



**STATE CORONER'S COURT
OF NEW SOUTH WALES**

Inquest:	Inquest into the death of Pauline Lynn Kessell
Hearing dates:	6 - 10 August, 10 – 12 December, 2018, 10 –12 April 2019
Date of findings:	7 August 2019
Place of findings:	State Coroner's Court, Lidcombe
Findings of:	Magistrate Russell Coroner
Catchwords:	CORONIAL LAW – Cause and manner of death, endoscopic pyeloscopy with laser lithotripsy, sepsis, antibiotic administration, clinical review
File number:	2015/240190

<p>Representation:</p>	<p>Counsel Assisting the Coroner: Ms Lesley Whalan of Senior Counsel Instructed by Mr Paul Armstrong Crown Solicitor's Office</p> <p>Family of Pauline Kessell: Ms Kirstin Edwards of Counsel Instructed by Ms Rebecca Tidswell Carroll & O'Dea Lawyers</p> <p>Dr Tania Hossack: Dr Vitali Broyda: Mr Richard Weintsein of Senior Counsel Instructed by Mr Ren Li From 10 April 2019: Ms Kim Burke of Counsel Instructed by Mr Ren Li Avant Mutual Group Limited</p> <p>Westmead Private Hospital: RN Andrea Flaiban: RN Yoojing Jeon: RN Maya Pillay: RN Susan Scott: RN Fatima Dandan: Mr Richard Sergi of Counsel Instructed by Ms Danielle Ashton HWL Ebsworth Lawyers</p> <p>Dr Mirmohammad Hamidi: Ms Kim Burke of Counsel Instructed by Mr Scott Sherwoon Moray & Agnew Lawyers</p> <p>Dr Muniswami Mudaliar: Ms Kim Burke of Counsel Instructed by Ms Kate Dobbie</p> <p>RN Caterina Pooke: Ms Katherine Doust Nurses and Midwives Association</p>
<p>Non publication order:</p>	

Findings:

Date and place of death

Pauline Lynn Kessell died on 14 August 2015 at Westmead Private Hospital, Westmead.

Cause of death

The cause of Pauline Kessell's death was multiple organ failure as a result of septic shock.

Manner of death

An endoscopic pyeloscopy with laser lithotripsy procedure performed on a 5cm staghorn calculus, undertaken at Westmead Private Hospital, on 12 August 2015. The increased intrarenal pressure associated with that prolonged pyeloscopic procedure, in the setting of an infection stone, resulted in the dissemination of endotoxic material and *Proteus mirabilis* bacteria into the bloodstream causing the sepsis, the cause of Ms Kessell's death.

<p>Recommendations:</p>	<p>Pursuant to s 82 of the <i>Coroners Act</i> 2009, I make the following recommendations:</p> <ol style="list-style-type: none"> 1. To the Urological Association of Australia and New Zealand: <p>that it give consideration to the need for further guidance to urologists on treatment of large staghorn calculi;</p> 2. To Ramsay Health Care and Westmead Private Hospital: <p>that, those organisations incorporate in the proposed <i>Lessons Learned</i> procedure, arising out of the death of Pauline Kessell,</p> <ol style="list-style-type: none"> i. consideration of problems arising, where a number of consultants are attending a patient, from a lack of clarity as to who has responsibility for ensuring the administration of antibiotics; ii. consideration of methods, including use of stat charts, for ensuring that antibiotics are given promptly upon their being ordered; iii. consideration of, and dissemination of information about, the dilemma, as <i>set out in these findings</i>, facing an experienced and competent PACU nurse in securing a clinical review for a patient about whom she was concerned. That the process address, not only those making the call for clinical review (PACU nurses), but also those receiving the call (anaesthetists/VMOs and members of the Rapid Response Review Team).

Table of Contents

Background	1
Investigations leading to surgical intervention on 12 August 2015	1
Functions of the Coroner	2
Findings as to identity, date, place and cause of death.....	3
Pre-admission antibiotic prophylaxis	3
12 August 2015 Westmead Private Hospital	5
Admission	5
Prior to the procedure commencing.....	5
E. coli demonstrated in midstream urine specimen.....	5
Pre-operative Gentamicin	6
Pyeloscopy Procedure.....	6
Post Anaesthetic Care Unit.....	8
The first two hours in Post Anaesthetic Care Unit.....	8
Availability of an appropriately qualified medical practitioner to review Ms Kessell in PACU.....	9
Evidence from Dr Broyda of a brief check on Ms Kessell.....	12
Effect of delay in post-operative review and treatment.....	13
Dr Broyda, Dr Hossack and Dr Hamidi in PACU	13
Antibiotic administration PACU	14
Intensive care unit.....	16
How did the procedure lead to the development of an overwhelming sepsis?	19
Proteus mirabilis and staghorn calculus	19
Identification of the stone pre-operatively.....	20
Size of stone	20
How were the bacteria and endotoxins released by the procedure?	21
Endoscopic pyeloscopy with laser lithotripsy	21
Intrarenal pressure	21
Length of the procedure	22
Alternative procedure	25
Percutaneous nephrolithotomy	25
Guidelines with respect to size of stone	26
Technical difficulties with PCNL	26
Time involved in the procedure	27
Dr Hossack's opinion at the time of these proceedings	27
CONCLUSION	27
Dr Hossack	27
Recommendation to Urological Association of Australia and New Zealand.....	28
Dr Broyda	29
Ceftriaxone and Tazocin.....	29
MR2A document.....	29
Recommendations sought by family	30
Findings required by s81(1).....	31
Recommendations	31

Background

1. Pauline Kessell died just before midnight on 14 August 2015 at Westmead Private Hospital, Westmead. Ms Kessell was, at the time of her death, 53 years old. She had been admitted to that hospital on 12 August 2015 for a procedure to remove a staghorn calculus from her kidney.
2. Ms Kessell was born in Adelaide. She was a talented netball player, playing at state representative level in her teens. She had a successful career in the banking sector but was, in the time leading up to her death, looking forward to the opportunities that semi-retirement would bring.
3. She is survived by her partner, Bruce Fletcher, and a close-knit family, including her father, brother, three sisters, nieces and nephews, two adult children, Lauren Doherty and Christopher Doherty, and grandchildren, Noah and Ben. She was survived by her mother, who has since died. In the time since she died, two more grandchildren have been born, Grace and Sam. It is a source of enormous grief to her family that she never saw those grandchildren.
4. Lauren and Chris Doherty were each born with albinism. They described their mother as capable, strong and protective. She supported them in practical ways, encouraged them and was a fierce advocate for them and for others, particularly those with albinism.
5. Her loss to her family, at the age of 53, is immeasurable.

Investigations leading to surgical intervention on 12 August 2015

6. On 16 July 2015 Ms Kessell consulted Dr Rokeya Fakir, a general practitioner at the Rouse Hill Health Care Centre, about what is described in the GP's notes as, constant left hip pain with radiation to the left groin. Dr Fakir noted that Ms Kessell had been experiencing that pain for about a week. Dr Fakir prescribed a non-steroidal anti-inflammatory drug, Naprosyn, to be taken twice a day.
7. The pain did not resolve and, on 3 August 2015, Ms Kessell consulted Dr Myra Tan, general practitioner, complaining of pain in her lower left abdomen radiating to the left groin. Dr Tan ordered a pelvic ultrasound and a CT scan of the abdomen. The CT scan demonstrated, in the opinion of Dr Brian Lam, radiologist, *inter alia*:

a large staghorn calculus within the left renal pelvis extending into the lower calyces.
8. I will have need to return to the size of the 'large staghorn calculus'.
9. In the analysis of the evidence which follows the staghorn calculus is at times referred to as a 'stone'. The terms are used interchangeably in these findings, as they were throughout the reports and the oral evidence.

10. On 4 August 2015, Dr Tan referred Ms Kessell to Dr Tanya Hossack, a urological surgeon. In her letter of referral, Dr Tan listed Ms Kessell's then current medication as one Naprosyn 500 mg tablet twice per day. Ms Kessell first saw Dr Hossack on 7 August 2015. At that appointment, Dr Hossack reviewed the CT scan and scheduled Ms Kessell for an endoscopic pyeloscopy with laser lithotripsy ('pyeloscopy') in her list at Westmead Private Hospital on 12 August 2015.
11. Ms Kessell underwent that procedure on the afternoon of 12 August 2015 and was received in the Post Anaesthetic Care Unit (PACU) of the hospital at 18:57 on that day. She died two days later in the Intensive Care Unit of Westmead Private Hospital.

Functions of the Coroner

12. Section 81 of the *Coroners Act 2009* sets out the principal functions of a Coroner conducting an inquest. Those are to record the identity of the person who has died, the date and place of his/her death and the manner and cause of that death.
13. Section 82 of the Act empowers a coroner to make recommendations that are necessary or desirable in relation to any matter connected with the death and makes specific reference to the following as matters that can be the subject of a recommendation:
 - (a) *public health and safety,*
 - (b) *that a matter be investigated or reviewed by a specified person or body.*
14. Section 151A (2) of the *Health Practitioner Regulation National Law (NSW)* confers power on a Coroner to give a transcript of relevant evidence to the Executive Officer of the Council for the health profession concerned. The power conferred arises where a Coroner has reasonable grounds to believe the evidence given before the Coroner may indicate that a complaint could be made about a person who is registered in a health profession.
15. Section 151A (3) provides that where a transcript of evidence is given to the Executive Officer of the Council for the health profession, a complaint is taken to have been made about the person to whom the transcript relates and the Executive Officer must give written notice to the National board of the relevant health profession.
16. In making findings, a coroner is to have regard to the principle laid down in *Briginshaw v Briginshaw* (1938) 60 CLR 336 as stated by Dixon J at 361-2:

when the law requires the proof of any fact, the tribunal must feel an actual persuasion of its occurrence or existence before it can be found ... The seriousness of an allegation made, the inherent unlikelihood of an occurrence of a given description, or the gravity of the

consequences flowing from a particular finding are considerations which must affect the answer to the question whether the issue has been proved to the reasonable satisfaction of the tribunal.

