CORONERS ACT, 2003

SOUTH  *AUSTRALIA*

FINDING OF INQUEST

An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 20th, 21st, 22nd, 23rd, 26th, and 27th days of September 2011, the 14th day of March 2012 and the 31st day of July 2012, by the Coroner's Court of the said State, constituted of Anthony Ernest Schapel, Deputy State Coroner, into the death of Trinity Isabel Kison.

The said Court finds that Trinity Isabel Kison aged 21 hours, died at the Flinders Medical Centre, Flinders Drive, Bedford Park, South Australia on the 28th day of October 2008 as a result of respiratory failure due to congenital pneumonia with hyaline membrane disease. The said Court finds that the circumstances of her death were as follows:

1. Cause of death and reason for Inquest

1.1. Trinity Isabel Kison was born by way of caesarean section at the Flinders Medical Centre (the FMC) at 8:11am on Monday 27 October 2008. Trinity died 20 hours after her birth. She was certified life extinct at FMC at 4:30am on 28 October 2008.

1.2. Trinity was born prematurely at 35 weeks gestation. Her prematurity was not directly responsible for her death. In reality she was only 2 or 3 weeks premature. Her premature delivery was due to the fact that her mother, Ms Kristen Giddings, experienced a premature rupture of the membranes, commonly referred to as the breaking of the waters, and early labour. Delivery by way of caesarean section was elective because Ms Giddings had experienced caesarean sections in respect of her first and second children.

1.3. Aside from the premature rupture of the membranes and labour, Ms Giddings' pregnancy with Trinity had been relatively uneventful.

1.4. At birth Trinity was noted to cry and no immediate resuscitation was required, but her condition deteriorated over the course of the ensuing day and night and she ultimately died.

1.5. Following Trinity's death a post-mortem examination of her body was performed by Dr Nick Manton who is a pathologist attached to the State Perinatal Autopsy Service, an arm of SA Pathology at Women's and Children's Hospital (the WCH). In his report Dr Manton states that the cause of Trinity's death was respiratory failure due to congenital pneumonia with hyaline membrane disease[1].

1.6. Hyaline membrane disease is an abnormality of the lungs that is commonly identified in premature babies. It is not usually fatal of itself. If necessary in a particular case, the abnormality can be corrected with the administration of surfactant via an endotracheal tube. That Trinity was born with hyaline membrane disease was identified during her very short life. It was also the subject of a finding at post mortem. However, hyaline membrane disease was possibly something of an incidental diagnosis and finding in Trinity's case because also present during her very short life was an ultimately lethal congenital pneumonia, the source of which was not identified clinically before Trinity died and, to begin with, could not conclusively be established at post-mortem.

1.7. Congenital pneumonia can be caused by more than one type of organism that might be present within the mother's birth canal and passed on to the baby during labour and delivery. The most well known if not most commonly seen of these is Group B streptococcus (GBS). A high vaginal swab taken from Trinity's mother approximately a week before Trinity was born when it was thought that Ms Gidding's membranes may have ruptured, but which proved not to be the case at that time, had revealed the presence within the vaginal canal of streptococcus pneumoniae, a less common source of congenital pneumonia in a newborn but one that can be just as deadly as GBS if not more so. However, cultures taken at autopsy were negative and so, while it was originally clear at post mortem that Trinity had died from pneumonia, the responsible organism was not identified at that time. Naturally there was a level of suspicion that the organism at work had been that identified in Ms Giddings' high vaginal swab, namely streptococcus pneumoniae, but this would not be proven until 2011.

[1] Exhibit C1a

1.8. Newly available technology in 2011 enabled testing to be conducted on retained lung tissue that had originally been sampled at Trinity's post-mortem. Analysis of this tissue in 2011 gave rise to a positive reaction for the streptococcus pneumoniae organism. Accordingly, Dr Manton now reports that streptococcus pneumoniae has been confirmed as the causative organism for Trinity's congenital pneumonia. The negativity of the cultures that had been taken at autopsy is possibly explained by the fact that shortly before her death Trinity had been administered antibiotics, a measure that did not arrest her terminal decline and which in some quarters is now said to have been delivered too late.

1.9. I find that Trinity's cause of death is as stated by Dr Manton, namely respiratory failure due to congenital pneumonia with hyaline membrane disease. I also find that streptococcus pneumoniae was the causative organism for the congenital pneumonia.

1.10. There is little doubt that Trinity contracted the infection that led to her death through her mother, probably in the period following the rupture of the membranes that had occurred a few hours prior to Trinity's eventual delivery by way of caesarean section. This, of course, is no reflection on Ms Giddings. Vaginal flora of the kinds under discussion are not unheard of in pregnant women. It can have a silent presence and may not involve symptomatology of any kind. As will be seen, due to the premature rupture of the membranes, certain guidelines recommended, if not dictated, that Trinity's mother should have been administered prophylactic antibiotics including penicillin prior to Trinity's delivery. This is administered in order to provide the unborn child with a measure of protection, during the process of labour and delivery, against infection by an organism present within the mother's birth canal.

1.11. It is said that the underlying reasoning behind the provision of prophylactic antibiotics is the possibility that in a given case premature rupture of the membranes and/or premature labour may have been the result of an infection caused by the unrevealed presence of an organism in the mother's birth canal. It is also believed that prematurity may render the infant more vulnerable to infection. As well, if a baby is delivered prior to 36 weeks gestation, it will usually be delivered in circumstances where routine screening of the mother for the GBS organism will not yet have occurred. The precise incidence of the existence of GBS in women amongst the Australian population does not need to be identified here, except to the extent that its incidence is much greater than the incidence of streptococcus pneumoniae. Indeed,

streptococcus pneumoniae is said to occur very infrequently within the genital tract of a woman. It is also said, however, that the effects of infection with streptococcus pneumoniae can be much more severe than those associated with GBS infections. GBS screening at 36 weeks gestation does not routinely involve an examination for the presence of organisms other than GBS, a fact that naturally gives rise to debate as to whether it should. If upon routine GBS screening a positive result is determined, prophylactic antibiotics including penicillin are given during the process of childbirth in accordance with the relevant guidelines. This would incidentally cover other organisms not specifically looked for or identified in the GBS screening. While the guideline is designed specifically to prevent GBS sepsis, penicillin is '*highly efficacious against all forms of streptococcal bacteria*'[2], and streptococcus pneumoniae '*is a bacterium extremely susceptible to penicillin as it is of the same bacterial family as Group B Streptococcus*'[3].

1.12. Due to the fact that Ms Giddings' pregnancy did not extend to 36 weeks, she was not the subject of routine GBS screening. However, as alluded to earlier, a high vaginal swab had been taken from her about a week out from Trinity's birth in connection with an examination as to whether her membranes had ruptured at that point, and although this had not been the routine screening for GBS, it can now safely be concluded that GBS had been looked for and was not found in this swab. However, as seen, it was positive for streptococcus pneumoniae.

1.13. Regardless of considerations as to whether infection was suspected to have or have not precipitated a premature rupture of the membranes in Ms Gidding's particular case, regardless of the absence of routine GBS screening normally performed at 36 weeks and notwithstanding the fact that the high vaginal swab was negative for GBS in any event, the relevant guidelines were such that Ms Giddings should have been administered prophylactic antibiotics prior to Trinity's birth by virtue of preterm rupture of the membranes in and of itself. In addition, the fact that the high vaginal swab had revealed the presence of streptococcus pneumoniae, if it had been properly understood at the time, of itself would also have dictated antibiotic prophylaxis. As will be seen, the medical practitioners who oversaw Trinity's delivery either did not know of the positive result of the swab or did not appreciate its significance as a potential neonatal pathogen. It is true that the guidelines as they existed in 2008 did

[2] Report of Associate Professor Haslam, Exhibit C11a, page 3
[3] Report of Professor Haslam, Exhibit C11c, page 1

not specifically identify streptococcus pneumonia as such a pathogen, concentrating for the most part on prevention of neonatal sepsis due to GBS. They did refer to other unspecified '*organisms seen less frequently*'. The amended guidelines now spell out streptococcus pneumoniae as one of them.

1.14. One issue for discussion during this Inquest is whether prophylactic antibiotics given to Ms Giddings in accordance with the guidelines would have prevented Trinity from contracting pneumonia and thus prevented her death.

1.15. Following Trinity's delivery she became symptomatic and, in particular, experienced a level of respiratory distress that did not improve over time. Her symptomatology would only be attributed to an infection at a time when it was too late to save her with the administration of antibiotics. Instead, her presentation was attributed for the most part to hyaline membrane disease which she appears to have experienced as a result of her prematurity. This is not to say that the possibility of an infection was completely overlooked during the course of her very short life. However, nothing was undertaken by way of treatment that would have arrested any such possible infection until, as I say, it was too late. An issue has arisen in the Inquest as to whether a failure to administer antibiotics to the symptomatic Trinity at an early stage post delivery was also not in accordance with other relevant guidelines that existed at the time.

1.16. The overarching issue in the Inquest was whether Trinity's death could have been prevented by timely and appropriate measures undertaken both before and after her birth.

2. Background

2.1. Trinity was the third child born to Ms Giddings. The first two children had also been born by way of caesarean section. At 34 weeks gestation with Trinity, Ms Giddings experienced a number of things that made her think that her waters had possibly broken at that point. She attended at the FMC on Tuesday 21 October 2008 where she saw Dr Kati King. In 2008 Dr King was employed at the FMC as an obstetrics and gynaecology registrar. Dr King was at that time engaged in a formal training program in obstetrics and gynaecology. Prior to that she had completed her internship and a number of years of residency in numerous hospitals including the Royal Adelaide Hospital and the Women's and Children's Hospital. Dr King performed

certain tests and examinations from which it was concluded that Ms Giddings' waters had not broken. On this occasion Dr King took the high vaginal swab to which I have already alluded. Dr King, who gave evidence in the Inquest, explained that she did this as part of an assessment of any woman who may have preterm ruptured membranes or may be in premature labour, the purpose being to identify any potential bacteria that may make the baby unwell in the future[4]. The swab that was taken was sent off for microscopic culture and sensitivity which is intended to identify any relevant microbiological organisms within the woman's vagina. The microbiological examination that Ms Giddings underwent in this case was a general examination for the existence of any growth of microbiological organisms including GBS and streptococcus pneumoniae.

2.2. After the swab was taken Ms Giddings was released. Dr King placed a patient sticker in the communications diary for three days hence because she anticipated that the result of the swab would be available within 48 to 72 hours. Dr King personally did not follow-up or see the test result. In the event the report relating to the swab would describe a heavy growth of mixed vaginal flora including yeast with a *'moderate growth of streptococcus pneumoniae'*. The report did not say anything specifically about whether the swab had been positive or negative for the presence of GBS. However, I am satisfied from evidence that was adduced in the course of the Inquest that GBS was tested for and that the swab did not reveal the presence of GBS[5]. In the normal course of events a routine test for GBS that revealed such a result would be reported as 'GBS negative'.

