for a second opinion, and that it would have been completely wrong to rule out a malignancy. Even if Dr Tan had not reached the same conclusion that the other pathologists had, the circumstances at least warranted further examination on his part. Indeed, his own testimony was that in 2009 (before he wrote the Original Report), he had decided that deeper cross-sections were not required because he deemed the specimen levels sufficient for his diagnosis. He could have made a further check by asking for a deeper cross-section, but chose not to do so.

It was difficult to understate the significance of the Respondents’ breach. The Respondents’ own expert had accepted that lives depend upon accurate diagnoses by pathologists, and diagnoses therefore had to be undertaken with due diligence. This does not mean that pathologists are expected to get it right all the time, but, at a minimum, if a pathologist could not rule out the worst-case scenario, he or she should state so in the report. Here, Dr Tan not only failed to state that he could not rule out melanoma, he also reported the exact opposite – that there was no malignancy. He intended

⁴ Under the *Bolitho* addendum, where (using the *Bolam* test) there is a genuine difference of opinion between other respected doctors as to whether the act of the doctor in question (Doctor A) was appropriate, the court will ascertain whether Doctor A’s act passes a threshold test of logic. This test is met if the other doctors have compared the relevant risks and benefits of the act, and come to a defensible conclusion that satisfies a threshold of logic and consistency.

to convey, and did convey, that the lesion was benign.

B. The Causation Question

(i) Observations on Causation

Before deciding whether the Respondents' breach had caused Mr Traynor's death, the CA addressed certain conceptual points.

(a) *Applicability of the Bolam-Bolitho test in causation.* The CA rejected the Respondents' argument that the *Bolam-Bolitho* test (where the *Bolitho* addendum is combined with the *Bolam* test) was applicable in determining causation. The test was relevant only in assessing breach: specifically whether the general professional standard had been met, and the potential diversity of views as to the standard of care when a person exercised a special skill. It was not concerned with a diversity of views as to causation, which concerns evidence of what had actually happened.

The *Bolam-Bolitho* considerations of what the practitioner ought to have done, and concerns over defensive medicine (insofar as the proposed standard would fortify or hinder the medical profession's fulfilment of its duties to patients), were fundamentally irrelevant in the context of causation. What the general professional standard(s) were had nothing to do with whether or not the defendant had *caused damage* to a patient. Arguments of causation would only arise after a practitioner had breached his or her duty of care, and sought to escape liability by arguing that the damage was not ultimately caused by him or her, or would have occurred regardless of the breach. Finally, if a practitioner had complied with professionally reasonable standards, it would not matter whether the treatment prescribed (or not prescribed) led to the patient suffering loss.

(b) *Causation in law or fact.* To prove causation, a claimant had to show a necessary physical connection between the defendant's wrongful conduct and the damage caused, i.e. "but for" the wrongful conduct, the damage would not have occurred. This was determined based on a balance of probabilities, i.e. that *it was more likely than not* that but for the wrongful conduct, the damage *would not have occurred*.

The "but for" test established "*causation in fact*", i.e. the physical connection between the defendant's actions and the damage suffered by the claimant. This test served as a first filter to exclude irrelevant causes, as there were a potentially infinite number of conditions which could "cause" an injury.⁵ In this respect (of multiple causes), the courts looked instead for "*causation in law*", i.e. picking out one or more necessary conditions which were "more important" than the mass of conditions making up the overall causal picture.

(c) *Use of expert evidence.* The CA noted that though a judge was not bound to make findings of fact, where he or she does so, it need not be an invariable election between competing expert opinions. The judge was not bound to accept any opinion in its entirety. The ultimate considerations in deciding whether to reject or accept expert evidence (in part or in whole) were consistency, logic, coherence, and a focus on the objective evidence.

(d) *Use of statistical evidence.* Noting the tendency in medical negligence cases (and in the present case) to focus overwhelmingly on the use of statistical evidence and the conflation between that and the standard of proof, the CA discussed how statistical evidence should actually be applied.

First, there was a difference between *fact probability* (the evidence that spoke to the existence, or non-existence, of a causal connection between the defendant's actions (or omissions) and the claimed

⁵ The CA used the following example: "For instance, a necessary condition for a driver to have caused injury to a pedestrian would be the asphalt laid on the road some years back. But it would be absurd to hold the asphalt layer liable for the driver's negligence."

damage), and *belief probability* (which was the degree of strength and credibility attributed by the decision-maker to the fact probability evidence). Statistical evidence was just *fact probability*: just because a statistical study showed a 64% likelihood that the pleaded damage was caused by the defendant's conduct, did not automatically mean that the test for causation was satisfied. The statistical value of 64% held no intrinsic legal significance, but depended on the belief probability (i.e., the level of confidence the court held in it). While a court could place its belief in the reliability and appropriateness of that piece of fact probability (the statistical evidence), it need not do so; instead, statistical evidence was but one factor to be weighed in the overall mix.