Findings as to identity, date, place and cause of death

17. There is no issue in these proceedings that Pauline Lynn Kessell died on 14 August 2015 at Westmead Private Hospital, Westmead.

18. There is no serious issue as to the cause of that death.

19. Dr Jennifer Pokorny, forensic pathologist, at autopsy, observed:

subcapsular and perinephric haemorrhage around the left kidney and extensive haemorrhage into the retroperitoneal soft tissue' [and that microscopic examination confirmed the areas of recent haemorrhage and showed changes in the lungs, liver and kidneys in keeping with the history of multiple organ failure.

20. Dr Pokorny noted that blood cultures, taken at Westmead Private Hospital showed *Proteus* bacteria in Ms Kessell's blood. She recorded the cause of Ms Kessell's death as 'multiple organ failure due to septic shock due to laser lithotripsy of staghorn renal calculus'.

21. Dr David Winkle, consultant urologist, agreed that the multiple organ failure associated with Systemic Inflammatory Response Syndrome, which occurred as a result of the treatment of the staghorn calculus in her left kidney, was the cause of Ms Kessell's death.

22. There is no serious issue that Ms Kessell developed septic shock, as a result of the endoscopic pyeloscopy with lasertripsy procedure conducted on the afternoon of 12 August 2015.

23. The focus of this inquest has been the manner, or circumstances, in which Ms Kessell died and whether Ms Kessell's death could, or should, have been prevented.

24. I have carefully read and considered the submissions of each party.

Pre-admission antibiotic prophylaxis

25. Dr Hossack's evidence was that, at the consultation on 7 August 2015, she gave Ms Kessell a prescription for trimethoprim 300 mg/day and advised her to commence taking that three days before the operation.

26. The evidence established that Ms Kessell did not take trimethoprim in the lead up to her admission and, taken as a whole, does not support the proposition that Dr Hossack did, in fact, prescribe trimethoprim to Ms Kessell at that consultation.

27. There is no record in the Pharmaceutical Benefits Schedule that Ms Kessell filled a prescription for trimethoprim or other antibiotic in the lead up to the procedure on 12 August 2015.
28. RN Andrea Flaiban who, on 12 August 2015, completed the admissions procedure with Ms Kessell, went through the *Patient Health History - General* form with Ms Kessell and noted that she had been prescribed analgesia by her doctor. She asked Ms Kessell if she was taking any other medications. Ms Kessell replied that she was not. RN Flaiban said that, had Ms Kessell told her that she was taking any other medications, she would have recorded those medications on the *Patient Health History* under the 'medication' section. The only entry in that section is 'analgesia by Dr'.
29. Dr Hossack said she asked Ms Kessell 'have you taken the tablets' and Ms Kessell replied 'yes'. At the time Dr Hossack was aware that Ms Kessell had been taking Naprosyn for pain. She appreciated, at the time she gave her evidence, but not on 12 August 2015, that by using the non-specific word 'tablets' the answer she got was not a confirmation that Ms Kessell had been taking the antibiotics Dr Hossack said she had prescribed.
30. Dr Vitali Broyda, the anaesthetist working with Dr Hossack on 12 August 2015, initially said that Ms Kessell had told him that she had taken trimethoprim but, on reflection, in his oral evidence, was unable to say whether trimethoprim was, in fact, mentioned to him by Ms Kessell or whether it was Dr Hossack who had mentioned the drug to him.
31. That evidence establishes that Ms Kessell, an intelligent woman, did not fill a prescription for, or take, trimethoprim in the lead up to the procedure on 12 August 2015.
32. Dr Hossack has no record of the prescription other than in a letter sent to Dr Tan which bears the date of 7 August 2015.¹ Dr Hossack's evidence was that that letter may not have been dictated immediately after she saw Ms Kessell. She used handwritten scripts from a prescription pad which leaves no record of the prescription with the prescribing doctor. Both the script and a duplicate are given to the patient.
33. That evidence, taken as a whole, grounds a finding, which I make, that Dr Hossack did not, on 7 August 2015, in fact prescribe trimethoprim to Ms Kessell.
34. It was the evidence of Professor William Rawlinson, medical virologist and infectious diseases physician, evidence to which I will return, that, although the *Proteus mirabilis* organism is susceptible to trimethoprim, the organism in the interstices of the stone would not have been accessible to trimethoprim and, therefore, trimethoprim would not have been effective in removing that organism.

¹ That letter is stamped as having been received on 18 August 2015.

35. Dr Hossack's failure to prescribe trimethoprim or to ensure that it was taken was not, therefore, implicated in the tragic outcome. For that reason, other than as it relates to Dr Hossack's management of Ms Kessell more generally, any issue raised by the fact that there is no record of Ms Kessell taking trimethoprim is not pursued in these findings.

12 August 2015 Westmead Private Hospital

Admission

36. At about 13:00 on 12 August 2015, RN Andrea Flaiban completed the admissions procedure. She recorded Ms Kessell's height (170 cm), weight (74 kg) and body mass index and, *inter alia*, her blood pressure on the appropriate hospital documents including the anaesthetic record.

Prior to the procedure commencing

E. coli demonstrated in midstream urine specimen

37. Dr Hossack had, on 7 August 2015, requested analysis of a midstream urine specimen. She accessed the urine test result on the morning of 12 August 2015. That result, she said, identified 'a multi-sensitive *E. coli*'.

38. Dr Hossack said that this result left:

the clinical dilemma of either cancelling the procedure ... leaving Ms Kessell in pain with a compromised kidney ... or proceeding on the assumption infection was adequately managed.

39. About 15 minutes before Ms Kessell was taken into the operating theatre, Dr Hossack spoke to her. She did not specifically, at that time, warn Ms Kessell of risks associated with going ahead with the procedure in the presence of a positive *E. coli* culture. She enquired as to whether Ms Kessell had any symptoms of infection (dysuria, frequency, urgency, fever, sweats) and, on learning that she had none, recommended that Ms Kessell's procedure go-ahead.
40. Dr Hossack conceded, in the context of these proceedings, that she should not have proceeded in the presence of the positive *E. coli* culture. In a supplementary statement of 6 April 2018 she says that she has changed her practice and 'increased [her] checks and balances to ensure clean urine prior to surgery' and she ensures that those results are clearly documented in the patient's medical records.
41. Professor Rawlinson excluded *E. coli* as the cause of Ms Kessell's sepsis. The organism identified as the cause of that sepsis was *Proteus mirabilis*.
42. For that reason, other than as it relates to Dr Hossack's management of Ms Kessell more generally, the presence of a positive *E. coli* culture is not further pursued in these findings.

Pre-operative Gentamicin

43. Dr Hossack arrived at the hospital in the early afternoon and, in response to that urine test result, determined that Ms Kessell should be placed last on the surgical list for that day and should, prior to surgery, be given a therapeutic dose of gentamicin. She conveyed that fact, she said, to Dr Vitali Broyda.
44. She told Dr Broyda, she said, that there had been a positive urine, that Ms Kessell 'had some antibiotics to treat it but we haven't got time to repeat it' and that she should be given a therapeutic dose of gentamicin at least an hour before the procedure.
45. Dr Broyda conducted a pre-anaesthetic assessment of Ms Kessell and ordered a dose of gentamicin 240 mg, which was given to Ms Kessell at 14:15. That dosage, Dr Skowronski, intensive care physician, said was in conformity with the relevant therapeutic guidelines².
46. In identifying to Dr Broyda the reason for the therapeutic dose of gentamicin Dr Hossack mentioned the *E. coli* infection. She did not alert Dr Broyda to any increased risk of sepsis by virtue of any characteristic of the stone or of the nature of the procedure. I will return to these issues.
47. Dr Hossack did not communicate with Dr Broyda during the procedure, to confirm that there were no concerns that he needed to raise with her. Dr Hossack did not adequately explain why she did not communicate in that way to Dr Broyda. Such communication, she acknowledged, was 'standard practice'.

Pyeloscopy Procedure

48. As it transpired, Ms Kessell was not the last patient in Dr Hossack's list on 12 August 2015. There was a delay in preparing a patient whose procedure had been scheduled before that of Ms Kessell. That patient was described by Dr Broyda as

an extremely high surgical risk man who was undergoing a transurethral resection of prostate. He required extensive and thorough preparation for his procedure including performing a spinal block in the operating theatre.

49. During the course of the day, he was moved to the final position on Dr Hossack's list. Ms Kessell's procedure was performed as the second last of the day.

² Antibiotic Guidelines (2017 edition) published by Therapeutic Guidelines Ltd ("The Guidelines"), which,

in relation to surgical prophylaxis for endoscopic urological surgery recommend either 2 mg/kg, or 3 mg/kg IBW if there is a known urinary infection.