2.3. In her evidence Ms Giddings told the Court that she was asked to call the hospital at the end of the week to find out the results of the high vaginal swab. Ms Giddings telephoned the FMC the following Saturday evening and states that she was advised by a nurse that the result could not be located. There is a dispute in the evidence between Ms Giddings and the nurse to whom she spoke on this occasion as to whether in truth there had been any discussion about the test results. The nurse in question, Ms Vanessa Air, told the Court that there had been no discussion about that issue and that the conversation had been confined to the fact that Ms Giddings had recently experienced a number of days of back pain and to a discussion of other matters, all of which Ms Air made a written note about. There is no notation relating to the results

[4] Transcript, page 48
[5] Exhibit C5a, page 11

of the high vaginal swab examination. In all the circumstances it is not necessary for me to resolve the issue as to whether anything had been said about the test results as it is clear that whatever was discussed, Ms Giddings was not informed of the test result that evening, even if it had been available at that time. In addition, it is by no means clear to me what Ms Giddings herself might have been expected to do with that information.

2.4. In the normal course of events there would have been an expectation that by that weekend the result would have been available. However, there is no evidence as to when it was available for the first time, although it is known for certain that the result was available by the time of Trinity's delivery. It was explained to me in evidence that the result could have been recorded in a number of ways including the placement of a hard copy of the test result on Ms Giddings' file at the FMC as well as by way of electronic recording of the result on both the OACIS and the ATS systems that can be accessed by way of computer terminals within the FMC. Dr King, the practitioner who ordered the tests in the first instance, did not personally chase up the result and there does not appear to have been in existence a system for results such as this to be verbally communicated from microbiologist to treating practitioner.

2.5. As I understand the evidence there was no further communication between Ms Giddings and the FMC until the early hours of the morning of Monday 27 October 2008 at which time it was apparent that Ms Giddings' membranes had now ruptured and that she was in the early stages of premature labour, culminating in the caesarean section later that morning. By that time the result of the high vaginal swab examination was in and was available within the computerised records relating to Ms Giddings in the terms that I have already described, namely that it revealed the presence of streptococcus pneumoniae. It is known that this computerised report was seen by a relatively junior medical practitioner shortly before Ms Giddings' delivery, but this practitioner has candidly acknowledged that she did not appreciate its potential significance at the time and so this information was not passed on. In the event, the result and its significance would not be properly understood until much later and at a time when it was too late. However, it needs to be re-emphasised here and kept in mind throughout that the guidelines were such that prophylactic antibiotics in any event should have been administered simply by virtue of the preterm rupture of the membranes.

2.6. A printed version of the microbiology report would in due course find its way into the clinical record relating to Ms Giddings. It can be found at page 11 of Exhibit C5a. This document reveals on its face that it was printed from the OACIS system on 29 March 2011.

2.7. A document known as an 'Antenatal Assessment' relating to Ms Giddings dated 27 October 2008 and apparently completed that morning, records in handwriting an assertion that Ms Giddings' 'GBS Status' was negative[6]. As indicated earlier there had been no routine GBS test in Ms Giddings' case as she had not advanced to 36 weeks of pregnancy. However, the swab that Dr King had taken would undoubtedly have been tested for GBS. It appears that the only source from which a negative GBS status could have been divined would have been the result of the high vaginal swab examination that Dr King had performed the previous week. As seen, the computerised report of that examination did not in terms specifically deal with GBS status, but the fact that it was negative may have been inferred from the report's silence on the issue. Whether a negative GBS status was understood explicitly or impliedly or whether it would wrong foot anybody having regard to the heavy emphasis placed within the existing guidelines on GBS status, cannot be known with complete certainty. However, this fact in and of itself should not in any way have shaped Ms Giddings' management because, once again, the guidelines suggested that regardless of GBS status she should be given prophylactic antibiotics due to the premature rupture of the membranes.

2.8. It is against that background that Ms Giddings presented at the FMC at approximately 5:50am on the morning of Monday 27 October 2008 and some hours later would give birth to Trinity by way of an elective caesarean section not covered by prophylactic antibiotics.

[6] Exhibit C5a, page 58

3. The guidelines

3.1. The guidelines to which I have referred are specifically those contained within the SA Perinatal Practice Guidelines, Chapter 10 – Prevention and Treatment of Neonatal Sepsis (including maternal Group B Streptococcal colonisation), promulgated by the South Australian government. The guidelines in operation at the time with which this Inquest is concerned are dated 30 April 2007[7]. Chapter 10 has since been amended and I will discuss the amendments later. Chapter 10 deals with both intrapartum prevention as well as management of the neonate in the postnatal period.

3.2. As alluded to earlier, the primary emphasis within the guidelines as they existed in 2008 was upon prevention of GBS colonisation and infection, stating:

> 'The vast majority of infections are due to Group B Streptococcus (GBS) or Escherichia coli, with other organisms seen less frequently.' [8]

The guidelines refer to routine antenatal screening for GBS, and it also contains a section in relation to 'Risk factors for neonatal sepsis'. Although the emphasis is on GBS prevention, the guidelines are not wholly confined to GBS prevention. In this section risk for early onset neonatal sepsis from GBS and other identified organisms is discussed. An infant is considered at risk for early onset neonatal sepsis from GBS *'or other organisms'* if any of a number of antenatal circumstances apply including, relevantly as far as this case is concerned, preterm labour at less than 37 weeks gestation and preterm prelabour rupture of membranes[9].

3.3. During this Inquest, the Court received the distinct impression that the fact that organisms less commonly seen than GBS, such as streptococcus pneumoniae, could be as lethal if not more so than GBS, was a matter that was inconsistently understood by antenatal medical practitioners whose primary focus is on the care of the mother and on the safe delivery of the child, or at least was better understood by neonatal practitioners whose primary focus and responsibilities relate to the care of the child once delivered.

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[7] Exhibit 2d
[8] Exhibit C2d, page 1
[9] Exhibit C2d, page 2

3.4. The guidelines contain a section entitled 'Management of intrapartum antibiotic prophylaxis and treatment'[10]. Subsection 7 of this section is here set out in full:

> '**<u>Preterm</u> rupture of membranes, with or without labour**
>
> Perform a low and a high vaginal swab for culture
>
> Give IV benzylpenicillin 3 g loading dose as soon as possible, then 1.2 g IV every 4 hours for 48 hours or until delivery if this occurs before 48 hours
>
> Commence oral erythromycin as soon as possible 250 mg 4 times a day for 10 days or until delivery if this occurs before 10 days
>
> If delivery does not occur, further benzylpenicillin prophylaxis is indicated when labour recurs, unless chorioamnionitis supervenes in which case manage as per 1. Above
>
> Repeat high vaginal swab at weekly intervals; results may guide use of antibiotics in any subsequent labour'

It is clear from an examination of the guidelines as a whole that the management set out in subsection 7 is to be instituted regardless of GBS status which in any event, given the fact that this subsection deals with prematurity, may not be known. That this is so can be gleaned from the fact that subsection 6 which deals with preterm labour with intact membranes relieves the requirement to give antibiotics where GBS status is known to be negative at the time of the woman's presentation. There is no such relief in cases of preterm rupture of the membranes with or without labour.

3.5. The extract set out above relating to preterm rupture of membranes with or without labour contemplates the serial administration of antibiotics during the period between rupture of the membranes and the delivery of the child, specifically every 4 hours. It will be observed, however, that Trinity's delivery occurred by way of an elective caesarean section that took place nearly 5 hours following the rupture of the membranes. Ms Giddings presented at the FMC at 5:50am. A cannula for the intravenous delivery of fluids was inserted at 6:30am. This would probably have been the earliest time in practical terms that the first delivery of antibiotics could have been effected. Trinity would be delivered at 8:11am and so there would have been no opportunity for further delivery of antibiotics after the stated period of 4 hours. Moreover, ideally antibiotics should be given at least 4 hours prior to delivery, and there was insufficient time for that. Nevertheless, there appears to be universal agreement in the Inquest that the guideline reproduced in the preceding paragraph was such as to dictate the administration of antibiotics at 6:30am intravenously

[10] Exhibit C2d, page 3

notwithstanding the prospect that the child would be delivered within 4 hours. This did not take place then or at any time. The guideline was not followed.

3.6. The antibiotics that the guidelines identify would have covered not only GBS but also streptococcus pneumoniae.

3.7. As far as management of the neonate in the postnatal period is concerned, again the guidelines cover various clinical scenarios and circumstances relating to the newborn. The guidelines relating to neonatal management heavily interact with those relating to antenatal management. As will readily be seen, to a large extent the neonatal guidelines involve considerations of how the antenatal and intrapartum guidelines have been applied in a given case. Thus, there would be an obvious need for open lines of communication to exist between antenatal and neonatal practitioners about the underlying circumstances that might activate the neonatal guidelines in a specific case.

3.8. The first clinical scenario set out in respect of this topic involves a symptomatic neonate and is described within a subsection entitled **'Baby with symptoms possibly due to early onset sepsis, or born after suspected chorioamnionitis'**. In this scenario routine investigations including a blood culture and a complete blood picture are stipulated together with the administration of benzylpenicillin and gentamicin over a period of at least 48 hours. In these clinical circumstances the stipulated measures apply irrespective of whether or not the baby is preterm. One would have thought, however, that if the mother had experienced preterm prelabour rupture of the membranes, a circumstance regarded as a risk factor for neonatal sepsis, then compliance with this guideline would be indicated all the more, especially if no or no adequate intrapartum prophylactic antibiotics had been administered to the mother.

3.9. The second broad scenario in the guidelines involves the asymptomatic neonate and contemplates two situations involving preterm deliveries depending upon whether or not the mother had received 'adequate' intrapartum antibiotics. The first such situation is that identified in subsection 5 which is entitled **'<u>Preterm</u> baby, asymptomatic, mother received <u>inadequate</u> intrapartum antibiotics'**. One of the **'Important points'** set out within the guidelines provides what in essence is a definition of adequacy for these purposes. It states: *'Adequate GBS prophylaxis is considered to have been achieved if at least 1 dose of antibiotics is given 4 hours*

before birth'. This is not to say, however, that even a loading dose delivered less than 4 hours before birth would have had no beneficial prophylactic effect at all. Trinity's mother, as seen, received no intrapartum antibiotics at any time. As well, at a time 4 hours before birth, Ms Giddings was still at home and by virtue of that fact was unable to receive antibiotics in accordance with the above definition of adequacy. Even if she had received a loading dose say at 6:30am, it was too soon prior to birth to be viewed as adequate for the purposes of this guideline. Thus by any measure, intrapartum antibiotics in Ms Giddings case should have been regarded as 'inadequate' when assessing whether or not Trinity should have received antibiotics once she was born. In this scenario the stipulation was that the same investigations as for the symptomatic baby, including blood cultures and complete blood pictures, should be carried out and treatment with penicillin and gentamicin (or other antibiotics based on results of preterm cultures) would be indicated. This stipulation was enlivened in Ms Giddings' case due to prematurity and by virtue of inadequate, indeed non-existent, intrapartum antibiotic coverage. If this stipulation was activated in Trinity's case, it would have meant that she would have been administered with antibiotics regardless of whether she was symptomatic or not.

