LOCAL COURT OF NEW SOUTH WALES

CORONIAL JURISDICTION

Inquest:	**Inquest into the death of Oi Fong Chan**
File number:	1910/06
Hearing dates:	15, 16 February 2010, 10 September 2010
Date of findings:	5 November 2010
Place of findings:	State Coroner's Court, Glebe
Findings of:	Deputy State Coroner H.C.B. Dillon
Findings:	I find that Oi Fong Chan died at Concord Hospital, Concord, NSW on 9 December 2006 as a result of an intracranial haemorrhage she suffered during the course of neurosurgery.
Recommendations:	***To the Minister for Health:***
	I recommend that NSW Health, when planning the introduction of the adapted World Health Organisation surgical safety checklist, also give close consideration to including in its safe surgery protocol a standard procedure that a surgical team briefing including *all*

members of the team take place before any operation.

I further recommend that NSW Health considers adopting a standard procedure of members of new surgical teams introducing themselves by name and role before operations commence.

Representation:

Ms G. Furness (Counsel Assisting) instructed by Ms J. Murty (Crown Solicitor's Office)

Mr R. Sutherland SC instructed by Mr M. Swan (Avant Law) on behalf of A/Professor Noel Dan

Ms J. Sandford instructed by Ms G Peres da Costa (GILD) on behalf of Sydney South West Area Health Service

Ms J. Lonergan instructed by Mr S. Chapman (TressCox Lawyers) on behalf of Dr L. Kalish and Dr R. Sacks

Mr G. Gregg instructed by Ms Y. Baldwin (MDA National) on behalf of Dr T. Steele and Dr R. McKinnon

Introduction

Mrs Oi Fong Chan was a 77 year-old Chinese woman who had developed a tumour on her pituitary gland. Although the tumour was not cancerous, it made her ill and caused her considerable pain. Unfortunately, the tumour could not be removed or cured by drug treatment or radiotherapy. An operation was needed. The pituitary gland is located within the skull behind the nose. All surgery within the head carries risks. Mrs Chan feared that she would not survive the operation and initially decided to go back to China to place her affairs in order. For reasons that I am unaware of, that decision was changed.

On 8 December 2006, Dr Raymond Sacks and A/ Professor Noel Dan, with Dr Sacks's surgical registrar, Dr Larry Kalish, operated on Mrs Chan at Concord Hospital. In the course of the operation, when attempting to remove the tumour, it appears that the surgeons struck an aberrant vein which began to bleed profusely. (An "aberrant" blood vessel is one that does not follow its normal course or which is located in an unexpected or anatomically unusual position). The surgical team packed the bleeding vessel and at first believed that they had stopped the bleeding. The operation was stopped. Unfortunately, however, the vessel continued to bleed, causing a severe brain injury and, ultimately, Mrs Chan's death the following day.

Because Mrs Chan had died following the use of anaesthesia, her death was reported to the coroner. An autopsy was conducted, including an examination of her brain, to determine the cause of her death.

A coroner's function is to attempt to establish the answers to five questions: Who died? When did he or she die? Where did he or she die? What was the cause of the death? What was the manner of death? The "cause of death" is the immediate physical cause. "Manner of death" refers to the way a person dies including the surrounding circumstances.

A coroner may also make recommendations concerning public health or safety arising out of the death in question.

The primary issue

In this case, the post mortem examination of Mrs Chan's brain suggested to the forensic pathologist, Dr Joanne Sy, that it was possible that the surgeons had made an error of navigation within Mrs Chan's skull when operating on her. Surgical misnavigation is a serious error and Mrs Chan's family were naturally concerned about this. The coroner was requested to conduct an inquest to determine whether or not Mrs Chan had died as a result of surgical error.

The hearing

Unfortunately, despite their direct interest in the proceedings, Mrs Chan's family was not represented at the inquest by lawyers. A friend of the family, a Mr Chang, attended the court on the first day but thereafter none of Mrs Chan's family or friends attended. I understand that few of the family speak English. Mr Chang may have felt that, although he understands colloquial English, he was unable to comprehend the complex vocabulary of neurosurgery. (Most native English speakers would struggle with it unless they had medical training.)