50. Ms Kessell was moved to the anaesthetic bay at 15:20. The procedure is recorded as commencing at 15:30 and concluding at 18:55.
51. In her statement of 4 September 2017, Dr Hossack described the procedure as follows³:

The left ureteric orifice was cannulated and the distal portion dilated with the internal obturator of the ureteric sheath.

52. Dr Hossack used the internal obturator of the ureteric sheath but did not use the ureteric sheath itself. Her description continued:

An Olympus V 2 video-pyeloscope was passed to the distal end of the stone without difficulty.

Laser commenced initially in the distal portion of the ureter and progressed into the renal pelvis.

The urine in the kidney was clear. A 400um fibre was used with a 1-litre normal saline pressure bag.

The laser was set at 12 Hz, 600 joules. Irrigation fluid was pressurised at 200 cmH₂O but was run at a slow flow. This allowed good visualisation of the stone throughout the case. Pressure in the kidney would have been less [than] the 200 cm H₂O as the pressure decreases down the pyeloscope, especially with the laser fibre in situ, due to the very small diameter.

The stone was successfully lasered. Several times during the case, fluid was aspirated via the pyeloscope to remove 'stone dust' which clouded the view. The stone in the ureter and renal pelvis was completely lasered however the stone in the lower calyx was only fragmented. I had been lasering for 75 minutes and it was late in the evening, so I elected to finish the procedure with a view to returning for a 'second look' in two weeks. There was minimal bleeding throughout the case.

53. The laser record sheet for the procedure indicates that the laser was turned on at 15:45 and off at 18:40. It records a 'laser time' (the sum of all the times during which the laser was activated) of 1 hour 8 minutes 58 seconds.
54. From about 18:00, slightly over two hours since the commencement of the procedure, Ms Kessell's blood pressure began to fall and her heart rate to increase. Professor Ross MacPherson, anaesthetist, noted that a decrease in blood pressure is 'a common occurrence in patients who are anaesthetised for prolonged periods' and that her blood pressure later stabilised. As I understood his evidence, he was not, even in retrospect, able to say that the anaesthetic record was indicative of the development of sepsis. Dr Broyda saw nothing

³ Paragraph numbers from the original have been removed.

untoward intraoperatively but said that he would have been 'more cognisant' of sepsis if he had been made aware that the risk of sepsis was 'higher than expected'.

55. The events in the PACU can be seen in the light of that observation by Dr Broyda. Neither Dr Broyda, nor, through him or otherwise, PACU nursing staff were alerted to the heightened risk of sepsis.
56. Professor Gordon who practices in infectious diseases and microbiology, and Professor Rawlinson, medical virologist and infectious diseases physician, noted an absence of data with respect to patients who have been given an appropriate antibiotic preoperatively. Each expressed the view that it was possible that additional antibiotic therapy at 18:30 may have prevented Ms Kessell's death but could not say that it was likely to have done so.

Post Anaesthetic Care Unit

The first two hours in Post Anaesthetic Care Unit

57. Ms Kessell was accompanied to the PACU by Dr Broyda and the anaesthetic nurse, RN Caterina Pooke who, at the time, was known as Caterina Scarraza. Ms Kessell arrived in the PACU at 18:57.
58. Nursing care was handed over to RN Maya Pillay. When she arrived in the PACU, Ms Kessell had a laryngeal mask and jaw support. RN Pillay observed that Ms Kessell's 'skin colouration was mottled' and that her respiratory rate was high. Dr Broyda told her that Ms Kessell may be in pain as a consequence of the size of the kidney stone which was removed. Dr Broyda administered propofol 40 mg to reduce Ms Kessell's respiratory rate and oxycodone 5 mg for pain relief. Ms Kessell's respiratory rate then reduced to around 20–22 breaths per minute.
59. At 19:00 RN Pillay commenced monitoring Ms Kessell's blood pressure, heart rate, respiratory rate, oxygen saturation and flow, temperature and level of sedation on a continuous basis. Because of her observations about Ms Kessell's skin colour, RN Pillay expected Ms Kessell's oxygen saturation level would be very low but was surprised when the oxygen saturation level recorded at 19:00 was 96%.
60. On his being satisfied that Ms Kessell was stable and that her oxygen saturation and respiratory rates were normal, Dr Broyda returned to the operation suite for the final procedure of the list which commenced at 19:08.
61. At 19:55 RN Pillay became concerned that Ms Kessell's systolic blood pressure had fallen to 94. Ms Kessell's preoperative blood pressure systolic reading was 159. RN Pillay said that, even taking into account that that preoperative blood pressure reading might have been elevated because of anxiety, the reading at 19:55 was, in her opinion, significant.

62. RN Pillay said she contacted Dr Broyda by telephone and told him of her concern about Ms Kessell's blood pressure and that her heart rate was still slightly elevated. Dr Broyda instructed her to increase the IV fluids to 250 mls an hour, which RN Pillay did.
63. Ms Kessell did not have a catheter in place and RN Pillay was concerned that Ms Kessell hadn't passed urine.
64. Ms Kessell complained of feeling cold. Her toes were cold to touch. A Bair Hugger was applied for 19 minutes.
65. At 20:10 Ms Kessell's blood pressure was 91/67 but, by 20:20, it had dropped to 81/53. RN Pillay, she said, contacted Dr Broyda for a second time. At the time she gave her oral evidence, RN Pillay had no specific recollection of that call but relied on the fact that she had documented it. Dr Broyda, she said, instructed her to give Ms Kessell a fluid challenge. RN Pillay said that she immediately implemented a 500 ml fluid challenge.
66. RN Pillay did not tell Dr Broyda, when she spoke to him on the telephone, that Ms Kessell was complaining of feeling cold and that her toes were cold to touch. When asked why she did not do so, she said:
- [i]t was difficult to communicate with Dr Broyda ... because he was involved in the next case in theatre so the conversations that I did have with him were very limited.*
67. At 20:34 RN Pillay attached ECG leads to monitor Ms Kessell's cardiac function. When asked why she did that she said:
- [j]ust the fact that she wasn't improving, I felt that I needed to escalate my interventions with her.*
68. At 20:40 RN Pillay was concerned about the oxygen saturation level of 91% and reapplied the Hudson mask. She was also concerned that Ms Kessell's blood pressure continued to drop after the 500 ml fluid challenge. At 20:40 Ms Kessell's blood pressure was 89/63. She contacted Dr Broyda again. Dr Broyda requested 500 mls of 4% albumin to commence immediately. He told RN Pillay that the procedure in the operating theatre was finished, that he was about to transfer that patient to the ICU and that he would organise a bed for Ms Kessell in the ICU and also that he would come to review her in PACU.
69. By this time it was clear to RN Pillay, she said, that Ms Kessell should be in the ICU.
70. At 21:00 RN Susan Scott took over the nursing care from RN Pillay.

Availability of an appropriately qualified medical practitioner to review Ms Kessell in PACU

71. During the first two hours in which Ms Kessell was in the PACU, Dr Hossack was operating in theatre with Dr Broyda who was responsible, as the

anaesthetist, for that high-risk patient. He was assisted by an anaesthetic nurse, RN Pooke. As is common in procedures in private hospitals, there was no aesthetic registrar. Subject to what is said below, Dr Broyda was, during that time, essentially unavailable to conduct the clinical review of Ms Kessell. Professor MacPherson stressed that an anaesthetist cannot leave an anaesthetised patient in the operating theatre.

72. Although his initial recollection was that RN Pillay contacted him twice, Dr Broyda did not dispute that RN Pillay did, in fact, contact him three times, while he was in the operating theatre, about her concerns.
73. Dr Broyda's inability to attend Ms Kessell created a significant dilemma for RN Pillay, who felt uneasy about Ms Kessell, but was unable, she felt, to point to any symptom specific enough for her to insist on a clinical review.
74. She explained that:

[t]he picture was very confusing in the sense that I felt that she was unwell. She didn't feel unwell so she wasn't giving me what I needed for her to tell me that she was feeling unwell. Even nausea, pain was settled, and she was very orientated, so we - you know, we had a chat. I asked her if she smoked. She said she socially would smoke, so we had a joke about that. ... That's the type of interaction I was having with her so my concerns, which I had, I couldn't escalate because I wasn't getting that feedback back from Ms Kessell. ... I needed something to escalate her because I felt I had little bits of the picture but I didn't have the whole picture. I didn't have something that I could actually say to - maybe call him and say, 'look, I want IC involved now'.

75. She thought that Ms Kessell's temperature would start spiking which would indicate that she had some sort of infection but that didn't happen. Asked what she would have done if, for example, Ms Kessell's temperature rose, she said:

I would have asked Dr Broyda to come and if he couldn't I would have asked him to organise ICU to come and review her in recovery.

76. As I understood RN Pillay's evidence, it was that, if she had a specific measurement or complaint to support her unease, she would then have sought an immediate medical review from Dr Broyda, or, through him, from the ICU.
77. The then current hospital procedures, set out in a document headed *Perioperative Nurses Record Recovery Room*, a document referred to as *MR2A*, listed criteria for clinical review which made reference to 'PACE criteria' and listed a number of symptoms or concerns, the final one being *[a]ny concerns that do not fit the criteria*. In such circumstances, the document provided relevantly: *Anaesthetist/CMO to review patient within 15 mins*. The hospital's expectation, on the evidence of Ms Leanne Howard, Director of Clinical Services at Westmead Private Hospital, was that that review would be conducted at the bedside. The CMO to whom the document refers was, in the circumstances of that evening, the intensive care registrar on duty that night, Dr

Mirmohammad Hamidi. There was no evidence that Dr Hamidi would not have been available to attend to review Ms Kessell.