3.10. The second situation involving the asymptomatic preterm baby is that contemplated in subsection 6 which is entitled **'<u>Preterm</u> baby, asymptomatic, mother received <u>adequate</u> intrapartum antibiotics'**. The stipulation in this scenario was also to investigate as if the baby was symptomatic, namely to perform cultures and a complete blood picture. However, instead of the administration of antibiotics, it recommended close observation and a consideration of whether selective antibiotics ought to be given based on results of preterm cultures or the degree of prematurity. This recommendation was not enlivened because Ms Giddings had not been given any antibiotics let alone adequately. It is nevertheless worth discussing because it can be seen that if anyone involved in Trinity's care had believed, albeit erroneously, that Ms Giddings had received adequate intrapartum antibiotics, administration of antibiotics would have been a matter to be considered as opposed to being mandated. However, it is difficult to see how any person could have believed that Ms Giddings had received adequate intrapartum antibiotics having regard to the fact that even if she had been administered with them at 6:30am, the caesarean section performed within the next 2 hours would have meant that the antibiotics that had been administered to that point would have been regarded as inadequate by virtue of the already seen definition

of adequacy. In any event, the fact of the matter was that Ms Giddings had not been administered antibiotics and so, as seen in the preceding paragraph, the stipulations in subsection 5 recommended that Trinity post delivery should have been treated with antibiotics regardless of whether she was symptomatic or not.

3.11. It can be seen that the guidelines in a sense set out what many might regard as a failsafe system for the treatment of preterm babies, regardless of GBS status, regardless of the existence of any known culture results and regardless of whether the baby is symptomatic or not. They were failsafe in the sense that if they were properly followed, the risks of the baby succumbing to an early onset sepsis were significantly mitigated.

3.12. There is one matter involving the interpretation of the guidelines that has troubled the Court. I have already alluded to the definition of what is to be regarded as 'adequate' intrapartum antibiotics. It seems to me that the issue of the adequacy of intrapartum antibiotics is only of relevance in considering the antibiotic measures that should be delivered to the baby after birth. It does not appear to have any relevance as to whether or not intrapartum antibiotics should have been delivered in the first instance. Aside from a reference to the possible futility of giving antibiotics to Ms Giddings made by one of the clinicians involved in her care[11], nobody in the course of the Inquest suggested that if one could not administer antibiotics 4 hours before birth, there was absolutely no point in giving them any closer to delivery than that because they would subsequently be regarded as inadequate or in fact would be wholly ineffective. However, it is fair to say that a contrary impression was available from the guidelines as they existed in 2008. The amended guidelines now deal with this difficulty. The following has now been added to the definition of inadequacy:

> 'However, antibiotic prophylaxis should still be given even if predicted time to delivery is short. GBS colonisation of the newborn is reduced where antibiotics are given at least 1 hour before birth. Where fetal infection is established maternal antibiotics will pass quickly into the fetal blood-stream and commence early treatment of sepsis.' [12]

I return to this issue later when discussing the question as to whether prophylactic antibiotics given to Ms Giddings even as late as 6:30am may have prevented Trinity's infection.

[11] Exhibit C15, Dr Ruben Van Spauwen
[12] Exhibit C2g, page 8

3.13. Finally, something should be said about the status and force of the guidelines. The guidelines as they applied at the time with which this Inquest is concerned state that they:

> '… represent a combination of
>
> - Established consensus guidelines for the prevention of neonatal Group B Streptococcal (GBS) infection using antenatal screening and intrapartum antibiotic prophylaxis
> - Evidence derived from trials of antibiotics in various prenatal scenarios
> - Suggested management of strategy for chorioamnionitis
> - Suggested guidelines for the management of the newborn.'

There was vigorous debate during the Inquest as to the force of the guidelines, particularly as they related to management of the neonate in the postnatal period and in particular whether or not there was scope to depart from the guidelines where the clinical circumstances warranted it. I will return to that issue in due course.

3.14. As far as the guidelines that relate to the management of intrapartum antibiotic prophylaxis and treatment are concerned, it has already been observed that the guidelines as they existed in 2008 focussed primarily on prevention of neonatal GBS infection, although they were not confined to infection by that means. No-one in the Inquest suggested, however, that there were scenarios in which those guidelines could reasonably be departed from, and certainly nobody suggested that the circumstances surrounding Ms Giddings' confinement could have warranted departure from the guidelines in her particular case. For instance, it could not be reasonably argued that known GBS negativity relieved clinicians of the responsibility of administering prophylactic antibiotics in cases of preterm rupture of membranes. It is to be noted that within a section of the guidelines entitled 'Antenatal screening', there is a stipulation in the following terms:

> '**NB:** All women with spontaneous preterm labour, or preterm prelabour rupture of membranes should have a <u>low</u> vaginal swab sent for GBS *and* <u>high</u> vaginal swab for other pathogens at the time of initial assessment' (underlining and italics are part of the original text).

This suggests that in cases of preterm rupture of membranes, separate consideration needs to be given to the question of pathogens other than GBS and it is for that reason that a high vaginal swab is taken that is intended to be analysed for pathogens other

than GBS. In other words, in the preterm situation GBS negativity is one, but not the only, consideration. It would follow that where no high vaginal swab is taken, or where the result is unknown or where a positive result is imperfectly understood, prophylactic antibiotics would be indicated under the guidelines, and naturally even more so where the result was positive for a pathogen such as streptococcus pneumoniae as was the case here.

3.15. It would naturally be inappropriate for a Court to interpret a document such as the guidelines as one would construe a statute, but the terms of the guidelines are reasonably clear upon careful reading. The guidelines themselves do not identify any circumstances in which a particular stipulation or recommendation might be departed from or where a clinician might regard him or herself as free to disregard the guidelines. This leads one to conclude that the guidelines were meant to be followed unless there was some very good reason to depart from them. No such reason has been identified either theoretically or in respect of Ms Giddings' specific case, and as already seen there were powerful reasons as to why in her case the guidelines should have been adhered to especially when the result of her high vaginal swab is taken into consideration. It seems to the Court that it would be difficult to mitigate a failure to comply with the guidelines when the result of the failure is an adverse consequence that would have been avoided if compliance had taken place.

3.16. It would be as well for clinicians to consider the guidelines as not only providing assistance to themselves in making clinical decisions, but also to regard them as measures that are protective of the public.

4. <u>The circumstances regarding the birth of Trinity</u>

4.1. The caesarean section by which Trinity was delivered was performed by Dr Reuben Van Spauwen who was at that time the Senior Registrar and Chief Resident in Obstetrics and Gynaecology. Dr Marion Crompton was involved in preparing Ms Giddings for the procedure. At the time, Dr Crompton was a resident medical officer at FMC. Apart from her medical degrees, Dr Crompton possessed a basic obstetrics and gynaecological certificate.

4.2. Dr Van Spauwen did not give evidence in the Inquest as it is believed that since these events he has returned to his native Belgium. However, Dr Van Spauwen provided a

signed written statement to police dated 19 July 2011[13]. It appears that Dr Van Spauwen's statement was taken in response to a number of set questions that had been posed to him in respect of Ms Giddings' caesarean section and Trinity's delivery. In his statement Dr Van Spauwen describes himself as of July 2011 as a consultant obstetrician and gynaecologist at a hospital in Belgium. He was the registrar on duty at the time of Ms Giddings' presentation. Dr Van Spauwen's statement essentially sets out his account of these events. It is apparent from his statement that he had access to the relevant casenotes when he made his statement.

4.3. Dr Crompton gave evidence in the Inquest as well as providing a statement[14]. Dr Crompton examined Ms Giddings in the labour and delivery suite and confirmed that her membranes had ruptured and that Ms Giddings was in early labour. It was Dr Crompton who recalled looking at the results of Ms Giddings' high vaginal swab and establishing that it had been positive for streptococcus pneumoniae, a revelation with which she was not familiar. She asserts that she had discovered these results on the OACIS system. She spoke with Dr Van Spauwen about Ms Giddings, although she does not claim to have told him of the positive streptococcus pneumoniae result. It was decided that Ms Giddings would undergo a caesarean section. Dr Crompton administered a cannula at 6:30am. Dr Crompton told me in evidence that she was aware of the guideline that recommended the administration of antibiotics in circumstances such as Ms Giddings' where she had premature rupture of the membranes. Dr Crompton gave me to understand that she also knew of the underlying reasons as to why that recommendation existed. Dr Crompton did not appreciate the significance of positivity for the presence of streptococcus pneumoniae; the infection that she would have been most concerned about was GBS. Nevertheless, Dr Crompton acknowledged that Ms Giddings should have been provided with prophylactic antibiotics in any event due to prematurity and said that the reason for this omission was one that she could only speculate about. She suggested that it was probably because of the need to get Ms Giddings quickly to theatre to deliver the baby. In her witness statement Dr Crompton had also suggested that it may have been because it was the end of the night shift and they were attending to other patients as well.

[13] Exhibit C15
[14] Exhibit c9

4.4. At one point Dr Kati King, who had taken the high vaginal swab several days earlier, arrived in the department and scrubbed for surgery. Dr King took over from Dr Van Spauwen once Trinity had been born. Dr King did not check whether Ms Giddings had been prescribed prophylactic antibiotics because, according to her evidence, she did not become involved in Ms Giddings' care until after Trinity's delivery and so she had not been present when the question of prophylactic antibiotics needed to be assessed[15]. Dr King had not been aware of the results of the high vaginal swab even though she had been responsible for the taking of the swab. In any event, like Dr Crompton, in 2008 Dr King would not have been aware of the significance of streptococcus pneumoniae in a woman in labour, although she asserted in evidence that she would have made the necessary enquiries if she had known of the high vaginal swab result and its significance would have been the subject of discussion[16]. Dr King also knew that the effect of the guidelines was that Ms Giddings should have received prophylactic antibiotics due to premature rupture of the membranes. I return to Dr King's involvement later in relation to the handover to the neonatal medical practitioners.

4.5. Dr Van Spauwen's statement reveals that he had not been aware of the fact that Ms Giddings had presented a week earlier on 21 October 2008 and that a high vaginal swab had been taken on that occasion[17]. He also assumed that because Ms Giddings had presented at 35 weeks gestation no screening test result for GBS would have been available. Dr Van Spauwen does say that if he had known of the presence of streptococcus pneumoniae in a high vaginal swab he:

> '…may or may not have ordered for IV penicillin to be administered because of the unclear significance of strep. pneumoniae at the time.' [18]

Thus it is that nobody concerned with Ms Giddings care at this point appreciated the significance of the high vaginal result, which seems astonishing. Dr Van Spauwen states that at the time he was aware of a protocol that required antibiotics to be administered to any woman of less than 37 weeks gestation to treat the possibility of GBS. He explains in his statement that this is because the GBS status of a woman of less than 37 weeks gestation would generally be unknown with the possibility therefore that she may be GBS positive. While all that is correct, it does not deal with

[15] Transcript, page 58
[16] Transcript, pages 68-69
[17] Exhibit C15, page 2
[18] Exhibit C15

the possibility that other organisms might be at work quite apart from GBS. As well, due to prematurity alone, the antibiotics are given regardless of GBS status. Dr Van Spauwen acknowledges that antibiotics were not given in this case. Finally, Dr Van Spauwen suggests that the administration of antibiotics in the short interval between admission of the patient at 5:50am and delivery of the baby at 8:11am may not have changed the outcome for Trinity. I deal with this issue later in these findings.