The inquest continued, however, without the involvement of the family. It is important to emphasise that there is a public interest in exploring the deaths of some individuals. What affects one person can affect many other people. Where an issue of surgical error is raised there may be a question of public safety involved. For this reason, the issue having been raised by the family, I considered it important to continue the inquest.

It is also important to note that an inquest is not a trial but an inquiry. This means that coroners do not decide whether someone is guilty or innocent or has been negligent. Rather, their job is to attempt to establish the facts concerning a sudden death.

The surgery

Dr Sacks and Professor Dan and Dr Kalish all gave evidence. Dr Sacks and Dr Kalish are ear, nose and throat (ENT) specialists and Professor Dan is a neurosurgeon. While Dr Kalish was a registrar (that is, he was undergoing specialist training) at that stage, he was considered by Professor Sacks to be a very skilful surgeon.

The surgical team was a multi-specialty team: the ENT surgeons were responsible for the approach and Professor Dan's responsibility was for the neurosurgery (the work inside the skull). Because the pituitary gland is located behind the nose, the ENT team decided to approach via the nostrils using an endoscope to gain access to the interior of the skull.

The evidence given by the three surgeons was consistent and, in my opinion, frank and truthful. I did not detect any attempt by any of the surgeons to evade responsibility or to conceal the facts. Quite the reverse. Each of them appeared to me to be a witness who sought to tell the truth and help the court to understand what had happened during and after the operation.

Because the evidence of each of the surgeons was consistent with that of the others, and because I believe them to be honest and reliable witnesses, what follows is a summary of the facts.

The ENT team made the approach through Mrs Chan's nose with an endoscopic tube up her right nostril containing a light and a television camera. Surgical instruments were passed through the left nostril. The endoscope enabled the surgeons to observe the approach on a television monitor. The endoscope was passed up the floor of the nose and through the sphenoid sinus. The sphenoid sinus is an air-filled cavity which surrounds the sphenoid bone in the skull. It was then passed into the floor of the pituitary fossa, the bony structure shaped like a bowl in which the pituitary gland sits. The position of the endoscope was regularly checked with an image intensifier. Once the pituitary fossa had been identified by the ENT team, it was opened with a "nibbler" machine which removed the thin bone on the pituitary fossa floor. To go this far took about one and a half hours.

Although there was no absolute boundary drawn, it was at this point that Professor Dan became directly involved in the surgery. Professor Dan is a very highly experienced neurosurgeon but his experience to that point had been in using surgical microscopes rather than endoscopes to enter the skull cavity. He attempted to cut through the dura (the leathery outer cover of the brain) but had difficulty due to his lack of familiarity with the endoscope which affected his ability to judge depth. This caused no harm because he was coming up short rather than cutting too deeply. Because Dr Kalish was familiar with the endoscope Professor Dan handed over to him but supervised the opening of the dura on the monitor.

Once the dura had been opened, the team checked their anatomical location (as they had been doing up to that point). Professor Dan examined the television pictures and identified what appeared to him to be the pituitary adenoma or tumour. As Dr Kalish had been doing well to that point, Professor Dan instructed him to continue. Dr Kalish used a suction adenoma curette to take small samples for biopsy. The curetting procedure continued. Professor Dan advised Dr Kalish to take a medial route in conducting this process as the diaphragma (a sheet of dura separating the pituitary gland in its fossa from the brain above) was not apparent. It is also generally advisable to work medially to avoid coming into contact with major blood vessels which are located to the sides of the pituitary gland.

Within the first movement medially, however, Dr Kalish saw bright red blood filling the view of the endoscope. A surgical neuropatty was placed by Dr Kalish into the site in an attempt to stop the bleeding. At this stage, the bleeding appeared to have been stopped. Professor Dan then took over the surgery. He continued to curette the tumour. Unfortunately, however, the bleeding recommenced. Professor Dan decided to stop the operation although not all the adenoma had been removed. The higher priority was to control the bleeding and to care for Mrs Chan.

To stop the bleeding the surgical team used a number of different techniques: neuropatties, surgicel, thrombin and gelfoam. Fat and abdominal muscle was also used to pack the site. During this period, Dr Tim Steel, a senior neurosurgeon, was called to assist. By the time the team was able to bring the bleeding under control (or so they thought), Mrs Chan had lost a large volume of blood. A transfusion was then given.