78. I will return to Westmead Private Hospital's directions to perioperative nurses with respect to obtaining a clinical review.
79. RN Pillay was clearly very concerned about her patient and those concerns fell into the category of 'any concerns that do not fit the criteria'. Dr Broyda could not attend Ms Kessell for a clinical review. RN Pillay did not think there would be any utility in her calling the ICU: She thought that, to have any effect, a call to the ICU registrar had to come from Dr Broyda. Despite the stated hospital procedures, RN Pillay said:

... as it stood, with what I had, if I had called ICU they more than likely would have scratched their heads and walked out again. There wasn't a - it was very hard at the time.

80. Asked to explain she said

basically because the consultant is still on site, they feel that the primary carer is still there to make that decision to escalate. It's not for me to do that – escalation.

81. That observation was of general application and, as I understood it, was not, in any way, directed at any specific ICU doctor.
82. RN Pillay's evidence, in that regard, gained some support from a general observation made by Dr Broyda and from the comments of Professor MacPherson. Dr Broyda⁴ said:

[a] lot of times some doctors are quite finicky ... sometimes they want a doctor to doctor conversation.

83. Professor MacPherson said:

[i]n terms of chain of command, it would be more logical for the nurse to tell the anaesthetist and then the anaesthetist to give ... a clinical handover to the ICU registrar.

84. RN Pillay was a most impressive witness whose evidence reflected a deep concern for her patient. It is clear that the position she found herself in on the evening of 12 August 2015 was a most difficult one. I accept her evidence, based in her experience, as it grounds the inference that, for practical purposes, any call to the ICU would most effectively have come from Dr Broyda.

⁴ Dr Broyda said he was 'not suggesting in any way that this would be the case in our hospital'.

85. It is clear that, while he was in theatre with the final patient of the day, Dr Broyda became concerned about Ms Kessell's condition and concerned that he could not review her. He explained:

when this occurs in a public hospital ... either myself or my anaesthetic registrar... will go and review the patient. It is very difficult in a private hospital when your obligation is to the patient on the table and yet I have later on developed two patients and, whilst my priorities are to the patient on the table who was quite unwell, Ms Kessell is also someone who deserves care.

86. Dr Broyda did not call the ICU⁵ because, as he explained it, Ms Kessell was his patient and he felt a 'duty of care' but he could not attend her.
87. Professor MacPherson's evidence was that Ms Kessell's condition at 20:20 was such that a clinical review was warranted. At that point, Ms Kessell's systolic blood pressure was 81 after a fluid bolus and she had an oxygen saturation of 93%.
88. With respect to Ms Kessell's condition at 20:40, Professor MacPherson explained that the albumin ordered by Dr Broyda was another form of blood volume replacement. He said:

we're still going down the treatment pathway of volume ... I think it's difficult for the anaesthetist to try and organise anything from an operating room without reviewing the patient, so I think that at that point it would be more appropriate for the patient to be reviewed personally.

89. A clinical review should have been undertaken in response to the concerns expressed by RN Pillay at 19:55 but certainly by 20:20.
90. Subject to what is said below, that clinical review could not have been undertaken by Dr Broyda. He should have contacted the ICU registrar to attend the patient. Asked whether it would be difficult for such a call to have been made from the operating theatre, Professor MacPherson said that it would have been appropriate for Dr Broyda to call ICU to attend.

Evidence from Dr Broyda of a brief check on Ms Kessell

91. It is Dr Broyda's evidence that, on the last of RN Pillay's calls, he did leave the theatre and, briefly, to check Ms Kessell in recovery. He did not describe that brief check as a clinical review. This occurred, he said, just before he took the last theatre patient to the ICU. As I understood Dr Broyda, that brief check was limited by his need to return to the patient in theatre and escort him to the ICU.
92. RN Pillay had no memory of that brief check but said:

⁵ and he did not suggest to RN Pillay that she call ICU

It's really difficult to even try and remember if I had seen him at all. I must have but I just - I can't remember my interactions with him.

93. Dr Broyda said he made a provisional diagnosis of sepsis. It was at that time, on Dr Broyda's evidence, that he ordered the bolus of 4% albumin. He did not, at that time, otherwise, prescribe or undertake any treatment of Ms Kessell. He thought he would, when he was in the ICU, be able to arrange for her to be admitted to the ICU. His intention was to return quickly to the PACU. He returned, he thought, in about 15 minutes.
94. Dr Broyda thought, he said, that the ICU doctor might be better placed to determine the nature and type of the additional antibiotic which should be given to Ms Kessell.
95. I am not able to determine whether Dr Broyda did, in fact, briefly check on Ms Kessell at that time. His memory of interactions with the PACU at the time he was caring for the other theatre patient was hazy. If indeed he did make a provisional diagnosis of sepsis, it is Professor MacPherson's opinion that more should have been done for Ms Kessell at that point. Inotropic and vasoactive drugs should have been administered, he said. Professor Gordon's evidence was that the principles of management at that stage would be fluid resuscitation and further antibiotic therapy.
96. With respect to whether sepsis should have been the preferred diagnosis from an early time in the PACU, Professor MacPherson, echoing Dr Broyda, said:

all I can say is, in this case had he been alerted, had that in the forefront of his mind, then it probably will have elevated that particular diagnosis.

97. Dr Broyda was not alerted, by Dr Hossack, to any features of the procedure in Ms Kessell's case which carried an enhanced risk of sepsis.

Effect of delay in post-operative review and treatment

98. The absence of any clinical review of Ms Kessell, in response to RN Pillay's concerns, delayed the commencement of appropriate treatment. In view of the evidence of Professors Gordon and Rawlinson, I am unable to find, on the balance of probabilities, that that delay caused, or contributed to, Ms Kessell's death.

Dr Broyda, Dr Hossack and Dr Hamidi in PACU

99. Dr Hossack arrived in the PACU followed shortly thereafter by Dr Broyda. The progress notes record that they arrived to review the patient at 21:20. Dr Hamidi, at some point, also came to the PACU. There is a lack of clarity about when Dr Hamidi arrived in the PACU. His recollection was that he arrived shortly after 22:00.
100. Drs Hossack and Broyda each suspected sepsis.

101. Dr Hossack placed a catheter into Ms Kessell's bladder and immediately drained 800 ml of bright red blood. As a result, Dr Hossack and Dr Broyda considered the possibility of haemorrhage resulting from the procedure. There is some difference in emphasis between them, and at different times within their evidence, as to the extent to which that persisted as an alternative diagnosis. Each of them was conscious of the potential need to treat a haemorrhage by embolising the artery. Dr Hossack said that her primary diagnosis remained sepsis. Dr Broyda's evidence was that, until the blood test results were reported, their focus was on haemorrhage.
102. Ms Kessell's oxygen saturation levels began to drop and her blood pressure was falling. Dr Broyda inserted an arterial line and obtained arterial blood for analysis. He arranged for a pathologist to attend to take blood. The blood test results, reported, he said, some 5 to 10 minutes later, were grossly abnormal. Those tests were repeated.

Antibiotic administration PACU

Ceftriaxone

103. Dr Hossack, Dr Hamidi, and perhaps, to a lesser extent, Dr Broyda discussed the administration of antibiotics. Dr Hossack, she said, requested meropenem, a broad-spectrum antibiotic, but was told that it was not readily available. A decision was made to prescribe, in its place, another antibiotic, ceftriaxone 1g IV. The time at which these decisions were taken is not clear. Dr Hamidi, while he was in the PACU, wrote up the order for it to be administered once daily with the apparent intention that the first dose be given immediately.
104. There is no indication on the medication chart that ceftriaxone was ever given. At the time he gave evidence, Dr Hamidi had no recollection of prescribing ceftriaxone but said it was the nurse's responsibility to give it. Dr Hossack said she was 'under the impression' that it was given. Dr Broyda said it was not given and Dr Hamidi accepted that it appeared that the ceftriaxone wasn't given.
105. Dr Hossack said that it wasn't clear who had responsibility for ensuring the drug was given, but accepted that, in a situation where she, as the primary surgeon, the anaesthetist and the intensive care registrar were all managing Ms Kessell's treatment, it was her responsibility 'to guarantee that it was given'. Dr Broyda, at the time, was focused on managing Ms Kessell's airway, breathing and circulation.
106. The order for ceftriaxone was crossed out, and an order written up, again by Dr Hamidi, for Tazocin 4.5g. There is no indication on the order itself as to when ceftriaxone was crossed out. The evidence of Dr Muniswami Yuganathan Mudaliar, the on call ICU consultant, was that, it was his recollection that, he spoke to Dr Hamidi while Dr Hamidi was in the PACU and suggested the dose of Tazocin. Dr Hamidi has no recollection of a call from Dr Mudaliar at that time. His memory is that the first call from Dr Mudaliar was sometime between 23.45 and 01.00 the next day, when Ms Kessell was in the ICU. Dr Hamidi's best recollection is that, in the ICU, he decided on Tazocin because it is an antibiotic

with a broader coverage. I will return to the order for Tazocin. There is no evidence that Tazocin was given in the PACU. The evidence is to the contrary.