Here, the parties' experts had relied on several studies to assist their respective cases, involving melanoma sufferers and their survival outcomes. In particular, the Respondents used these studies to suggest that since Mr Traynor's melanoma would have resulted in death anyway, the Respondents should not be held liable for his death. However, the CA noted such studies were concerned with populations rather than individuals. Thus, while the correlations within the studies might lend weight to an inference of causation, they could not, in an individual case, conclusively prove causation.

This was illustrated through the UK case of *Gregg*. The claimant Gregg, who suffered from non-Hodgkin's lymphoma, was unable to prove on the balance of probabilities that the defendant's misdiagnosis had prevented an outright cure for his condition. Gregg pointed to statistical evidence suggesting that 42% of patients with his symptoms (at that stage of cancer) at the time of the misdiagnosis (and when treatment should have been commenced) would survive to the 10-year interval. By the time he had been accurately diagnosed, his tumour had grown and invaded the neighbouring tissues in the left side of his chest. The statistical evidence showed that patients in Gregg's position (at this stage of cancer) would by then only have a survival rate of 25%. The court looked at statistical evidence which showed that Gregg's initial condition was, on the balance of probabilities, not susceptible to treatment, or would have produced a relapse anyway. If the cancerous outcome would still occur because of some other reason despite timely treatment, then it could not be said that, *but for* the defendant's breach, Gregg would have survived. There was in effect no damage.

However, such reasoning led to an outcome where all patients whose characteristics appeared to correspond to survival outcomes below 50% were left without any compensation, whereas those with characteristics corresponding to survival rates above 50% were given a full award.

The CA rejected such reasoning. The *first* error lay in the comparison. This required reasoning backwards, by looking at how many persons with similar characteristics perished 10 years from that initial state. Since more of them died than survived, it was decided it was likely Gregg was doomed anyway. However, this missed the point: Gregg could not have gotten to that 10-year mark, because the defendant's breach interrupted the usual course of events. It was an error to transpose the *endpoints* of other patients to Gregg's *initial state*. At best, the statistical outcome was a proxy for what might have been; it did not reflect what actually happened, as the breach precluded Gregg from ever getting timely treatment.

The *second* error was in conflating the *tools* of analysis (the statistics and the balance of probabilities test) with the *object* of analysis (the damage). While Gregg in his initial state had the same characteristics as the 58% who did not survive, he also had a similar condition as the 42% who did survive. Thus, the percentages did not indicate which group he would have (as a matter of relapse), or had already (as a matter of pre-existing latent condition) fallen into. Moreover, the course of his cancer was an event independent of the statistical outcomes. It was thus an error to use this *fact probability* (the 42%) as a substitute for the actual legal standard, which was the degree to which the court was convinced on the balance of probabilities (the *belief probability*).

The CA also stressed that statistical evidence was only one piece of the factual probability puzzle.

Although the statistical evidence could be so compelling that the court may be able to infer belief probability from fact probability, it must be mindful of the distinction between the two. The court could not abdicate its fact-finding function just because of the statistical evidence.

(ii) Was there actual causation?

Based on the above principles, the CA agreed with the HC that the Respondents' breach caused Mr Traynor's death. It held that the only cause of death was the melanoma that had haematologically spread (i.e. spread through the bloodstream) from his infected lymph nodes *after* September 2009. Had he (and his doctor) been made aware of the malignancy at that time, he would have agreed to undergo the appropriate surgical procedures, which would have removed *all* of the melanoma. Instead, he lost the opportunity for treatment at that crucial time. Thus but for the Respondents' negligence, he would have been cured of his melanoma. As such, it held that the HC erred in finding that Mr Traynor had only lost a "fighting chance".

First, the CA held that, on a balance of probabilities, *after* September 2009 the growth of the melanoma in his lymph nodes would have been a source of fatal melanoma. There was a straightforward causative link between the Respondents' negligence (and the ensuing delay) and Mr Traynor's death. The large amount of melanoma in his five infected lymph nodes in 2012 suggested that the unbridled growth of the melanoma in his lymph nodes from 2009 to 2012 would likely have caused haematological spread during this period, causing his eventual death in 2013.

Second, the CA rejected the Respondents' claim that the haematological spread had already occurred before September 2009 – i.e. that *before* September 2009, the melanoma had already migrated from the primary tumour or lymph nodes to Mr Traynor's distant organs via his bloodstream, but had lain dormant.⁶ The Respondents thus argued that the cancer would not have been treatable even if Mr Traynor had obtained treatment then. However, the CA held that simply because the cancer in the distant organs was not detected from January 2012 to August 2013, did not mean that dormancy was present *before* September 2009. While Ms Armstrong could not conclusively disprove dormancy before September 2009, the Respondents also could not prove (on a balance of probabilities) that dormancy existed by that point. The Respondents had only established, at best, a mere *possibility* of dormancy.