5. The handover

5.1. The delivery of Trinity a little after 8am coincided with a shift change. As well, in the normal course of events there would be a handover from the obstetric team responsible for Trinity's delivery to neonatal practitioners. Dr King told the Court that information as to the mother's antibiotic status, specifically whether she had received antibiotics, would have been an important piece of information to have been imparted to the neonatal practitioners. As well, if anyone had seen the streptococcus pneumoniae result from the high vaginal swab, that also would have been an important piece of information to be handed over[19]. Other information such as whether the mother had exhibited any clinical signs of infection would also be information that would need to be imparted in a handover[20].

5.2. Importantly Dr King acknowledged that if it had been appreciated that Ms Giddings had not been given antibiotics as per the guidelines:

> 'Certainly it would have been relayed to the neonatal doctors. It's also a question that most of the neonatal doctors would ask the midwifery or medical staff, had she had antibiotics, and it's normally documented within the neonatal initial assessment.'[21]

5.3. According to his statement, Dr Van Spauwen who was the most senior doctor involved in Trinity's delivery did not have any further involvement in the treatment of the mother or baby after performing the caesarean section. His statement is silent as to whether he was involved in transfer of information to the neonatal practitioners.

5.4. In the event, there is no evidence that the positive result of streptococcus pneumoniae from the high vaginal swab was verbally imparted to neonatal practitioners. It will be remembered however that, according to Dr Crompton, the result was available on the computerised system. This ought to have been available to neonatal practitioners.

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[19] Transcript, page 76
[20] Transcript, page 79
[21] Transcript, page 91

6. Trinity's care after her birth

6.1. As seen, Trinity was born at 8:11am. Some respiratory distress was noted that included intermittent grunting. Trinity was transferred to the Level 2 Nursery where she was observed to be vigorous with normal blood oxygen saturations but with some respiratory distress as evidenced by rib retractions and tachypnoea. At 9am the respiratory distress was observed to persist and 24% to 27% oxygen was now required to maintain normal oxygen saturations. At 9:10am blood was collected for a full blood examination (FBE). Blood cultures were not taken. In the event the FBE would be reported as normal and, in particular, there was no evidence of infection having been present when the baby was born. However an FBE, while being a good guide as to the presence of infection, is not perfect. An FBE takes some time, maybe several hours, to change after the onset of infection. It would not be abnormal simply because of colonisation with a pathological organism present at delivery. Thus, the FBE result taken at this time would not necessarily have been expected to show evidence of any infection at birth or at the time it was taken. However, as I understood the evidence, a normal FBE would not rule out colonisation. Associate Professor Marshall was the consultant neonatologist on duty and at that time was the Director of Neonatal Medicine at FMC. He is a physician of long experience in the field of neonatal medicine. He told the Court in evidence that he had regarded the FBE as '*completely normal*'[22]. However, Associate Professor Marshall testified that the normal FBE probably reflected the fact that Trinity had only been colonised with the organism at that point and that the colonisation was evolving towards infection at the time the samples were taken. He did say that it would have been preferable if the sample had been taken 3 to 4 hours following birth and not at 1 hour, a matter which he said he was not aware of at the time. He now believed that the samples for the FBE were taken too early to have been meaningful.

6.2. Trinity's respiratory distress persisted throughout the course of the morning, afternoon and into the early evening, although it appeared not to worsen significantly, with oxygen saturations remaining as they had been on 26% oxygen.

6.3. A chest X-ray was performed at about 1pm which is described as being typical of mild hyaline membrane disease. This would be in keeping with prematurity, but the radiological appearance while being typical for hyaline membrane disease, cannot be

[22] Transcript, page 184

totally differentiated from early onset pneumonia. Associate Professor Marshall told me in his evidence that the X-ray was '*absolutely consistent with hyaline membrane disease*'[23]. He also pointed out that there was no consolidation which one might normally see with pneumonia and no pleural effusion, markers of infection that would act as '*red flags*'[24]. That said, Associate Professor Marshall conceded that it did not exclude infection[25].

6.4. Associate Professor Marshall suggested in his evidence that as at lunchtime, in the light of the FBE that he believed had been taken later than it had, the chest X-ray, a known negative GBS status and the fact that the baby was minimally unwell demonstrated a picture of hyaline membrane disease with no suggestion of infection. In his view it had been safe to '*watch and wait*'[26], and although consideration needed to be given to antibiotics, one would be comfortable managing without[27].

6.5. At 4:15pm the neonatal nurse practitioner for Trinity's care discussed the baby's status with Associate Professor Marshall. It was determined that the current level of care should be continued but that if the oxygen requirement rose to 40% or more then the infant ought to be moved to the Level 3 Nursery for intubation and the administration of surfactant which is a measure designed to correct hyaline membrane disease.

6.6. There was nothing in Associate Professor Marshall's view of Trinity at 4:15pm that caused him to revise his already formed differential diagnosis of hyaline membrane disease[28]. As far as the possibility of infection is concerned, in his view the signs for this could be monitored by the nurse at the bedside.

6.7. Later that afternoon Associate Professor Marshall went off duty. The ward was handed over to Dr Srinivasababu Subramanian who was the Fellow in the Department. Dr Subramanian would essentially be responsible, in conjunction with the nursing staff, for the Neonatal Intensive Care Unit (NICU) as well as the Level 2 Nursery. Associate Professor Marshall would not be made aware of any further development until about 8:30pm when he believes he made a routine phone call to the unit. In the meantime, there were emerging signs of deterioration and although the

[23] Transcript, page 183
[24] Transcript, page 183
[25] Transcript, page 183
[26] Transcript, page 184
[27] Transcript, page 185
[28] Transcript, page 188

oxygen requirement at 7pm was still 26%, Trinity's perfusion was poor and she was grunting. There were other observations that had he known about them at the time, Associate Professor Marshall would have regarded as signs of poor circulation and markers of a baby becoming '*really sick*'[29]. Nonetheless, Associate Professor Marshall's view was that the baby would have been salvageable at 7pm[30]. By 8pm it was noted that Trinity's circulation was poor with an oxygen requirement of 40%. A further X-ray was conducted at approximately 8pm and the report suggested that there was now an area of consolidation within the lung that should have generated concern for the presence of pneumonia[31]. The report may not have been immediately available to clinicians within FMC at that time, but according to Associate Professor Marshall an experienced clinician would have picked up the abnormality from the radiological imagery.

6.8. The picture at both 7pm and 8pm would have dictated the administration of antibiotics, but these were not administered and Associate Professor Marshall would not be apprised of these developments even in the telephone conversation at 8:30pm.

6.9. Ms Deborah Bridger was a registered nurse working within the NICU on the evening of 27 October 2008. She had commenced work at 7pm. She was working in the special care unit with another nurse, looking after six babies within that unit. Trinity Kison was one of those babies. Nurse Bridger took care of Trinity from the time of the commencement of her shift at 7pm until she was transferred to the Intensive Care Unit sometime after 9:30pm. It was Nurse Bridger who had made and noted Trinity's observations from 7pm onwards.

6.10. Nurse Bridger told the Court that she was not happy with the way the baby looked right from the moment that she came on duty. Although the oxygen requirement was recording 26%, Nurse Bridger recalibrated the device and discovered that at that point the baby was receiving 40% oxygen. Nurse Bridger told the Court that she informed Dr Subramanian that the baby was requiring 40% oxygen. Nurse Bridger was aware that this should have triggered the baby's removal into the NCIU which would have accorded with Associate Professor Marshall's plan as earlier seen. Nurse Bridger told the Court that Dr Subramanian indicated that he did not want to commence antibiotics but ordered a chest X-ray and that it was appropriate to commence the baby in head

[29] Transcript, page 191
[30] Transcript, page 193
[31] Transcript, page 192

box oxygen. Nurse Bridger asserts that she had specifically requested Dr Subramanian to consider administering antibiotics:

> 'Because I was concerned that the baby had been in oxygen for so long and wasn't improving and that they hadn't started antibiotics and I had - I asked him when I came on, was he not going to still start antibiotics on this baby.' [32]

Dr Subramanian responded in a negative fashion. Similarly she asserts that Dr Subramanian did not see the need for a further FBE.

6.11. By 8pm Nurse Bridger noted that the baby's circulation was poor and very pale[33]. The baby was experiencing grunting respirations that indicated to her that she was becoming more distressed and having more trouble breathing. Shortly after that, Trinity was removed into the head box with the baby still looking very ill. Nurse Bridger made certain observations at 9pm by which time the respirations had gone up to higher than normal. Trinity was not moved into the Intensive Care Unit until 9:30pm when another nurse took over Trinity's care. In due course Associate Professor Marshall came into the unit, but not until the early hours of the following morning by which time the baby's fate was sealed.

6.12. Nurse Bridger told the Court that she had been frustrated with Dr Subramanian's responses to her expressions of concern regarding administration of antibiotics and a further FBE, but believed that policy dictated that she should not go over his head[34]. She was not aware that Dr Subramanian had spoken on the telephone to Associate Professor Marshall. Nurse Bridger candidly told the Court that she would do things differently now by speaking to the consultant direct[35]. Nurse Bridger explained that the lateness of transfer to the Intensive Care Unit was in part caused by lack of a nurse to take care of the baby in that unit, but it is to be observed that antibiotics could have been administered in the Level 2 Nursery.

6.13. There is no doubt that a telephone conversation took place between Dr Subramanian and Associate Professor Marshall that evening. Associate Professor Marshall told the Court on oath that he made this call himself routinely, not because of any particular concern in respect of Trinity Kison. On the morning of Tuesday 28 October 2008 Detective Senior Constable Gladigau of Sturt CIB took a statement from Dr

[32] Transcript, page 387
[33] Transcript, pages 388-389
[34] Transcript, page 393
[35] Transcript, page 395

Subramanian. This statement which became Exhibit C3c has not been signed, but a notebook entry in the same terms has been signed by Dr Subramanian. In any event a statement verified by affidavit of Detective Senior Constable First Class Peter Gladigau asserts that Dr Subramanian's statement contains an accurate account of the information provided by that doctor. Dr Subramanian was not available to be called to give oral evidence at the Inquest.

6.14. In Dr Subramanian's statement it is recorded that Dr Subramanian commenced his shift at 7pm on Monday evening 27 October 2008 at which stage Trinity was in the Level 2 special care facility. He knew that Trinity was having breathing difficulties and was on oxygen as much as 40% to 50%. A chest X-ray was 'organised' and Dr Subramanian describes it in terms of having 'showed evidence of HMD which is hyaline membrane disease'. The chest X-ray that Dr Subramanian is referring to can be none other than that taken at about 8pm when regard is had to Dr Subramanian's use of the word 'organised', meaning arranged after he commenced his shift at 7pm. This X-ray, unlike the X-ray taken at about lunchtime, reportedly showed evidence of consolidation with volume loss involving both lung bases with loss of silhouette of the right cardiac margin all consistent with pneumonia. The report that would become available in respect of this X-ray would not necessarily have been seen by Dr Subramanian at the time of his telephone conversation with Associate Professor Marshall. If, as Dr Subramanian's statement implies, he told as much as he knew to Associate Professor Marshall, at best he told Associate Professor Marshall that the most recent X-ray showed nothing more than hyaline membrane disease which if anything would have reinforced in Associate Professor Marshall's mind that there was nothing acutely problematic about the child's current presentation. Dr Subramanian asserts that he contacted Associate Professor Marshall as his on call consultant and advised Associate Professor Marshall about developments since he had commenced duty, including the fact that the baby was still experiencing difficulty breathing. He claims that he was advised to intubate the baby and give her surfactant via the endotracheal tube. As well, he was advised to place Trinity into Level 3 care. There were other babies who were also sick for which Dr Subramanian had responsibility. Dr Subramanian does not assert that there was any discussion with Associate Professor Marshall about the administration of antibiotics, which would not be given for the first time until 12:30am by which stage Trinity had become very sick and was turning blue.