107. Professor Rawlinson's opinion was that:

the use of Gentamicin in adequate doses is appropriate treatment for urosepsis.... However, if severe sepsis is suspected/diagnosed, then Gentamicin at appropriate doses... plus another antibiotic such as Ampicillin, Ceftriaxone Cefotaxime, Ciprofloxacin, Tazocin or Meropenem would be standard therapy, as recommended in the Australian Therapeutic Guidelines.

108. Professors Rawlinson and Gordon elaborated on this in their oral evidence. As I understood that evidence, clinicians are faced, as they were in Ms Kessell's case, with treating sepsis without, in many cases, knowing the organism responsible. Where sepsis had developed in the presence of gentamicin therapy, the question would arise, in a clinical setting, as to whether the organism was susceptible to gentamicin. On that basis a beta-lactam antibiotic, such as ceftriaxone or Tazocin would be added.

109. It is now known the organism responsible for Ms Kessell's infection was *Proteus mirabilis*. Ceftriaxone is active against the *Proteus mirabilis* organism, as is gentamicin. Professor Gordon's opinion, an opinion with which Professor Rawlinson agreed, was that there is:

no clear evidence that adding a second effective antibiotic improves the overall response to infection ... as long as the first antibiotic is effective.

110. Gentamicin 120mg, ordered by Dr Hamidi, was recorded as being given at 22:15.

111. Professor Rawlinson and Professor Gordon were of the opinion that, in the presence of an adequate concentration of gentamicin, 'on the balance of probabilities' the addition of ceftriaxone at that time, 'would not have made any difference' to the outcome. They were able to form that opinion because they know, as the treating clinicians did not, that the organism was one which was susceptible to gentamicin.

Adequacy of the dosage of gentamicin

112. The dosage of gentamicin, given at 22:15, was based on Dr Hamidi's estimate of Ms Kessell's ideal body weight. That dosage was ordered as treatment for sepsis. In calculating that dosage, Dr Hamidi took into account the 240mg given at 14:15.

113. Dr Hamidi accepted Professor Rawlinson's opinion that the dosage he ordered in the PACU and the dosage given at 14:15 did not, given the gap of eight hours, exactly represent the optimal treatment dose. Professor Rawlinson had gone on to conclude, however, that Ms Kessell's rapidly deteriorating kidney function would have meant that she would have had higher, not quantifiable,

levels of gentamicin in her system than would have been the case were her kidneys functioning effectively. In determining the appropriate dose, Dr Hamidi considered the fact that Ms Kessell's kidneys were failing and that 'gentamicin is almost entirely cleared by kidneys'.

114. Professor Gordon considered that, after the second dose of gentamicin, there was an adequate concentration of aminoglycoside. Professor Rawlinson, too, thought the concentration of gentamicin, after that dose, was probably adequate.

Intubation in theatre

115. At the time that Ms Kessell was being assessed in the PACU her deterioration was such that Dr Broyda determined to take her to the operating theatre where he could intubate her. He planned to insert a central venous catheter to administer intravenous resuscitation fluids including inotropes and vasopressors, such as noradrenaline. However, her condition became critical and, while still in the PACU, he began to run the noradrenaline by infusion via a peripheral line. He then took Ms Kessell to the operating theatre and intubated her to provide respiratory support, inserted the central venous line and ran the noradrenaline infusion via that line. Ms Kessell was stabilised by these procedures in the sense that her oxygen saturation and blood pressure improved but Ms Kessell was gravely ill. That procedure commenced at about 22:40 and, on its completion, Ms Kessell was transferred to the ICU.

Intensive care unit

116. Ms Kessell arrived in the ICU and under Dr Hamidi's primary care at approximately 23:40. At that time, her condition was observed, by Dr Hamidi, to have substantially deteriorated since he had seen her in the PACU. She was experiencing cardiovascular, respiratory, renal, haematological, and hepatic failure. Dr Hamidi referred to a Sequential Organ Failure Assessment score of 19 which he said equated to an estimated likelihood of mortality of over 90%.

Late administration of Tazocin

117. Tazocin 4.5g IV three times daily appears in the plan written by Dr Hamidi in the progress notes at 23:45 in the ICU. The order appears on the medication chart but, on that chart, there is no time attached to the order. Dr Hamidi said that his usual practice was to chart the order when he wrote it on the plan and that is what he can be fairly sure he did.
118. The medication chart records that Tazocin was first given at 02:30 on 13 August 2015, nearly 3 hours after it was noted in the plan and, on Dr Hamidi's evidence, ordered by Dr Hamidi and written up in on the medication chart.
119. Dr Hamidi said that his practice, with respect to medications that need to be given immediately, 'stat' medications was to chart them and inform whoever is giving the medications or the bedside nurse of that order. At the time he gave his evidence, in August 2018, Dr Hamidi could not specifically recall giving that order orally. He said:

that's what I always do so I think I did but I don't have an exact recollection that.

120. With the benefit of hindsight, Dr Hamidi thought that, because the bedside nurse was very busy with numerous treatments being given to Ms Kessell in the first two hours in the ICU, Tazocin might have been delayed or forgotten. In retrospect, in that context, Dr Hamidi thought that he should have reminded the nursing staff. He agreed that antibiotics in cases of severe infection need to be given as soon as possible. It didn't occur to him, he said, that it wouldn't be given on time.
121. RN Fatima Dandan was the ICU nurse charged with the care of Ms Kessell on the night of 13 August 2015. It was her role to action Dr Hamidi's orders for administering fluids and medications. She said that Dr Hamidi would give such orders orally and at the same time start writing them up. She could not recall if Dr Hamidi instructed her to give Tazocin straight away. Her practice, she said, when instructed to give medication straight away, was to give it straight away.
122. The evidence does not permit me to determine whether, or when, an oral order was given to RN Dandan to give Tazocin stat, or straight away.
123. Professor Gordon stressed the need for a prescriber to communicate with the people who are going to administer any drug that needs to be given immediately. He referred to a study, in which he was involved, where there was 'more delay when [the drug was] written up on the ongoing drug sheet rather than on what's called a stat drug sheet'.
124. RN Dandan gave evidence of the significant number of medications which had to run through the various lines attached to Ms Kessell. That evidence was complex and at times confusing but, as I understood RN Dandan, she said there was a need to wait for medication to run through the lines before further medication could be given. On the other hand, she said that there was always a line that could be used for giving antibiotic medication.
125. Dr George Skowronski and Dr David Bihari, both intensive care physicians, stressed the importance of timely administration of antibiotics. They each accepted that there were difficulties, not infrequently encountered in intensive care units, with shortages of lines to deliver medications to a patient. Dr Skowronski, however, said 'it's almost always possible to juggle ... what's being given through lines'. It was a question of prioritising administration of Tazocin. Both Dr Skowronski and Dr Bihari considered the delay in treating Ms Kessell with Tazocin was 'a clinical error', although Dr Skowronski later qualified that opinion somewhat by saying that he couldn't 'strongly conclude' that it was a clinical error.
126. Professor Gordon and Professor Rawlinson, too, each stressed the importance of timely administration of antibiotics in cases of sepsis. Professor Rawlinson, in his report, said:

[t]he initial delay in the administration of Tazocin may have contributed to Ms Kessell's death, on the basis that this is outside recommended guidelines, that Proteus mirabilis release from the infected calculi remnants and upper urinary tract was continuing ... , And that reduction in bacterial load using antibiotics can improve outcome.

127. In that report he qualified that comment:

[h]owever, Ms Kessell was likely to have an adverse outcome, including death, on the basis that by the time of administration of Tazocin she had advanced sepsis, with a poor outcome as discussed by Dr Hamidi in his statement.

128. Professor Gordon said that it was difficult to determine if the delay had any effect. If Tazocin had been the only antibiotic used:

the delay is likely to have been significant. However this time period coincided with higher levels of gentamicin being present, so on balance I do not think this delay had a material effect on the outcome.

129. In his oral evidence, Professor Rawlinson confirmed his agreement with Professor Gordon's opinion.

130. The evidence does not permit a finding that the delay in administration of Tazocin contributed to Ms Kessell's death. However, the evidence of that delay, at least from the time it was prescribed in the ICU, if not from an earlier time in the PACU, and the likely non-administration of ceftriaxone attracted significant criticism from the intensive care and infectious diseases experts who gave evidence at this inquest.

Continued management in the ICU

131. Dr Hamidi managed Ms Kessell in the ICU in consultation, by telephone, with Dr Mudaliar. He managed the administration of further intravenous fluid to ensure adequate circulating volume while balancing its effects on her respiratory status. He treated the severe dilatation of vessels with noradrenaline and vasopressin. After consultation with Dr Mudaliar, he introduced Novo seven to assist with controlling her bleeding. She was administered blood products and constantly monitored.

132. Dr Mudaliar managed Ms Kessell's care in the hospital on 13 August and again on 14 August 2015. Despite the efforts of the ICU staff Ms Kessell continued to deteriorate and died shortly before midnight on 14 August 2015.

How did the procedure lead to the development of an overwhelming sepsis?

Proteus mirabilis and staghorn calculus

133. *Proteus mirabilis* is a gram negative bacterium which has a propensity to cause staghorn calculi.⁶ According to Dr Winkle, studies:

*demonstrate that between 30% and 44% of staghorn stones will be infection stones. Such stones develop when bacteria living within the urinary tract change the urinary pH and allow precipitation of phosphate and several compounds (mainly ammonia and magnesium) resulting in a substance called struvite. A number of bacteria can cause struvite stones including Proteus, Klebsiella, Pseudomonas and Staphylococcus aureus.*⁷

134. *Proteus* is the most common bacterial cause of staghorn calculi. The bacteria are embedded within such stones. The unanimous opinion of the relevant experts was that the *Proteus mirabilis* organism, in Ms Kessell's case, was 'almost certainly'⁸ present within the staghorn calculus, that it was 'embedded in the calculus' and able to avoid preoperative antibiotics.