Conversely, Ms Armstrong could prove, on a balance of probabilities, that haematological spread had only occurred *after* September 2009. Ms Armstrong's expert witness, who had extensive experience in this field, testified that the likelihood of a long dormancy period (more than 36 months) was extremely rare. According to the Respondents' arguments, the fatal melanoma would have had more than 43 months to seed in Mr Traynor's distant organs *and* remain dormant throughout. As a matter of common sense, this comparatively long period of dormancy (compared to less than 43 months, based on Ms Armstrong's arguments) made the Respondents' case, on the balance of probabilities, less likely than Ms Armstrong's case.

Third, the CA held that had the melanoma been detected in September 2009, Mr Traynor would have undergone a sentinel lymph node biopsy ("SLNB"), which would have revealed the cancer in the lymph node. He would have undergone complete lymph node dissection, which would have removed the remaining lymph nodes containing the melanoma (which, since the nodes were not removed, eventually spread into his bloodstream and killed him). This was a loss of opportunity for treatment.

The CA rejected the Respondents' argument that Mr Traynor would not have chosen to undergo SLNB in September 2009 even if he had been properly diagnosed then. The CA observed that in

⁶ Dormant melanoma cells do not grow, but are also not eliminated from the body. If the patient's immune system is impaired or the melanoma cells undergo further mutation, the tumour cells will escape from the immune system and start to grow, i.e. the melanoma will no longer be dormant.

April 2012, he had chosen to remove all the relevant lymph nodes, rather than just undergo SLNB. Further, both Ms Armstrong's and the Respondents' experts agreed that SLNB and complete dissection would have been the likely treatment course at that time. Finally, even if Mr Traynor had opted for close observation only, regular ultrasound examinations would have been performed, meaning that the cancer would have been detected at an earlier time (and complete dissection would have been undertaken).

Finally, the CA held that Mr Traynor would have been completely cured of his melanoma if he had elected for SLNB. In September 2009, *all* of the melanoma would have been confined to his lymph nodes, including the fatal melanoma that eventually spread into his bloodstream. SLNB would have not only removed the possibility of the haematological spread that did kill him, it would also have removed all possibility of a relapse (due to melanoma remaining and/or recurring in his lymphatic system). Thus he would have lived to his full life expectancy.

With regard to the various large-scale studies tendered by the Respondents to support their assertions, the CA noted that they were either irrelevant or inappropriate in relation to Mr Traynor's situation. The CA also noted that under the circumstances, it did not need to consider Ms Armstrong's alternative arguments, or whether the HC should have applied the minority's reasoning in *Gregg* pertaining to the loss of chance doctrine or used a "lost years" approach.

C. The Damages Question

The CA stated that damages should be assessed based on the finding that, but for the Respondents' negligence, Mr Traynor would have been cured of his melanoma (instead of, as the HC held, living for at most another four years). In this regard, the CA made certain findings, and also remitted certain issues to the HC for consideration. It also noted that it would be in the interests of all parties to arrive at a settlement, to effect closure and save costs.

IV. LEGAL IMPLICATIONS

First, given the complexities of modern medical science, medical professionals may have to deal with a novel area of medical diagnosis or treatment that would require them to consider a variety of opinions, sometimes involving diametrically opposing perspectives. In such situations, medical error may understandably occur, and it is arguable that the medical professionals should not be held liable for negligence. However, in cases where the error made is fundamental and the negligence is blatant, the *Bolam-Bolitho* test should not be engaged as a smokescreen to escape liability. As such, the CA's clarification of the applicable test to ascertain the standard of care for a medical professional is a helpful reminder regarding the correct manner of applying this test.

Second, in medical negligence cases, parties often rely heavily on statistical evidence. In this regard, the CA clearly identified the distinction between "fact probability" and "belief probability". While a piece of statistical evidence may produce a fact probability of more than 50%, the CA pointed out the fallacy in equating this fact probability with the legal requirement of proving the fact on a balance of probabilities. The requirement of proving something on a balance of probabilities pertained to a *belief* probability, which is the degree of strength and credibility attributed by the decision-maker to the fact probability evidence. Hence, the requirement of proving a fact based on the balance of probabilities is not met simply because a piece of evidence shows a 51% probability of such fact occurring. Rather, the focus should be on improving the relevancy and reliability of such statistical evidence. This may depend in part on whether the statistical evidence was actually applicable to the specific circumstances faced by the parties.

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