6.15. Associate Professor Marshall was not made aware of the X-ray results and naturally did not see the imagery for himself. I have already referred to the fact that he believes that it demonstrates evidence of pneumonia at that point which of itself ought to have dictated a blood culture and antibiotics. Associate Professor Marshall asserts that he has no recollection of being advised by Dr Subramanian in respect of Trinity either of the change in the baby's perfusion or of any other signs or symptoms of infection[36].

6.16. I received Dr Subramanian's statement into evidence with some hesitation having regard to the fact that the statement was neither signed or on oath and was in conflict with the sworn evidence of Associate Professor Marshall in respect of how the call originated and in respect of the information imparted during that conversation. Dr Subramanian's assertions are untested, but it seemed to me that it would be difficult for the Court to totally ignore what Dr Subramanian has told the police on the morning of these events. At the time I received the statement into evidence I indicated that I would treat it as an account given by Dr Subramanian to the police at the first available opportunity, but also intimated that I could not accept Dr Subramanian's account of those events insofar as they were inconsistent with Associate Professor Marshall's account. I see no reason to differ from that approach now. Dr Subramanian's statement does not shake my confidence in Associate Professor Marshall's sworn evidence as to the content of the conversation. I make no finding about who initiated the conversation. It seems to me that there is an inherent unlikelihood that Associate Professor Marshall would have ignored the significance of the observations made about Trinity at 7pm and 8pm having regard to the fact that they demonstrated a clinical decline and if they had been properly described. The flavour of Dr Subramanian's statement in any event is one in which, if anything, he imparted reassuring information to Associate Professor Marshall insofar as he revealed that X-rays showed no more than hyaline membrane disease. In any event I prefer the sworn evidence of Associate Professor Marshall relating to the content of their conversation.

6.17. Associate Professor Marshall told the Court that if he had been given to understand at 8:30pm that the baby was significantly ill, that he would have come into the hospital and ordered blood cultures and antibiotics[37]. Associate Professor Marshall also suggested that from what he understood later about how busy the NICU had been, it

[36] Transcript, page 192
[37] Transcript, pages 191-192

would have been better if he had been asked to come in in any event. However, the impression he gleaned from Dr Subramanian is that everything was under control[38]. Associate Professor Marshall in his evidence did not express any surprise that the nursing staff had not telephoned him with their concerns because he would have expected them to defer to a more senior nurse and also to Dr Subramanian[39]. Associate Professor Marshall would not be called again until approximately 2:20am the following morning. At that point Dr Subramanian was very worried and it sounded to him that by then the baby had become desperately ill. This was a development that, according to Associate Professor Marshall, was highly unexpected. In the intervening period Dr Subramanian, as explained in his statement, was attending to other babies who were also sick. He attended to Trinity and she was transferred to the NICU where she was intubated and placed on a ventilator. By 12:30am Trinity had deteriorated and it was at that point that antibiotics were given to her for the first time at Dr Subramanian's initiative. A further chest X-ray revealed a pneumothorax, which is a hole in the lung, in this case probably caused by ventilation. Associate Professor Marshall attended at the FMC at approximately 2:45am and he found that Trinity was in an extremely poor state. I do not need to describe Trinity's decline from the early hours of the 28th October until her death at approximately 4:30am. I am satisfied that all that could be done for Trinity was done in that period.

6.18. I infer that throughout all this time Ms Giddings' positive vaginal swab for streptococcus pneumoniae was not known by those treating Trinity. This only came to be established by Associate Professor Marshall once he was on the ward. When Associate Professor Marshall examined Trinity in the early hours of the morning the pattern of illness strongly suggested possible GBS infection or something similar, clearly not at that point hyaline membrane disease as originally thought. Associate Professor Marshall examined the electronic records of Ms Giddings on the OACIS system which is the general Department of Health system as well as the internal Flinders Medical Centre system. The result was present on one of the systems and not on the other. Associate Professor Marshall believes that the result was present on the ATS system but not the OACIS system. It will be remembered, however, that Dr Crompton suggested that she had seen the result on the OACIS system. I do not believe that the discrepancy is material. One thing is clear and it is that at no point

[38] Transcript, page 194
[39] Transcript, page 193

was the question of Ms Giddings' microbiological status properly sought or established following Trinity's birth. Associate Professor Marshall suggested that perhaps the obstetricians had not told the neonatologists about the swab result because they had looked at the wrong system. The fact of the matter was, accepting as I do Dr Crompton's evidence, that at least one medical practitioner, namely Dr Crompton, was aware of the result at a time prior to Trinity's birth, but that the significance of the result was simply not understood and that is where it remained. Once Associate Professor Marshall established the positive result for streptococcus pneumoniae he formed the correct conclusion that this was what was causing Trinity's difficulties. Associate Professor Marshall told me that if that result had been conveyed to him at any time during his management of Trinity he '*would have started antibiotics following a blood culture, without question*'[40]. I take it that he meant that he would have started it immediately following Trinity's delivery or at least as soon as Trinity was accommodated within the Level 2 unit.

6.19. Associate Professor Marshall acknowledged in evidence that it was known that Ms Giddings had not received intrapartum antibiotics, or at least that was understood from the usual course that if there has been no mention of antibiotics having been given, it is assumed that the mother has not been given them[41]. However, he suggested also that it would have been understood that there had been a GBS negative result recorded. This of course would not have signified the absence of any other possible neonatal pathogen in whatever swab was examined, but it had the potential to mislead neonatal clinicians into believing that no other result that was positive was in existence. This might be reinforced by the fact that when a GBS screening takes place it is usual only for GBS to be screened with no other organisms screened.

6.20. During the course of the Inquest there was a great deal of debate about whether the neonatal guidelines had been enlivened and/or whether the neonatal management of trinity had not been in accordance with the guidelines. The debate centred for the most part around whether or not the child's clinical presentation, involving as it did symptoms of respiratory distress, triggered the need for cultures and antibiotics at a very early point in time after her delivery. There was, perhaps, a more fundamental issue and this concerns why the second triggering circumstance for the administration of antibiotics at the neonatal stage did not result in that administration; namely the

[40] Transcript, page 199
[41] Transcript, page 221

fact that this had been a preterm delivery in which it was understood that no antibiotics had been adequately given and that if the guideline was followed antibiotics would have been given to Trinity in the neonatal phase regardless of whether she was symptomatic or not. To my mind this departure from the guidelines was not satisfactorily explained at any stage of the Inquest.

7. The expert evidence concerning Trinity's management

7.1. The management of Trinity's delivery and neonatal management prior to her death was reviewed by Associate Professor Ross Haslam who is a neonatologist at the WCH. Associate Professor Haslam was the Head of Neonatal Medicine until November 2010. He is a Clinical Associate Professor in the Department of Paediatrics and Department of Obstetrics in the Faculty of Medicine at the Adelaide University. He has various academic qualifications that include Fellowship of the Royal Australian College of Physicians. Like Associate Professor Marshall, Associate Professor Haslam is a very experienced practitioner in neonatal medicine. Associate Professor Haslam provided three written reports to counsel assisting the State Coroner dated 10 February 2011[42], 30 August 2011[43] and 26 February 2012[44] respectively. Associate Professor Haslam also gave oral evidence in the Inquest. Associate Professor Haslam had no involvement with Trinity Kison's birth or management.

7.2. I also received into evidence the reports of Professor Roger Pepperell[45]. Professor Pepperell is a obstetrician and gynaecologist. I have referred to Professor Pepperell's report in other contexts within these findings. Professor Pepperell had no involvement with Trinity Kison's birth or management.

7.3. I also received into evidence the report of Professor David Tudehope[46] who is Professor of Paediatrics and Child Health at the University of Queensland and who is a visiting medical officer in neonatology at Mater Mothers' Hospital in South Brisbane, Queensland. Professor Tudehope's report was commissioned by the solicitors for and on behalf of Associate Professor Peter Marshall. Professor Tudehope had no involvement with Trinity Kison's birth or management.

[42] Exhibit C11a
[43] Exhibit C11c
[44] Exhibit C11e
[45] Exhibit C17, C17a
[46] Exhibit C16

7.4. I regarded the three gentlemen to whom I have referred in this section as experts in their respective fields. I add here that I naturally regarded Associate Professor Marshall as an expert in the field of neonatal medicine.

7.5. Regarding the fact that Ms Giddings was not given intrapartum antibiotics by virtue of premature rupture of the membranes, Associate Professor Haslam pointed to the guidelines and the need to administer intravenous penicillin in cases of preterm rupture of the membranes with or without labour. Associate Professor Haslam suggests in his report[47] that this practice recommendation is specifically to prevent GBS sepsis, but as seen earlier it is not confined to this. I have referred to the antenatal screening stipulation that suggests in terms that in cases of spontaneous preterm labour or preterm prelabour rupture of the membranes, women should be examined by way of both low and high vaginal for pathogens including but not limited to GBS. There are numerous other references within the guidelines to pathogens other than GBS, although for the most part they remained unidentified by name until the guidelines were revised. In any event there does not appear to be any dispute that prophylactic antibiotics should have been given regardless of Ms Giddings' GBS status. Associate Professor Haslam agreed with that proposition in his oral evidence[48]. The debate is somewhat arid in any event because of the fact that Ms Giddings' high vaginal swab was positive for streptococcus pneumoniae and that this fact should have been known and understood by clinicians as a reason in and of itself to provide Ms Giddings with prophylactic antibiotics.

7.6. The most agitated debate concerned Associate Professor Haslam's views about the need to administer antibiotics to Trinity after her birth, having regard to her symptomatology including respiratory distress. I have already referred to the fact that regardless of Trinity having been symptomatic, antibiotics were dictated because of the inadequacy of her mother's intrapartum antibiotics. Be that as it may, Associate Professor Haslam suggested in his reports variously that:

> 'It is a standard practice recommendation, international and national to always culture and treat with antibiotics any newborn who develops respiratory distress after birth.' [49]

and:

[47] Exhibit C11a
[48] Transcript, page 281
[49] Exhibit C11a, page 3

> 'It is a firmly established and universally practiced (sic) principal for the management of babies with respiratory distress that infection must be considered, looked for with cultures and treated with antibiotics.' [50]

7.7. It can be readily seen that Associate Professor Haslam's views about that are reflected in the guidelines as they apply in respect of a **'Baby with symptoms possibly due to early onset sepsis, or born after suspected chorioamnionitis'**[51]. Associate Professor Haslam explains the rationale behind giving antibiotics in these circumstances. He explains that early onset infection is typically respiratory in presentation and that it is impossible clinically or radiologically to differentiate sepsis including pneumonia from other forms of respiratory distress, say caused by hyaline membrane disease, and so it is necessary always to consider that both conditions may coexist. Indeed, that was the case here, although the favoured differential diagnosis had for the most part remained one of hyaline membrane disease. In short, Associate Professor Haslam suggests that little confidence could be placed on evidence that suggested the existence of hyaline membrane disease as the sole explanation for respiratory distress.