135. Contained within gram negative bacteria such as *Proteus*:

*are substances called lipopolysaccharides ... [T]hese substances are ... endotoxins.*⁹

136. They are not susceptible to antibiotics. 'The lipopolysaccharide of a treated organism will still act as an endotoxin.'¹⁰

137. Endotoxins stimulate the body's response to eliminate bacteria. In the presence of a large bacterial load, introduced into the bloodstream, however, endotoxins can be implicated in an 'uncontrolled inflammatory response'.¹¹

138. Professor Rawlinson thought that, it is likely that there would be more endotoxins in a large stone than in a smaller one. Professor Gordon thought 'intuitively', that 'there would be more bacteria present in a larger stone and more endotoxin perhaps'. He said that 'the larger stones are more likely to have a postoperative complication of either inflammatory response or infection'.

⁶ Dr Rawlinson citing articles by Stamer TA (1980) Parthenogenesis and treatment of urinary tract infections and Schaffer JN & Pearce MM (2015) *Proteus mirabilis and urinary tract infections. Microbiology Spectrum*

⁷ Dr Winkle cited an article by Viprasit DP, Sawyer MD, Herrell SD, Miller NL, *Changing composition of staghorn calculi. J Urol* 2011 Dec.

⁸ Dr Rawlinson

⁹ Report of Dr Winkle.

¹⁰ Report of Dr Winkle

¹¹ Evidence of Drs Rawlinson and Gordon.

Identification of the stone pre-operatively

139. Dr Hossack, in her evidence in these proceedings, said that the stone was:

much more consistent with what we call a metabolic stone, a calcium oxalate stone, which a staghorn calculus is over 55% of them are metabolic and not struvite and struvite stones are the ones that are associated with infection and have a higher infection risk.

140. In her operation notes she recorded that the stone was soft. Dr Winkle noted that the term was subjective, but said that 'a soft stone is more likely to be an infection stone'.

141. Dr Winkle said that, preoperatively, it is not possible to determine accurately the nature of the stone, that is, whether the stone is an infection stone or a metabolic stone, nor is it possible to determine that fact intraoperatively. Although '[v]arious stones do ... have characteristics which ... provide some information as to [their] composition', '[t]he only accurate way of determining the nature of a staghorn calculus is [post-operative] chemical analysis.

142. Dr Cameron-Strange, with whom Dr Winkle agreed, said that, in treating patients with staghorn calculi, 'you've got to have a high index of suspicion' that the stone is an infection stone. The staghorn calculus in Ms Kessell's case, Dr Cameron-Strange said, should have been assumed to be an infection stone.

Size of stone

143. Dr Hossack, in a statement of 4 September 2017, described the stone as a 2.5 cm stone involving the proximal ureter and extending around into the lower calyx. She made a supplementary statement, on 6 April 2018, which did not address the size of the stone.

144. Dr Hossack's description of the stone, as being 2.5cm, was clearly wrong, a fact which Dr Hossack acknowledged. When pressed in examination by Counsel Assisting, Dr Hossack said that she 'wouldn't argue' that the stone was about 4 to 5 cm in size.

145. The stone was described as large by Dr Lam when reporting Ms Kessell's CT scan. Dr Winkle, who viewed the CT scan online, described the stone as large and said that it measured 5 cm x 3.2 cm. A staghorn calculus is an irregular stone. The maximal diameter was 5 cm. The transverse measurement was 3.2cm

146. Notwithstanding Dr Hossack's evidence that the '*measurement of stones is not ... precise - it is just looking at a film and putting a ruler onto it to take a measurement*', Dr Winkle expressed a high degree of confidence in the measurements he obtained. He said that there was a facility within the program in which he viewed the image to allow measurement.

147. RN Pooke said that the size of the stone was a matter discussed in the theatre before the procedure began. As I understood her evidence, she said that in the

context of considering the x-rays ‘we were having a look at the size of the stone and just the location ... so we were aware that it was going to be a decent sized stone’.

148. RN Alice Suttie, the laser nurse, said she recalled Ms Kessell’s procedure ‘as the stone appeared particularly large’.

How were the bacteria and endotoxins released by the procedure?

Endoscopic pyeloscopy with laser lithotripsy

149. The procedure involves introduction of a thin fibre optic digital telescope (a pyeloscope) into the kidney through the urethra, bladder and ureter. It allows visualisation and treatment of the renal pelvis. As I understood the evidence, the energy of pulses, conveyed through a laser fibre, fragments the stone.

150. The nature of the procedure requires irrigation by a constant flow of fluid introduced under pressure in order to maintain visibility.

151. At times during the procedure, fluid is aspirated together with stone fragments or ‘dust’.

Intrarenal pressure

152. The flow of fluid introduced under pressure can create an increase in intrarenal pressure. Dr Cameron-Strange explained that the system is a closed one except at the end of the instrument where the lasering of the stone is taking place. He agreed with Dr Winkle that Dr Hossack’s statement that ‘the pressure decreases down the pyeloscope’ was not correct.¹² He said:

the important thing about this though is the pressure in the kidney ... and those pressures have been measured in the type of situation.

153. Dr Cameron-Strange said that:

the pyelovenous backflow threshold is 25 to 35 cm of water. With a flexible ureteroscopy you are getting up much higher than that - up to 60 plus.

154. That increase in pressure, Dr Winkle said:

can lead to both infectious and non-infectious complications due to intrarenal, pyelovenous and pyelolymphatic backflow.

155. He said:

[t]he size of this stone was such that the procedure was long at 90 minutes, during which time, pressure perfusion would have resulted in pyelovenous [and pyelolymphatic] backflow.

¹² unless it referred to the time at which the system was aspirated.

156. It was that backflow of endotoxins and bacteria which, in Dr Winkle's opinion, 'resulted in subsequent overwhelming sepsis suffered by Ms Kessell'.
157. Professor Rawlinson described the mechanism by which he considered septic shock developed as follows:

the breaking up of the calculi by lithotripsy released materials (endotoxins and cytokines) present in the calculi into the circulation, these released materials having initial adverse effects such as causing inflammation systemically (generally) within the body., ii) the breaking up of the calculi by lithotripsy released Proteus mirabilis organisms into the blood, iii) these circulating Proteus mirabilis organisms caused a generalised (systemic) infection (sepsis or septicaemia) that rapidly developed into septic shock, iv) the combination of endotoxins/cytokines and Proteus mirabilis infection resulted in the reduction in blood pressure, vasodilation, and other signs of septic shock occurring within the typical 6 hours post organism release into the bloodstream.

Ureteric sheath

158. Dr Winkle and Dr Cameron-Strange noted that, during the pyeloscopy, Dr Hossack used the internal obturator of the ureteric sheath but did not use the ureteric sheath itself.
159. Dr Cameron-Strange, with whom Dr Winkle agreed, said:

It has been shown that the intrarenal pressures are lower with an access sheath than when you are not using an access sheath.

160. They each were of the opinion that the use of a ureteric sheath would have decreased intrarenal pressures and that it should have been used. Having said that, Dr Winkle acknowledged that there is a debate which rages about the value of an access sheath. He referred to the American Urological Association Guidelines for stone management in 2016 which recommended that for complex large stones an access sheath should be used.
161. I note those opinions of the expert urologists but accept the submissions of Counsel Assisting that this was not a matter which was investigated in detail in the inquest. For that reason it is not a matter on which I propose to make any finding.

Length of the procedure

162. Ms Kessell's procedure commenced at 15:30 and she left the operating theatre at 18:55. She was in the operating theatre for three hours and 25 minutes. The time from the laser being turned on to its being turned off was some two hours and 55 minutes.

163. The operation report of Dr Hossack of 12 August 2015 indicates that the laser time was about 90 minutes. In her statement of 4 September 2017, Dr Hossack said that she 'had been lasering for 75 minutes and it was late in the evening so I elected to finish the procedure with a view to returning for a "second look" in two weeks'.
164. The times the laser machine is on and the times it is being actively used are recorded on the Holmium Laser Record. In this case that was done by laser nurse, Alice Suttie, The laser machine was turned on at about 15:45 and first used at about 16:00. It was switched off at about 18:40. It was in active use for one hour, eight minutes and 58 seconds. Nurse Suttie said the:

procedure stood out to me ... due to the length of the procedure and the length of time the laser was in active use.

165. The size of the stone was such that the procedure if attempted entirely, or substantially, at the one time, in Dr Winkle's opinion, would inevitably have been a long one. He said that 'considerable time would be needed to "dust" a stone of this size.
166. That opinion is one which Dr Hossack shared. She was aware, she said, from the outset, that the size of the stone meant that the procedure was 'going to take a long time' and, at least during the procedure, she thought:

I could almost do this in one operation which was to an extent the aim of looking at a pyeloscopic approach.

167. Dr Hossack said she did not consider that the procedure had taken longer than she had expected it would at the outset. Dr Hossack did not stop the procedure because of any concern about its length. In fact, she recorded, in her operation report, that the procedure was discontinued because of diminished visibility.
168. Dr Cameron-Strange thought '[t]he procedure was not only prolonged, it was very prolonged indeed'. Dr Winkle's opinion was that 'if one was aware that this was an infection stone, three hours is a very long time to be inside a kidney with the pressurised inflow of fluid'.