By this time, there had been a large intracranial haemorrhage. An urgent CT brain scan showed extensive intra-ventricular bleeding. Mrs Chan was taken back to theatre where intraventricular drains were inserted in an attempt to reduce intracranial pressure and consequent brain damage. Mrs Chan was then treated in the Intensive Care Unit. One of the drains became blocked and this was replaced on 9 December.

At post mortem examination, the brain was found to have been markedly swollen and that severe intraventricular bleeding had taken place. This led to acute intracranial pressure and compression of the brain stem.

During his evidence, Professor Dan said that he believed that although the bleeding appeared to stop during the operation after the vessel had been packed, the vessel in fact continued to bleed on the other side of the packing, thus leading to the build up of intracranial pressure on the brain. This appears to me to be consistent with the physical evidence found at autopsy.

In the post mortem report, the forensic pathologist, Dr Sy, offered a qualified opinion that "it appears that the site of surgical access was the result of surgical misnavigation". She stated in her report, however, that a specialist in otonasolaryngology, that is, an ENT specialist, or a specialist neurosurgeon should review the case. Evidence was obtained from two specialists. The consensus of the evidence, apart from Dr Sy's report, is that there was no surgical misnavigation. It appears that Dr Sy, on seeing the site which had been packed, wrongly assumed that this had been the entry point for surgical access to the pituitary tumour.

The small samples of tissue curetted before the bleeding began turned out not to be part of the tumour but were part of the frontal cortex of the brain. It seems that, even for such a highly experienced neurosurgeon as Professor Dan, there can be difficulties in discerning the difference on a television monitor. What had happened was that, after the bone supporting the dura had been removed to enable entry to the pituitary fossa, Mrs Chan's frontal cortex had, in effect, sagged down in front of the pituitary gland. The internal structure of the brains of individuals may vary slightly. As I understand it, Mrs Chan's brain sat slightly lower in the skull than is usual, thus exacerbating the sagging effect when the bony structure supporting the dura was

removed. This was not caused by surgical error or carelessness but by natural differences between people.

This was not, however, the cause of the bleeding. It was the fact that an aberrant blood vessel in an unanticipated location was encountered that caused the bleeding. Again, this was not the result of surgical error or carelessness but was due to a natural difference between individuals. The expert evidence also demonstrated that the attempts to stop the bleeding and to relieve the intracranial pressure had been carried out appropriately and carefully.

Surgical teamwork

Although the facts do not suggest any lack of skill or care on the part of the surgeons involved in Mrs Chan's operation, this was the first time that this team had worked together. During the hearing, this led me to explore the question of surgical teamwork.

Some evidence was given by Dr Sacks to the effect that, ideally, surgical teams would work together as much as possible. He explained that Concord Hospital recognised the benefits of teamwork and sought to roster the same teams together as much as was practicable. Nevertheless, because of the many calls on staff, it is not always possible to manage this.

Recent studies have shown that the adoption of surgical checklists appear to have a significant effect in reducing mortality and morbidity in surgery[1],[2]. In his recent book *The Checklist Manifesto*[3], Professor Atul Gawande, a US surgeon and Director of the

[1] Alex B. Haynes, M.D., M.P.H., Thomas G. Weiser, M.D., M.P.H., William R. Berry, M.D., M.P.H., Stuart R. Lipsitz, Sc.D., Abdel-Hadi S. Breizat, M.D., Ph.D., E. Patchen Dellinger, M.D., Teodoro Herbosa, M.D., Sudhir Joseph, M.S., Pascience L. Kibatala, M.D., Marie Carmela M. Lapitan, M.D., Alan F. Merry, M.B., Ch.B., F.A.N.Z.C.A., F.R.C.A., Krishna Moorthy, M.D., F.R.C.S., Richard K. Reznick, M.D., M.Ed., Bryce Taylor, M.D., and Atul A. Gawande, M.D., M.P.H. for the Safe Surgery Saves Lives Study Group "A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population" *N Engl J Med* 2009; 360:491-499 January 29, 2009

[2] Weiser TG, Haynes AB, Lashoher A, Dziekan G, Boorman DJ, Berry WR, Gawande AA. "Perspectives in quality: designing the WHO Surgical Safety Checklist". *International Journal for Qaulity in Health Care*. Published online August 11, 2010

[3] Profile Books, London 2010.