7.8. Associate Professor Haslam is of the view that an FBE is a good guide as to the presence of infection but not a perfect one. He also suggests that an FBE takes some time, maybe several hours, to change after the onset of infection as it would not be abnormal simply because of colonisation. All of this of course suggests that an FBE conducted almost exactly an hour following delivery would be of limited significance if it was normal. As seen, Associate Professor Marshall agrees with this contention.

7.9. In Trinity's case Associate Professor Haslam suggested that although her respiratory distress was mild in the first instance, requiring only 26% oxygen, antibiotics on admission to the Level 2 Nursery would have very likely prevented early onset infection or have significantly ameliorated any developing sepsis. Associate Professor Haslam was of the view that Trinity should have been given antibiotics at that point. At one point in his evidence Associate Professor Haslam suggested in answer to questions from me that he would have given antibiotics to the child even if the child had been asymptomatic and even if adequate prophylactic antibiotics had been given to the mother intrapartum, a measure that does not appear to be stipulated

[50] Exhibit C11a, page 9
[51] Management of the neonate in the postnatal period, Subsection 1

within the guidelines[52]. It is apparent that Associate Professor Haslam adopts a very cautious approach in respect of neonates who have been born following a preterm rupture of the membranes, and especially those who display symptoms of respiratory distress.

7.10. Associate Professor Haslam was also of the view that quite apart from administering antibiotics at an earlier point in time, there were other opportunities later during Trinity's short life including at approximately 8pm.

7.11. Regarding the lunchtime X-ray and its appearance and report consistent with mild hyaline membrane disease, Associate Professor Haslam suggested that this and early onset pneumonia could look precisely the same. Associate Professor Haslam was asked to comment on Associate Professor Marshall's reliance on the FBE which the latter had believed had been taken at a later point in time, and on the X-ray on the basis of which he had made a presumptive diagnosis of hyaline membrane disease and on the fact that Associate Professor Marshall had been content to treat it as such until further review. To this Associate Professor Haslam suggested that he would have given antibiotics in any case because he did not believe that either marker was 100% reliable[53]. When challenged about his assertions that it was universal practice to administer antibiotics to a baby displaying symptoms, Associate Professor Haslam pointed to the guidelines and suggested that the same recommendation was established in text books so he believed that it was a universal recommendation regardless of whether or not it might be regarded as standard practice[54]. He suggested '*if it is not universal, it is very close to universal*'[55]. In cross-examination by Mr Lindsay, counsel for Associate Professor Marshall, Associate Professor Haslam agreed that it would be wrong to read the guidelines as mandatory rules[56]. When it was suggested to him that the guidelines left open room for clinical judgment as to whether or not neonatal symptoms are possibly due to early sepsis, Associate Professor Haslam agreed that they did[57]. However, when asked by me as to the degree of satisfaction that would be required that there is no possibility of early onset sepsis before one departed from the guidelines, Associate Professor Haslam suggested

[52] Transcript, page 287
[53] Transcript, page 293
[54] Transcript, page 295
[55] Transcript, page 295
[56] Transcript, page 317
[57] Transcript, page 319

that one would need to be '*very confident indeed*'[58]. He made that assertion having regard to the seriousness of an outcome of uncontrolled sepsis. In addition, he pointed out that although in a preterm baby the index of suspicion might favour the existence of hyaline membrane disease being at work, Associate Professor Haslam said that this would be counter balanced by the fact that premature babies are more susceptible to sepsis both in acquisition and in succumbing from it[59]. He also suggested that even if one were to favour hyaline membrane disease as a diagnosis, there was '*an element of risk*' in so concluding when one does not also cover the possibility of infection at the same time[60]. Associate Professor Haslam agreed with cross-examining counsel, Mr Lindsay, that his management is more stringent than those contemplated within the guidelines insofar as he would administer antibiotics regardless of whether adequate intrapartum antibiotics had been administered or not[61]. Thus, it is argued on behalf of Associate Professor Marshall, that if anything Associate Professor Haslam has a somewhat idiosyncratic view of the need for antibiotics in the neonate. For reason that I later explain, I do not regard Associate Professor Haslam's views in that manner.

7.12. For Associate Professor Marshall's part, he told the Court that he believed the diagnosis to be one of hyaline membrane disease. As indicated earlier, he had placed some reliance on the normal result of the FBE.

7.13. Associate Professor Marshall told me that he believed the guidelines to have been created primarily as part of an obstetrics/maternity service package for use by non tertiary hospitals to provide clinicians there with advice as to what they ought to be doing. He did not believe the guidelines to be necessarily applicable to the tertiary environment where repeated diagnostic FBEs could be serially carried out. At FMC Associate Professor Marshall explained that the need for antibiotics was broadly based on clinical practice and on clinical judgment. He cited some statistical information that suggested that in cases of respiratory distress infants were treated without antibiotic therapy and with good effect. Associate Professor Marshall resisted the suggestion that there was no scope for clinical judgment in considering whether or not antibiotics should be given to the symptomatic neonate.

[58] Transcript, page 319
[59] Transcript, page 321
[60] Transcript, page 322
[61] Transcript, page 323

7.14. Central to Associate Professor Marshall's plans for Trinity's management was the knowledge of negative Group B status, the FBE result and the X-ray taken at lunchtime. But there is also the important fact that neither Associate Professor Marshall, nor anyone else concerned with Trinity's neonatal management for that matter, had any idea that there was a positive swab result for streptococcus pneumoniae. Associate Professor Marshall also acknowledged that there are risks associated with relying upon an FBE taken one hour after delivery if the organism had been acquired during the delivery process[62].

7.15. As for his belief that the FBE result had been taken some hours later and was therefore regarded as having been of greater diagnostic significance than was warranted, it is difficult for the Court to find that such a belief was reasonable having regard to the fact that documentation available to be read by him clearly established that the sample had been taken at 9:10am, only an hour since Trinity's delivery, the very fact that rendered its diagnostic utility questionable. Moreover, the FBE was never repeated.

7.16. Associate Professor Marshall told the Court that he did not agree with Associate Professor Haslam's view that the giving of antibiotics in these circumstances was universal standard practice where there is evidence of respiratory distress after birth[63].

7.17. In cross-examination by counsel assisting, Ms Kereru, Associate Professor Marshall acknowledged that it had been known that Trinity's mother had not been given intrapartum antibiotics[64]. On that basis, his interpretation was that there would be no need for antibiotics to be given to the neonate. This was an interpretation that is in truth contrary to the guidelines in a case involving preterm delivery as this had been, but I understood the underlying basis for Associate Professor Marshall's interpretation to involve a consideration that because a Group B negative result had been apparent, there was no real need for intrapartum prophylaxis as this had signified that '*We're okay*' and amounted to '*a flag that says "We're fine"*'[65]. Associate Professor Marshall now acknowledges, however, that he had not been aware of the intrapartum guidelines suggesting that Ms Giddings should have had prophylactic antibiotics. He said that he became aware of that after he had read the guidelines in more detail. He

[62] Transcript, page 240
[63] Transcript, page 217
[64] Transcript, page 234
[65] Transcript, page 234

candidly acknowledged that he had taken false reassurance from the fact that antibiotics had not been given in the maternal stage[66], which is ironic because not only is that fact not reassuring, it actually provided a powerful reason for administering antibiotics to the neonate due to the risk factor created by the mother's premature prelabour rupture of the membranes.

7.18. Associate Professor Marshall acknowledged that in light of the condition of the baby as described by the nursing staff at 7pm and thereafter the delay that occurred during the course of the evening from that time onwards was totally unacceptable. He said there was a lack of intervention in relation to the baby's poor perfusion and that this should not have happened. He used the term 'red flag' in relation to many pointers along the way that suggested that Trinity was in significant decline as the evening wore on.

7.19. In the event Associate Professor Marshall agreed that in retrospect one would treat all babies with respiratory distress syndrome with antibiotics, a measure that in the light of the events with which this Inquest is concerned, is now undertaken[67].

7.20. Associate Professor Marshall's assertions that there is scope for clinical judgment in the application of guidelines that recommend antibiotic therapy is supported only to a limited extent by the report of Professor Tudehope commissioned by his solicitors[68]. It has to be borne in mind that one is examining the situation as it existed in October of 2008 and not as it may exist now. Professor Tudehope acknowledges in his report that it is difficult or impossible to differentiate severe early onset sepsis with pneumonia and/or septicaemia from other respiratory distress not involving sepsis or pneumonia. He says that the predictive value of clinical signs such as respiratory distress is poor 'and the price paid for a missed or late diagnosis is often huge in terms of mortality and morbidity'[69].

7.21. Professor Tudehope's report suggests that in 2008 there was:

> '... a 'small window for management of highly, selected babies respiratory signs by clinical judgement which involved delaying the decision for antibiotic treatment and investigation.' [70]

[66] Transcript, page 235
[67] Transcript, page 254
[68] Exhibit C16
[69] Exhibit C16, page 4
[70] Exhibit C16, page 9

Professor Tudehope suggests that progressive updating of guidelines in the last 15 years have reduced the scope for management by clinical judgment, their purpose being to 'reduce the likelihood of human error and frailties'. He did suggest that clinicians managing babies in this manner needed access to all 'relevant information'. That is a pertinent observation particularly in this case when one considers that the information as it related to Trinity was incomplete; the positive result of the high vaginal swab was overlooked and the FBE result took on a importance that it should never have been given, not to mention the worrying result of the 8pm X-ray that was not imparted to Associate Professor Marshall.

7.22. Finally, Professor Tudehope suggested that in 2008 if the judgment of an experienced clinician is that the diagnosis of early onset respiratory distress is most likely transient tachypnoea of the newborn (TTN) or transient adaptation to extra uterine life and 'highly unlikely to be sepsis', there was a 'narrow window' for management by clinical acumen. He qualified this by suggesting that one would manage by way of clinical acumen under certain circumstances that would include early onset of mild signs with respiratory distress improving, being static or only involving mild deterioration. He also qualifies his view by stating that in order to deal with a case using clinical judgment there would need to be an absence of recognised risk factors for sepsis including, relevantly as far as this case is concerned, prematurity less than 37 weeks where the guidelines for prevention of GBS use this broad definition for risk factors. This would seem, therefore, to preclude clinical judgment in cases where there has been prematurity or at least premature rupture of the membranes as there was here, especially where prophylactic antibiotics are not given.

7.23. In the event, I did not understand Professor Tudehope's evidence as to the relevant approach as it existed in 2008 to vary in any significant manner from that of Associate Professor Haslam or indeed from the guidelines.

8. Could Trinity's death have been prevented?

8.1. This issue needs to be examined by reference to both the time prior to her delivery and after. I will deal with each scenario separately.