Risk associated with a long procedure

169. Dr Hossack did not accept that the length of the procedure necessarily correlated with an increased risk of infection:

There is... no strong evidence to say that the longer the procedure goes ... the more at risk from other complications and potentially even from sepsis. It's sort of an assumption that the longer it goes for - we know that if someone is acutely infected that you want to do as little as possible, so you put a stent in and you come out, and I'm talking about someone who is septic at the point of time of going into theatre, but there is no strong correlation between the length that the procedure goes for and the increase in complication rate, and there are - in multiple- and in peer-reviewed journals there is certainly case - large

case series and large series where there have been laser cases of large stones up to 7 cm, lasering time up to an hour and a half of what I've done without an increase in complication associated with them.

170. Dr Cameron-Strange agreed that:

[i]n a patient who does not have urinary infection or an infection stone, the length of the procedure is not an issue.

171. Dr Cameron-Strange distinguished that situation from one in which there was the presence of infection:

[h]owever operative duration in the presence of infection is a risk factor for infectious complications when performing flexible ureteroscopy. It should also be noted that using pressure infusion would tend to promote bacteraemia by pyelovenous backflow.

172. Dr Winkle agreed with Dr Cameron-Strange that there should have been a 'very high index of suspicion' that this was an infection stone, that, in effect, it should have been treated as an infection stone.

173. Dr Winkle, supported by Dr Cameron-Strange, accepted that 60 minutes might be a reasonable timeframe for such a procedure. He referred to 'literature support' for the proposition that most of the operative times for such procedures 'are between an hour and an hour and a half rather than three hours'.

174. The urologists, Drs Winkle and Cameron-Strange, and the infectious diseases physicians, Professors Gordon and Rawlinson, agreed that the duration of such a procedure is a risk factor for the development of sepsis. Professor Rawlinson identified the predominant determinants of urosepsis and septic shock as, relevantly, '*duration of procedure, bacterial load ... and infection in the calculus*'.

175. Professor Gordon said that 'preoperative positive urines, the duration of the procedure, the size of the stone and the pressure used during the procedure would all increase the risk of sepsis. He thought that, in Ms Kessell's case, the fact that sepsis developed despite gentamicin use, was 'probably because the bacterial load released (perhaps in an ongoing manner) was very high'.

176. As I understood Professor Gordon's evidence, it was that, while the length of the procedure is a risk factor for the development of sepsis, it is difficult to isolate the length of the procedure from the size of an infection stone as a causative factor. Professor Gordon said that the hydrostatic pressure involved in pyeloscopy, which created pyelovenous backflow, was a factor in the risk of developing sepsis. With respect to that hydrostatic pressure, Professor Gordon said, 'but I'd probably need some urology thinking about that'.

177. Although Dr Winkle and Dr Cameron-Strange, in oral evidence, spoke of the length of the procedure in terms of risk, Dr Winkle, in his report, having considered the hydrostatic pressure involved in the procedure, described the

mechanism by which bacteria and endotoxins were released into Ms Kessell's bloodstream. That was, in Dr Winkle's opinion:

[t]he increased intrarenal pressure associated with a prolonged pyeloscopic procedure in the setting of an infection stone result[ing] in the dissemination of endotoxic material and bacteria into the bloodstream.

178. I am satisfied, on the balance of probabilities, that the prolonged nature of the pyeloscopy, necessarily involving increased intrarenal pressure on an infected stone of this size, did contribute to the development of sepsis, the cause of Ms Kessell's death.

179. Dr Hossack conceded that, in retrospect, she had underappreciated the risk of a long procedure.

Alternative procedure

180. Ms Kessell sought treatment for the pain she was experiencing in her left flank radiating to the groin. The cause of those symptoms was the staghorn calculus. It was 'entirely appropriate' that that stone be treated.¹³

Percutaneous nephrolithotomy

181. An available procedure by which the staghorn calculus could have been treated was percutaneous nephrolithotomy (PCNL) which requires the kidney to be punctured and a tube inserted directly into the kidney. The stone is fragmented. Dr Winkle said that:

because of the size of the tube used for access, the system is a low-pressure system and, as well as laser, a variety of alternative techniques of stone destruction (ultrasound fragmentation and the use of so-called, lithoclast) will allow more efficient clearing a large stone and shorten the time of overall treatment. Fragments smaller than 1 cm can be visually removed through the access tube.

182. Both Dr Winkle and Dr Cameron-Strange stressed the lower pressures involved in PCNL.

183. Dr Hossack said that, although it was not something that she had personally seen, puncturing a kidney is associated with bleeding risk which can lead to a person losing a kidney. She said that patients can get uromas and most persons that she had seen 'who had got septic were through PCNL approaches'.

184. Dr Cameron-Strange and Dr Winkle each acknowledged the risks of bleeding and sepsis associated with PCNL but were each emphatically of the opinion that a staghorn calculus of the size of Ms Kessell's stone should have been

¹³ Report of Dr Winkle, page 4

removed using PCNL. Such a procedure, they said, would have lowered the risk of sepsis.

Guidelines with respect to size of stone

185. There are no relevant Australian guidelines. It was Dr Winkle's evidence that the Urological Association of Australia and New Zealand has endorsed the European Association of Urology Guidelines. The American College Guidelines and European Urological Association Guidelines recommend PCNL for stones that are larger than 2cm. The emphasis in the recommendation in the European guidelines is on the desirability of avoiding repeated procedures.

186. In her statement of 4 September 2017, Dr Hossack said that PCNL was the traditional approach for stones larger than 1 cm but 'recent studies (and my own personal experience) has shown pyeloscopy to be effective in managing stones much larger'.

187. She said that guidelines tend to lag behind current practice and she didn't see herself as 'going rogue' in using pyeloscopy for a stone the size of Ms Kessell's stone. She said:

there has been this increase of doing larger stones that were still seen as being sort of acceptable among colleagues. There [were] certainly published papers on doing very large stones of that size.

188. It is not clear, from that evidence, what those published papers were or what circumstances they described.

189. Despite that evidence, Dr Hossack acknowledged that she had not known a colleague in Australia to employ pyeloscopy on a stone over 3 cm. Before Ms Kessell's procedure, the largest stone Dr Hossack had treated using pyeloscopy was about 2 to 3 cm. She had not specifically discussed with colleagues using an endoscopic approach on Ms Kessell's stone.

190. Her most senior colleague at Westmead Private Hospital and head of the Department of Urology, at Westmead Public Hospital, was Associate Professor Andrew Brooks. Associate Professor Brooks' evidence was that he was operating at both Westmead Private and Westmead Public Hospitals in August 2015. He was not using pyeloscopy on stones as large as 5 cm. The largest stones he was operating on using pyeloscopy, 'if all things were favourable', were stones up to 3 cm.

Technical difficulties with PCNL

191. One of the reasons that Dr Hossack did not adopt PCNL, she said:

was the lack of dilation of the lower calyx and the acute angle between the lower calyx and upper ureteric stone. The lack of dilatation would make percutaneous puncture more difficult while the acute angle would make access from the lower calyx puncture to the proximal ureteric portion of the stone very difficult.

192. Dr Winkle said that he accepted Dr Hossack's concerns in relation to access but said it was technically feasible to perform PCNL 'I guess in experienced hands'. Dr Cameron-Strange agreed.

Time involved in the procedure

193. With respect to her practice generally, Dr Hossack explained that PCNL was very time-consuming. She said she deals with a lot of public patients and there is often an enormous time to wait for patients who are in pain. She said that three patients can be treated with pyeloscopy for everyone treated by PCNL. I did not understand her to be proffering that as an explanation for not undertaking PCNL in Ms Kessell's case.

Dr Hossack's opinion at the time of these proceedings

194. Dr Hossack said that after Ms Kessell's death, she 'reviewed the medical literature ... [and] identified an article, published in 2016, which ... [reported] 6 similar cases with fatal outcomes in a single institute in Italy'. She said she has 'discussed this with colleagues who have had similar events (not all resulting in mortality)'. Her conclusion was that:

[t]his suggests the risk of overwhelming sepsis following endoscopic laser may be higher than previously reported in the literature but overall remains extremely low, especially considering the number of endoscopic procedures performed (68,499 endoscopic laser cases in Australia between 2010-2016 according to Medicare Australia statistics).

195. She said:

I now believe the risk of overwhelming sepsis for endo-pyeloscopy is higher and more unpredictable than previously.

196. She said she now recommends PCNL for stones that are greater in size than 1.5cm.

CONCLUSION

Dr Hossack

197. The endoscopic pyeloscopy with laser lithotripsy procedure on a 5cm staghorn calculus, undertaken by Dr Hossack at Westmead Private Hospital, on 12 August 2015, led to Pauline Kessell's death. The expert opinion establishes that the increased intrarenal pressure associated with a prolonged pyeloscopic procedure, in the setting of an infection stone, resulted in the dissemination of endotoxic material and *Proteus mirabilis* bacteria into the bloodstream causing the sepsis, the cause of Ms Kessell's death.