World Health Organisation's *Global Challenge for Safer Surgical Care* project, argues that the use of a 19-point checklist improves surgical teamwork by, among other things, improving communication within the team. He does not argue that the use of checklists provides a surgical recipe or replaces surgical skills or expertise. Rather the principal point made is that the cognitive load on members of surgical teams is reduced by the use of an aide memoire and communication is promoted by a structured introduction of the team to another and a short explanation of the surgical plan to all team-members.

Professor Dan's evidence suggests that he has used a version of the techniques suggested by Professor Gawande's project within his teams for a significant period. With advances in equipment, training and technique, he has seen a significant decline in surgical mortality and morbidity in neurosurgery over his long career. He believes that it is likely that there will be further developments and improvements. One such advance may be the widespread adoption of a short surgical safety checklist. A 2009 study in the New England Journal of Medicine (see footnote 1) found that the adoption of a standard surgical safety checklist reduced surgical mortality by half and major post-operative complications by one-third.

Surgical checklists are not and cannot be a complete panacea for all the problems of surgical error and medical deaths. A recent article in *The Lancet* warns against oversimplification:

> The emphasis on checklists is… a distraction … that diverts attention from how safer care is really achieved. Safer care is really achieved when all three – not just one – of the following are realised: summarise and simplify what to do; measure and provide feedback on outcomes: and improve culture by building expectation of performance standards into work processes. We propose that widespread deployment of checklists without an appreciation of how or why they work is a potential threat to patients' safety and to high-quality care… The mistake of the "simple checklist" story is in the assumption that a technical solution (checklists) can solve an adaptive (sociocultural) problem. [4]

[4] CL Bosk, M Dixon-Woods, CA Goeschel, PJ Pronovost "The art of medicine: Reality check for checklists" www.lancet.com Vol 374 August 8, 2009 p444-445

The authors go on to stress that checklists are one part only of a cultural change in a US program that successfully reduced infections in 103 US intensive care units.[5] Nevertheless, although checklists are not of themselves the answer to all complex medical (or other) issues, to the degree that they promote good teamwork and eliminate some cognitive errors, they are very valuable tools.

Professor Gawande notes that in his own experience of using the WHO checklist potential errors caused by forgetfulness are frequently picked up and avoided: "To my chagrin… I have yet to get through a week in surgery without the checklist's leading us to catch something we would have missed. Take last week, as I write this, for instance. We had three catches in five cases." [6]

Although there does not appear to be any evidence of poor teamwork or surgical error causing or contributing to Mrs Chan's death, the general question of teamwork in reducing the potential for surgical area nevertheless remains an important one as Dr Sacks agreed during the inquest. The evidence before me suggests that although NSW surgeons are conscious of the desirability of teamwork and surgical protocols, there is no standard approach to surgical planning, surgical teamwork or surgical safety checks.

How checklists promote better surgical teamwork is not quite clear, yet there appears to be little doubt that they can do so. Gawande again:: [7]

> … some [surgeons] objected that the study had not clearly established *how* the checklist was producing such dramatic results. This was true. In our eight hospitals we saw improvements in administering antibiotics to reduce infections, in use of oxygen monitoring during operations, in making sure teams had the right patient and right procedure before making an incision. But these particular improvements could not explain why unrelated complications like bleeding fell, for example. We surmised that improved communications was the key. Spot surveys of random staff members coming out of surgery after the checklist was in effect did indeed report a significant increase in the level of communication. There was also a notable correlation

[5] Peter Pronovost, M.D., Ph.D., Dale Needham, M.D., Ph.D., Sean Berenholtz, M.D., David Sinopoli, M.P.H., M.B.A.,Haitao Chu, M.D., Ph.D., Sara Cosgrove, M.D., Bryan Sexton, Ph.D., Robert Hyzy, M.D., Robert Welsh, M.D.,Gary Roth, M.D., Joseph Bander, M.D., John Kepros, M.D., and Christine Goeschel, R.N., M.P.A. "An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU" *N Engl J Med* 355;26 2725-2732 Dec 28, 2006
[6] *The Checklist Manifesto* n.3 p.187.
[7] *The Checklist Manifesto* n.3 p.156.