8.2. The first issue for consideration is whether Trinity would have survived if her mother had been administered antibiotics prior to Trinity's birth, specifically whether the administration of antibiotics at 6:30am would of itself have prevented colonisation or

infection in Trinity prior to her delivery and thus have prevented her death. I have already referred to the question of 'adequacy' as defined in the guidelines. Ideally, antibiotics would have been administered 4 hours prior to Trinity's delivery. For reasons already explained this could not be effected. If Ms Giddings had been administered with antibiotics at 6:30am, the antibiotics would have been on board for a period of 1 hour and 40 minutes prior to Trinity's delivery. The guidelines suggest that this would be regarded as 'inadequate' intrapartum antibiotic therapy. However, Associate Professor Haslam gave evidence that if Ms Giddings had been administered with antibiotics at 6:30am, the antibiotics would not have covered her entirely but would have covered her significantly[71]. Associate Professor Haslam stated in his evidence that it is accepted that the amount of time necessary between the administration of antibiotics and complete coverage prophylaxis is 4 hours, but adds that there is good evidence to show that value from prophylaxis is occurring even at 1 hour. In his first written report[72] Associate Professor Haslam suggested that prophylactic antibiotics at 6:30am would very likely have prevented Trinity's infection. In his report he states that administration of antibiotics would, in accordance with the guidelines, have been primarily designed to prevent infection from GBS, but he states that penicillin is highly efficacious against all forms of streptococcal bacteria which of course would include streptococcus pneumoniae. In a further report[73] Associate Professor Haslam reiterated that complete and adequate prophylaxis against streptococcus would not have been achieved given the timeframes, but there was sufficient time for some reduction of streptococcus pneumoniae colonisation to have been achieved such that it was possible that administration of penicillin to Trinity's mother could have changed the outcome. He goes on to say, however, that although a positive outcome could not be certain, it is highly likely that penicillin administered to Ms Giddings would have reduced her streptococcus pneumoniae colonisation even after 1 to 2 hours and so have ameliorated any subsequent infective disease in Trinity[74]. This approach, as seen earlier, is reflected in the revised guidelines which now carry a reminder that even though administration of antibiotics closer than 4 hours to birth would be defined as inadequate, where foetal infection is established maternal antibiotics will pass quickly

[71] Transcript, page 282
[72] Exhibit C11a, page 10
[73] Exhibit C11c
[74] Exhibit C11c, page 1

into the foetal bloodstream and will commence early treatment of sepsis such that antibiotic prophylaxis should still be given even if predicted time to delivery is short.

8.3. Other evidence on this subject is contained within the report of Professor Roger Pepperell. Professor Pepperell is a Professor Emeritus at the University of Melbourne. Professor Pepperell was Professor and Chairman of the Department of Obstetrics and Gynaecology at the University of Melbourne (Royal Women's Hospital) from 1978 to 1998. Between 1999 and 2003 he was a Professorial Fellow in the same Department. Following his appointment as Professor Emeritus at the University of Melbourne, from 2004 to 2009 he continued to teach obstetrics, gynaecology and other related medical subjects. Commencing in January 2010, Professor Pepperell undertook a two year appointment as Professor of Obstetrics and Gynaecology at the Penang Medical College in Penang, Malaysia. Although Professor Pepperell is now retired, he continues to undertake clinical work in obstetrics and, in particular, at the Royal Women's Hospital in Melbourne. Professor Pepperell possesses Fellowships of both the British and Australasian Colleges of Obstetrics and Gynaecology. He is also an Honorary Fellow of the American College of Obstetrics and Gynaecology. Professor Pepperell provided two reports to the Court but did not give oral evidence[75]. In his reports Professor Pepperell discusses the question of antenatal prophylactic antibiotics in circumstances such as these. In his first report[76] Professor Pepperell, points out that Ms Giddings would only have had the benefit of one dose of penicillin prior to delivery and questions whether administration of penicillin at 6:30am would have controlled the infection which subsequently caused Trinity's death unless further penicillin had been given to Trinity after birth.

8.4. A further report was sought from Professor Pepperell in September 2011 in the light of the conclusive result of testing for streptococcus pneumoniae. Professor Pepperell expressed the opinion that if antibiotics had been given at 6:30am to Ms Giddings, the infection in Trinity would have been less likely to have occurred or it would have been much less severe, stating also that further doses of antibiotics would almost certainly have been needed to be given in the neonatal period to achieve full beneficial effect. He indicated that he would defer to a paediatrician on the latter subject. In short, Professor Pepperell's opinion as to the efficacy of prophylactic

[75] Exhibits C17 dated 31 August 2010 and Exhibit C17a dated 20 July 2011
[76] Exhibit C17a

antibiotics was more guarded than that of Associate Professor Haslam, but it is clear that he believed that they would have been of some benefit, especially if followed up with antibiotics to the newborn.

8.5. The question of Trinity's possible survival had prophylactic antibiotics been administered during the caesarean section was also examined by Professor Paul Goldwater who is a clinical microbiologist and a physician in the field infectious diseases. Professor Goldwater is the Senior Consultant, Clinical Microbiologist and the Microbiology and Infectious Diseases Department, SA Pathology at the WCH. Professor Goldwater provided a report to the Inquest[77] and he gave oral evidence. In his report Professor Goldwater states that had the child been exposed to prophylactic antibiotics during the caesarean section, then 'on balance of probabilities' the pneumococcal sepsis would have been avoided.

8.6. Finally on this issue I again refer to the evidence of Dr Van Spauwen who performed the caesarean section in respect of Ms Giddings. In his witness statement Dr Van Spauwen asserts that he doubts:

> 'That the administration of penicillin would have changed the outcome because of the short time interval between admission of the patient to L&D at 05:50 and delivery of the baby at 08:11'.

Naturally he makes a similar observation in respect of the interval between the time at which he reviewed the patient and delivery. I take those views into account, but I prefer the evidence of Associate Professor Haslam, Professor Pepperell and Professor Goldwater.

8.7. The preponderance of evidence in my opinion is that while it cannot be said with absolute certainty that Trinity's infection would have been prevented if antibiotics had been given in accordance with the guidelines at 6:30am, it is more likely than not that it would have been prevented. If infection had been prevented there is no reason to suppose that Trinity would have died.

8.8. I turn to the question as to Trinity's chances of survival if notwithstanding the failure to administer Ms Giddings with prophylactic antibiotics, Trinity herself had been administered antibiotics following her delivery.

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[77] Exhibit C12

8.9. In his report Associate Professor Haslam states that if antibiotics had been administered to Trinity on admission to the Level 2 Nursery, early onset infection would very likely have been prevented, or any developing sepsis would have been significantly ameliorated. As well he states that if antibiotics had been given to her when she was recognised to be deteriorating at around 8pm, very likely due to infection, then progression from infection to death could quite possibly have been prevented even at that point.

8.10. In his oral evidence Associate Professor Haslam elaborated on those views. Firstly, as far as the time of admission to the Level 2 Nursery at 9am is concerned, Associate Professor Haslam stated in evidence that he believes that Trinity would have 'survived intact'[78] if she had been administered antibiotics at that time. He based his opinion on a number of matters that included the normality of the results of the full blood examination conducted at 9:10am, the clinical description of the baby, the degree of its respiratory distress, the rate of progression throughout the day and the appearance of the first chest X-ray, all of which suggested to Associate Professor Haslam that Trinity was possibly only colonised at that time rather than having been infected at that time. He voiced the opinion that antibiotics at 9am would have prevented progression from colonisation to infection.

8.11. Secondly, as far as the chances of survival if antibiotics had been administered for the first time at 8pm are concerned, in his evidence Associate Professor Haslam suggested that in these circumstances one could not predict the outcome with certainty, but it was more likely to have preserved the baby than if antibiotics had not been given. Associate Professor Haslam added that the earlier antibiotics are given the more likely that Trinity would have survived[79]. Certainly when the antibiotics were administered at 12:30am the following morning it was too late to have any effect on the outcome.

8.12. Associate Professor Peter Marshall acknowledges in a number of places during the course of his evidence that Trinity was a baby that they should not have lost. When asked as to what Trinity's chance of survival may have been if antibiotics had been given at 7pm when there had been a noticeable change in her condition, Associate Professor Marshall stated in his evidence that one could not be absolutely certain in

[78] Transcript, page 304
[79] Transcript, page 301

relation to an infection once it gets underway, but his experience suggested to him that Trinity was:

> '… salvageable at 7 o'clock, even 8 o'clock and probably would have survived.' [80]

He added:

> 'It's most likely she would have done fine.' [81]

8.13. In his report Professor Goldwater suggested on the balance of probabilities that had penicillin been instituted on a diagnosis of respiratory distress syndrome, the outcome would have been more favourable. He added, however, that one could not be categorical about this because a sepsis cascade can occur very rapidly, and once set in motion it is often difficult or impossible to reverse. In his evidence before the Court Professor Goldwater was questioned about that view. He said that having regard to the fact that there was early evidence of respiratory distress, in the circumstances one could not say with certainty in Trinity's case at what point the sepsis cascade had commenced, and one did not know how much of her presentation could be accounted for by hyaline membrane disease or how much was due to sepsis. He suggested that if it was due to sepsis, the giving of antibiotics at that early stage might not have saved the baby, especially when one considers the high mortality rates in respect of this type of infection[82]. However, Professor Goldwater did not resile from the position stated in his report that on the balance of probabilities had penicillin been instituted upon the diagnosis of respiratory distress syndrome the outcome would have been more favourable.

8.14. Having considered the matter carefully, I prefer the evidence of the neonatal clinicians Associate Professor Haslam and Associate Professor Marshall to Professor Goldwater on this issue. I am particularly impressed by Associate Professor Haslam's evidence as to the significance of a normal full blood examination at 9:10am, taking into account also the clinical picture at that point and the manner in which the disease progressed throughout the day. In my view, although the matter is not completely devoid of uncertainty, on a balance of probabilities Trinity would have survived if antibiotic therapy had been commenced at 9am or thereabouts.

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[80] Transcript, page 193
[81] Transcript, page 193
[82] Transcript, pages 373-374

8.15. The issue of Trinity's survivability is less certain as time wore on during the day and evening. Notwithstanding Associate Professor Marshall's guarded confidence that Trinity would have 'done fine' if administered with antibiotics at 7pm or 8pm, there is insufficient certainty about that when the evidence of Associate Professor Haslam and Professor Goldwater is considered. When things are considered carefully the Court is unable to make any positive finding about Trinity's prospect of survival at or beyond 8pm except to say that her chances of survival would have been better if she had been administered antibiotics at that time than without antibiotics. All of this demonstrates that, as appears to be universally believed, the earlier antibiotics are given the better, and that there is a clear need for guidelines in respect of these matters to be adhered to and implemented at the first available opportunity.

9. Conclusions

9.1. Trinity Kison was born at the Flinders Medical Centre by way of caesarean section at 8:11am on 27 October 2008. She was certified life extinct at 4:30am on 28 October 2008.

9.2. Her cause of death was respiratory failure due to congenital pneumonia with hyaline membrane disease. The organism responsible for the pneumonia was streptococcus pneumoniae.

9.3. Trinity was born prematurely at 35 weeks gestation. Furthermore, Trinity's mother's premature labour was accompanied by a preterm rupture of the membranes.

9.4. Approximately a week before Trinity's delivery, Trinity's mother, Ms Giddings, had a high vaginal swab taken which ultimately demonstrated positivity for streptococcus pneumoniae, a known potential neonatal pathogen. The result of this examination was available as of the day of Trinity's birth. The result was known to one medical practitioner who was concerned with Trinity's mother's management on the day of Trinity's birth, but its significance was not appreciated by that medical practitioner nor communicated to any other practitioner involved in the management of Trinity's caesarean section birth.