198. Ms Kessell's staghorn calculus was the largest stone, by a considerable margin, that Dr Hossack had treated using pyeloscopy. At the time Dr Hossack undertook Ms Kessell's procedure, the Guidelines endorsed by the Urological Association of Australia and New Zealand did not recommend use of pyeloscopy on stones larger than 2 cm. Her most senior colleague, at Westmead Private Hospital, would not have operated on a stone of that size using pyeloscopy. The evidence establishes that Dr Hossack should not have chosen to treat Ms Kessell using pyeloscopy but should have recommended PCNL as the appropriate method for treating her stone.
199. Dr Hossack should have given sufficient weight to the propensity of *Proteus mirabilis* to cause staghorn calculi. She should have proceeded with a 'high index of suspicion' that the staghorn calculus was an infection stone and, from the outset, treated it as if it were an infection stone. She did not.
200. Having determined that she would treat Ms Kessell using pyeloscopy, Dr Hossack should have been aware of the risk, associated with increased intrarenal pressure over a prolonged period, that bacteria and endotoxins would be disseminated into the bloodstream. In those circumstances she should have limited the procedure to one to one and a half hours.
201. She did not, as she should have, alert Dr Broyda and other staff, including PACU staff, to the heightened risk of sepsis nor did she communicate with Dr Broyda intraoperatively to ensure that she would be alerted to any change in Ms Kessell's condition.
202. Although the following are not matters which, on the evidence, were implicated in Ms Kessell's death, Dr Hossack should have been vigilant to ensure that she, in fact, prescribed trimethoprim and should have confirmed that Ms Kessell had taken it. She should not have proceeded with the pyeloscopy in the presence of a urine test positive for *E. coli*.
203. Although Dr Hossack has given evidence of changes in her practice, the deficiencies in her care of Ms Kessell, established in the course of this inquest, are such that I have reasonable grounds to believe the evidence may indicate that a complaint could be made about her. Pursuant to section 151A (2) of the *Health Practitioner Regulation National Law (NSW)* a transcript of the relevant evidence will be given to the Executive Officer of the Medical Council of New South Wales.

Recommendation to Urological Association of Australia and New Zealand

204. There has been substantial evidence in these proceedings about the risks associated with pyeloscopy on large staghorn calculi. That evidence, given by Professors Rawlinson and Gordon and Drs Winkle and Cameron-Strange, considered the bacterial and endotoxic load, the length of the procedure and intrarenal hydrostatic pressure. Drs Winkle and Cameron-Strange gave evidence of the desirability of using a ureteric sheath to reduce intrarenal hydrostatic pressure. In the light of that evidence it is appropriate to

recommend to the Urological Association of Australia and New Zealand that it give consideration to the need for further guidance to urologists on treatment of large staghorn calculi.

Dr Broyda

205. I acknowledge that, had Dr Broyda been alerted, by Dr Hossack, to the heightened risk of sepsis, sepsis would have been elevated in his mind as a potential explanation of symptoms being described to him by RN Pillay. Nonetheless, in the light of the communication of RN Pillay's concerns to him, while he was in theatre with a high risk patient and could not attend to conduct a clinical review of Ms Kessell, Dr Broyda should have contacted the ICU registrar to arrange a clinical review, at least after the call at 20:20.

Ceftriaxone and Tazocin

206. It is likely that ceftriaxone wasn't given in the PACU. The evidence does not permit a finding that any failure to administer ceftriaxone in the PACU contributed to Ms Kessell's death.

207. There was a very substantial delay in the administration of Tazocin ordered in the ICU, if not earlier. The evidence does not permit a finding that the established delay in administering Tazocin contributed to Ms Kessell's death but, I note, that the delay in administering Tazocin was described by expert witnesses as 'a clinical error'.

208. The evidence relating to those antibiotics raised questions about:

- i. a lack of clarity between consultants, where a number are attending a patient, as to who has responsibility for ensuring the administration of antibiotics;
- ii. the need to stress oral communication about drugs which need to be given immediately; and
- iii. methods, such as the use of stat charts, for ensuring that antibiotics are given promptly upon their being ordered.

209. Those are matters on which will be incorporated in a general recommendation to Ramsay Health Care, the operator of Westmead Private Hospital, and Westmead Private Hospital.

MR2A document

210. Ms Kessell did not meet the criteria for an emergency call set out in the MR2A document in operation at August 2015. With respect to clinical review, that document required that if one or more of the specified criteria were persistently present, *Anaesthetist/CMO to review patient within 15 minutes*. It also said activate *PACE call if indicated x265*.

211. In the evidence at inquest, there was confusion among staff as to what PACE, in that document or otherwise, meant. It would appear that some staff thought it meant Pre-Arrest Criteria Escalation and others that it meant Patient with Acute Condition for Escalation.
212. The MR2A has undergone three revisions since August 2015. The last revision, Ramsay Health and Westmead Private Hospital advise, will be rolled out formally on 1 September 2019. The revised document states *[i]f the anaesthetist or VMO cannot review the patient within 10 minutes, a rapid response should be made by calling ext 265 and ext 294*. References to CMO and PACE have been removed. That revision has the merit of setting out what the nurse should do in the event that the anaesthetist or VMO cannot attend within 10 minutes, a feature that was missing from the August 2015 version.
213. The submissions on behalf of Ramsay Health Care and Westmead Private Hospital do not accept that RN Pillay experienced any difficulty in escalating Ms Kessell's care and that she 'did not encounter any problem arising from the wording of MR2A'. RN Pillay did not insist on a clinical review, but that was because she did not have a specific measurement or complaint to support her unease. She clearly, however, wanted a clinical review at a much earlier time than that was achieved. Contrary to the hospital's submissions, she did experience difficulty in escalating Ms Kessell's care.
214. RN Pillay is an experienced and very competent nurse but she clearly thought that, whatever the MR2A said about *concerns that do not fit the criteria*, her experience was that, while Ms Kessell's consultant and anaesthetist were on the premises, she could not realistically advance Ms Kessell's case, otherwise than through that consultant or anaesthetist, based on 'concerns that do not fit the criteria'. It is appropriate to recommend to Ramsay Health Care and Westmead Private Hospital that proper consideration and dissemination of those concerns on the part of an experienced PACU nurse form part of the *Lessons Learned* document (to which reference is made below) and that, with respect to those concerns, that document, and any subsequent training, address not only those making the call for clinical review (PACU nurses) but also those receiving the call (anaesthetists/VMOs and members of the Rapid Response Review Team).

Recommendations sought by family

215. Ms Kessell's family has sought that a number of recommendations be made as a result of the evidence in this inquest. I have carefully considered those recommendations and the response by Ramsay Health Care and Westmead Private Hospital. *Inter alia* Ramsay Health Care and Westmead Private Hospital have submitted that a de-identified *Lessons Learned* document will be created which:

will include a synopsis of [Ms Kessell's] case and sections addressing clinical matters and issues to consider, and specific learning and education. The document will include links to appropriate references, clinical guidelines and policies.

The 'Lessons Learned' document will be disseminated throughout every relevant health care facility operated by Ramsay through each facility's Director of Clinical Services.

216. The recommendations I propose to make to Ramsay Health Care and Westmead Private Hospital will focus on that *Lessons Learned* document.

217. Pauline Kessell's loss to her family has been an immeasurable one. In a letter to the Coroner, in a statement made in these proceedings and through their Counsel, Ms Kessell's family have made clear that their grief and suffering at her death have been exacerbated by the knowledge that, whether they would have saved her or not, a number of opportunities were missed to provide her with appropriate treatment while she was in the care of Westmead Private Hospital. That grief and suffering was also exacerbated by the less than adequate communication from Westmead Private Hospital in the wake of Ms Kessell's death. Westmead Private Hospital has acknowledged that its contact with Ms Kessell's family 'was not what it should have been' and, during the course of this inquest, has apologised to the family.

218. I hope that these proceedings have furthered their understanding of what went wrong in the care and treatment of their much loved mother, daughter, sister, grandmother and aunt.

Findings required by s81(1)

Date and place of death

Pauline Lynn Kessell died on 14 August 2015 at Westmead Private Hospital, Westmead.

Cause of death

The cause of Pauline Kessell's death was multiple organ failure as a result of septic shock.

Manner of death

An endoscopic pyeloscopy with laser lithotripsy procedure performed on a 5cm staghorn calculus, undertaken at Westmead Private Hospital, on 12 August 2015. The increased intrarenal pressure associated with that prolonged pyeloscopic procedure, in the setting of an infection stone, resulted in the dissemination of endotoxic material and *Proteus mirabilis* bacteria into the bloodstream causing the sepsis, the cause of Ms Kessell's death.

Recommendations

Pursuant to s 82 of the *Coroners Act* 2009, I make the following recommendations:

1. To the Urological Association of Australia and New Zealand:

that it give consideration to the need for further guidance to urologists on treatment of large staghorn calculi;

2. To Ramsay Health Care and Westmead Private Hospital:

that, those organisations incorporate in the proposed *Lessons Learned* procedure, arising out of the death of Pauline Kessell,

- i. consideration of problems arising, where a number of consultants are attending a patient, from a lack of clarity as to who has responsibility for ensuring the administration of antibiotics;
- ii. consideration of methods, including use of stat charts, for ensuring that antibiotics are given promptly upon their being ordered;
- iii. consideration of, and dissemination of information about, the dilemma, *as set out in these findings*, facing an experienced and competent PACU nurse in securing a clinical review for a patient about whom she was concerned. That the process address, not only those making the call for clinical review (PACU nurses), but also those receiving the call (anaesthetists/VMOs and members of the Rapid Response Review Team).

I close this inquest.

Magistrate Paula Russell

Coroner
Lidcombe
Date: 7 August 2019