> between teamwork scores and results for patients – the greater the improvement in teamwork, the greater the drop in complications.

The NSW Health "Correct Patient, Correct Procedure and Correct Site" Policy Directive[8], which was developed to reduce surgical error, adopted a 10-point checklist that in several respects is similar to the WHO checklist. I note that the NSW Health protocol emphasises active communication within the team at the time the checklist is carried out. It states:

> Success is reliant on active communication amongst all members of the procedure team. "Time out" must be initiated and completed by a designated team leader. This should be the senior proceduralist present… All members of the procedure team share responsibility for ensuring that "Time out" is completed.[9]

The Australasian College of Surgeons has adapted the WHO checklist for use in Australia and New Zealand. NSW Health is in the process of establishing a working party to incorporate features of the WHO checklist into its present procedures and expects this work to be complete by July 2011. I support the College of Surgeons and NSW Health in that initiative.

The development of communication within a procedural team goes beyond running through a checklist and ticking the boxes. Gawande argues that the WHO project discovered that two of the key ways of ensuring that the team works as a team are, first, for all members of the team to be included in a short briefing before the procedure begins and, second, for all of them to announce their names and roles before the operation begins:

> Teamwork may just be hard in certain lines of work. Under conditions of extreme complexity, we inevitably rely on a division of tasks and expertise… [The team members] can each be technical masters at what they do… But the evidence suggests we need them to see their job not just as performing their isolated set of tasks well but also as helping the group get the best possible results. This requires finding a way to ensure that the group lets nothing fall between the cracks and also adapts as a team to whatever problems arise…

[8] PD2007_079 published 2007.
[9] PD2007_079.

> … [In] the checklists from Toronto and Johns Hopkins and Kaiser… insistence that people talk to one another about each case, at least for a minute before starting was basically a strategy to foster teamwork – a kind of team huddle, as it were. So was another step that these checklists employed, one that was quite unusual in my experience: surgical staff members were expected to stop and make sure that everyone knew one another's names… Before starting an operation with a new team, there was a check to ensure that everyone introduced themselves by name and role: "I'm Atul Gawande, the attending surgeon"; "I'm Zhi Xiong the anaesthesiologist"… [10]

When team members did these two things, Gawande argues, communication within the teams markedly improved.

I propose therefore to recommend that NSW Health, when planning the introduction of the adapted WHO checklist, also give close consideration to including in its safe surgery protocol a standard procedure that a surgical team briefing including *all* members of the team take place before any operation. I also propose recommending that NSW Health consider the benefits of adopting as a standard procedure members of new surgical teams introducing themselves by name and role.

Conclusion

All surgery carries with it the risk of complications and even death. The human brain is obviously a complex and fragile organ. Neurosurgery, no matter how carefully conducted by no matter how skilful or experienced a surgeon, may, due to no fault on the part of the surgeon or the surgical team, have fatal consequences. In my view, the death of Oi Fong Chan was a tragic accident.

The pity here is that she feared that surgery may result in her death. She had wished to return to China to settle her affairs just in case. She did not go and her family is left to mourn her. I offer them my sincere respects and condolences. I now turn to the formal findings I must make under the Coroners Act.

[10] *The Checklist Manifesto* n.3 pp 103, 107.

Findings under s 81 Coroners Act 2009

I find that Oi Fong Chan died at Concord Hospital on 9 December 2006 as a result of an intracranial haemorrhage she suffered during the course of neurosurgery.

Recommendations

I recommend to the Minister for Health that NSW Health, when planning the introduction of the adapted World Health Organisation surgical safety checklist, also gives close consideration to including in its safe surgery protocol a standard procedure that a surgical team briefing including *all* members of the team take place before any procedure.

I further recommend that NSW Health considers adopting a standard procedure of members of new surgical teams introducing themselves by name and role before operations commence.

Magistrate Hugh Dillon
Deputy State Coroner