9.5. The South Australian Department of Health Guidelines in respect of the Prevention and Treatment of Neonatal Sepsis (including maternal Group B Streptococcal colonisation) recommended that in circumstances involving preterm rupture of

membranes with or without labour that intrapartum antibiotics should be administered to the mother. The prophylactic antibiotics were not given. The prophylactic antibiotics should have been given for two differing reasons, namely, firstly the preterm rupture of the membranes in and of itself, and secondly the fact that there had been a high vaginal swab positive for streptococcus pneumoniae. The fact that the same test was negative for GBS did not mean that the guidelines could not be followed.

9.6. There is no or no adequate explanation as to why the guidelines were not adhered to in Ms Gidding's case.

9.7. The fact that the high vaginal swab was positive for streptococcus pneumoniae was available by way of computerised records but these records do not appear to have been sighted by neonatal clinicians until the early hours of the following morning.

9.8. Shortly after Trinity's birth she exhibited signs of respiratory distress that would not resolve at any time prior to her death. Trinity's presentation was attributed for the most part to hyaline membrane disease, a condition that is not uncommonly found in premature neonates. A full blood examination (FBE) conducted approximately one hour after Trinity's birth revealed no abnormality or evidence of infection. It is likely however, that although there was no evidence of infection at that point, colonisation with the streptococcus pneumoniae organism had occurred. While the FBE is illustrative of lack of infection at the time of Trinity's delivery and at the time the FBE was conducted, it was taken too close to the time of Trinity's delivery to exclude the possibility that infection might subsequently develop within the infant.

9.9. The guidelines to which I have already referred stipulated that in respect of an asymptomatic preterm baby where the mother had received inadequate intrapartum antibiotics, there should be an investigation for blood culture and a complete blood picture as well as the administration of penicillin and gentamicin antibiotics. If this guideline had been followed, Trinity Kison would have been administered with antibiotics very soon after her birth even if she had been asymptomatic. The fact that Trinity was recorded as being GBS negative ought to have made no difference as to whether or not this guideline was enlivened, as the fact of the matter was that the high vaginal swab had revealed the presence of streptococcus pneumoniae.

9.10. However, Trinity was symptomatic insofar as she exhibited respiratory distress that did not resolve. The same guidelines stipulated that in a baby with symptoms possibly due to early onset sepsis, routine investigations for blood culture and complete blood picture and the administration of antibiotics was indicated. In the event, Trinity's respiratory distress was not attributed to possible early onset sepsis. The favoured diagnosis was that of hyaline membrane disease.

9.11. According to Associate Professor Peter Marshall, in 2008 it was considered appropriate for a neonate in Trinity's circumstances to be managed by way of clinical judgment. The clinical judgment in her case was that her presentation was attributed to something other than early onset sepsis. However, regardless of the accepted practice at that time within the FMC, the neonatal management of Trinity cannot be said to have been reasonable because clinical decisions were made on the basis of incorrect or imperfect information, including the fact that her mother's high vaginal swab had been positive for streptococcus pneumonia, a matter that was not understood by neonatal clinicians. Furthermore, the FBE result was falsely reassuring insofar as it was erroneously believed by Associate Professor Marshall to have been taken at a time significantly later than one hour following Trinity's birth when in truth the result of the FBE was not meaningful.

9.12. What this Inquest has illustrated is that if clinicians choose to depart from established guidelines in respect of prevention and treatment of neonatal sepsis, they do so at their own peril and that of the subject neonate. Departure from the guidelines could only ever be justified on the basis of a very high degree of likelihood of a diagnosis other than possible early onset sepsis and on the basis of full and complete information relating to the child and mother including the result of antenatal screening, microbiological testing and the adequacy or otherwise of intrapartum antibiotics in the case of preterm babies.

9.13. In the event Trinity was not administered with antibiotics until 12:30am on the morning of 28 October 2008 at a time when unfortunately it was too late for that measure to have had a therapeutic effect.

9.14. There were several missed opportunities to have prevented or minimised the risk of Trinity's death resulting from:

a) A failure to achieve a proper understanding of the significance of the high vaginal swab taken from Ms Giddings a week before Trinity's birth;

b) A failure to administer prophylactic intrapartum antibiotics in accordance with the guidelines;

c) A failure of neonatal clinicians to understand the fact of, and significance of, no or no adequate intrapartum antibiotics having been administered to the mother when it was clear that Trinity's mother had experienced preterm rupture of the membranes;

d) A failure to administer antibiotics to Trinity on the basis of inadequate intrapartum antibiotics having been administered to the mother;

e) A failure to understand the limited significance of the FBE conducted only an hour after Trinity's birth;

f) The attribution of Trinity's presentation to hyaline membrane disease when the possibility of early onset sepsis was a real and significant one having regard to the risk factor adhering to the mother's premature rupture of the membranes, the limited value of the early FBE, the positive result of the high vaginal swab and the equivocality of an X-ray taken at approximately 1pm on 27 October 2008;

g) A failure to administer antibiotics to Trinity before 12:30am on the morning of 28 October 2008;

h) A failure to appreciate the significance of the X-ray taken at 8pm on 27 October 2008 which was consistent with pneumonia;

i) A failure to appreciate the significance of a deterioration in the condition of the child observed from 7pm onwards and a failure to adequately communicate with consultant neonatal expertise about that matter;

j) The delay in administering antibiotics until the passing of several hours after the child's deterioration being observed from 7pm onwards. It will be observed that if the opportunities to administer antibiotics had been taken at the points in time identified above, the outcome for Trinity may have been different. Certainly as time progressed her chances of survival diminished, but the preponderance of evidence is that Trinity probably would have survived if antibiotics had been administered:

i. Prophylactically to Ms Giddings;

ii. Soon after Trinity's birth;

iii. At any time up until approximately 8pm after which her chances of survival would have significantly diminished.

10. Recommendations

10.1. Pursuant to Section 25(2) of the Coroners Act 2003 I am empowered to make recommendations that in the opinion of the Court might prevent, or reduce the likelihood of, a recurrence of an event similar to the event that was the subject of the Inquest.

10.2. Following these events a root cause analysis was conducted by SA Health. The report in respect of that exercise was tendered to the Inquest[83]. The investigation identified multiple cognitive and system issues relating to the death of Trinity Kison and made a number of recommendations. I set out the recommendations in full.

> **'Recommendation 1**
> There is a multi-disciplinary review of the guidelines for *Sepsis Prevention (neonatal including group B streptococcal colonisation)*. The review must define the symptoms of sepsis, criteria for repeating the FBE and emphasise the importance of administering antibiotics in pre-term delivery even when the time to delivery is short. The revised protocol should be sent to the SAPPG. The revised protocol is communicated to all NNU and O&G staff.
>
> **Recommendation 2**
> The NNU develops a standardised policy for nurses to escalate concerns to a consultant.
>
> **Recommendation 3**
> The handover between O&G staff and NNU staff at delivery is structured and standardised and encompasses doctor to doctor/nurse practitioner and nurse to nurse handover.
>
> **Recommendation 4**
> The Microbiology laboratory verbally notifies *Streptococcus pneumoniae* and other significant HVS organisms to the requesting clinician. A comment about the clinical significance of the organism is added to the comments field for *Streptococcus pneumoniae* HVS specimens.' [84]

10.3. I was satisfied during the course of the evidence that these recommendations have been acted upon. I do not need to go into the detail of the action taken in response to

[83] Exhibit C2i
[84] Exhibit C21

these recommendations. There is only one comment that the Court wishes to make and that is in respect of Recommendation 4. As at the time of the Inquest, the communication that exists between the microbiology laboratory and clinicians at FMC was confined to communication between microbiology and the obstetricians and in particular the clinician who ordered the examination in the first instance. To my mind the significance of the results of microbiology examination, especially if there is a positive result, is of equal significance and possibly more so for neonatal practitioners responsible for the subject infant's care. There is a need in my opinion for the recommendation to encompass communication between microbiology and both the obstetric and neonatal departments as both departments are concerned in the management of the mother and the child, especially the neonatal department once the child is delivered and are both concerned with considering the need to administer antibiotics in the light of the results of microbiological testing.

10.4. I was also told by Associate Professor Marshall that in respect of FMC neonatology, antibiotics are now administered routinely in circumstances where there is unresolved respiratory distress after a period of 4 hours. I was told that administration of antibiotics in these circumstances is mandatory pursuant to this protocol. I would only add to this that neonatologists also must have regard to the presence of risk factors, such as existed in this case, surrounding the preterm nature of the child's delivery which could trigger the need for the administration of antibiotics to the neonate in any event. It seems to the Court that this circumstance alone would enliven that requirement, quite apart from the fact that the child might be symptomatic for a period of time.

10.5. I have already referred to a number of alterations to the guidelines. They now relate more specifically to organisms other than GBS in that they identify them by name and there is now a requirement that antibiotics be administered notwithstanding the fact that they may be given less than 4 hours prior to birth. Otherwise the actual guidelines themselves appear to be unaltered; they do not refer to the revised approach of FMC to the administration of antibiotics where respiratory distress persists for a period of 4 hours. To my mind the revised guidelines should emphasise the need for practitioners to be certain that a baby's symptoms are not due to early onset sepsis before deciding in any particular case not to administer antibiotics.

10.6. The Inquest has demonstrated that practitioners involved in antenatal management, particularly junior practitioners, have an imperfect understanding of the scope of the guidelines insofar as they are not confined to the management of early onset sepsis due to GBS alone.

10.7. During the course of the Inquest there was some debate, although not fully developed, as to the need or otherwise for antenatal screening of the mother for organisms other than GBS. While it is an issue that may well require further consideration, it is an issue that in reality did not arise during the course of the Inquest. This was due to the fact that whilst there was no formal screening in this case for GBS, there was the obtaining of a high vaginal sample which was tested and which revealed the presence of an organism other than GBS. Thus it was known or should have been known and understood from the very outset that streptococcus pneumoniae could become a factor in this child's survivability. Thus need for antenatal screening for all potential neonatal pathogens is an issue that does not arise from this Inquest. I therefore make no recommendation in this regard.

10.8. I make the following recommendations directed to the Minister for Health:

1) That these findings and recommendations be drawn to the attention of all antenatal and neonatal clinical staff attached to all public hospitals;

2) That microbiology laboratory staff be instructed to inform neonatal practitioners of the results of microbiological testing in respect of the pregnant mother;

3) That the SA Perinatal Practice Guidelines, Chapter 10 - Prevention and Treatment of Neonatal Sepsis (including Group B Streptococcal colonisation) be altered to included reference to the need for neonatal practitioners to be certain that a baby's symptoms are not due to early onset sepsis before deciding not to administer antibiotics, and in particular to have careful regard to risk factors such as prematurity as well as to the clinical condition of the baby;

4) That education be delivered to junior practitioners concerning the potential effects of neonatal pathogens other than Group B Streptococcus;

5) That clinicians, both antenatal and neonatal be reminded of the importance of handovers and the need for full information to be imparted during handovers.

Key Words: Perinatal; Sepsis; Antibiotics

In witness whereof the said Coroner has hereunto set and subscribed his hand and Seal the 31st day of July, 2012.

Deputy State Coroner

Inquest Number 32/2011 (1587/2008)