

Maternal and Perinatal Mortality in South Australia 2018



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Mortality Committee on maternal and perinatal deaths
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- State Coroner's Office, Courts Administration Authority of South Australia

Summary

This is the thirty-third Annual Report of the Maternal and Perinatal Mortality Committee, for deaths occurring in 2018.

1. There were three maternal deaths in 2018. The maternal mortality ratio for the last five-year period 2014-2018 was 7.1 deaths per 100,000 women who gave birth, which is low by international standards, and lower than in the preceding five-year period where there were 10.1 deaths per 100,000 women.
2. The Committee reviewed the 177 perinatal deaths of babies born in South Australia in 2018. The perinatal mortality rate for all births (stillbirths of at least 400g or 20 weeks gestation and all live births) was 9.2 per 1,000 births. The stillbirth rate was 6.9 per 1,000 births and the neonatal mortality rate was 2.2 per 1,000 live births.
3. One hundred and fifty-two (85.9%) of the perinatal deaths occurred in preterm babies (less than 37 weeks gestation). The leading cause of perinatal death in 2018 was congenital anomalies, which accounted for 31.6% of the deaths. Other leading causes were specific perinatal conditions (14.7%) and unexplained antepartum deaths (13.0%).
4. Twelve (27.9 %) of the 43 neonatal deaths occurred in neonates born between 20 to 23 weeks gestation. Of the 31 deaths in neonates born at or after 24 weeks, nine (29.0%) were associated with congenital anomalies.
5. *Fifteen babies of Aboriginal mothers died during the perinatal period. The perinatal mortality rate for Aboriginal women was 19.9 per 1,000 births compared with 22.7 in 2017, and compared with 8.7 per 1,000 births for non-Aboriginal women.*
6. The Committee's previous recommendations have been incorporated into South Australian policies, standards or guidelines. These recommendations are available within previous year's reports or from the Pregnancy Outcome Unit website.

Key Learning Points

In 2020, the Maternal and Perinatal Mortality Committee adopted a new process for the formulation of committee recommendations. Key Learning Points (KLP) will be developed and published instead of formal recommendations, to provide readers and clinicians with more context to the Committee's review.

1. Cardiovascular disease is one of the leading causes of maternal death in Australia. The 2018 review of maternal deaths highlighted the importance of early identification and judicious antenatal and postnatal management of women who are experiencing cardiac conditions. Clinicians caring for affected women should consider the need for birth to occur in an intensive care setting; assess women carefully prior to considering early discharge; and facilitate regular postnatal review by a physician.
2. High quality morphology ultrasound is an essential component of antenatal care and allows health care providers and women access to critical information to inform decision making. The review of 2018 perinatal deaths demonstrated that, in a very small number of cases, ultrasonography was not high quality, contributing to delays in diagnosis and subsequent suboptimal outcomes for women and their families. The Subcommittee would like to highlight the role that appropriately timed morphology ultrasound, along with thorough assessment of the placenta and the fetus for structural anomalies, contribute to improved perinatal outcomes.
3. Women who live in rural and remote areas face additional barriers to care in comparison to women living in metropolitan areas. The 2018 perinatal mortality review highlighted that a small proportion of women in regional areas were deterred from accessing antenatal care due to increased out of pocket expenses for care. Women in rural and remote areas will benefit from contemporary approaches to maternity care, including increased access to fully bulk-billed models of care such as caseload midwifery care as well as telemedicine.

Introduction

This is the Thirty-third Annual Report of the South Australian Maternal and Perinatal Mortality Committee, which was established in 1985. An earlier Committee collected maternal death data from 1961 and perinatal death data from 1979. The South Australian Maternal and Perinatal Mortality Committee is an authorised quality improvement body established under Part 7 of the *South Australian Health Care Act 2008*. Its terms of reference are as follows:

To advise the Chief Executive of Wellbeing SA on:

1. the pattern and causation of maternal and perinatal deaths in the state
2. the avoidability of any factors associated with such deaths and any measures which could be taken to assist with the prevention of such deaths, including improvements in health services in the state
3. education and training for members of the medical, midwifery and nursing professions and for the community generally in order to assist in the reduction of maternal and perinatal morbidity and mortality in the state.

The terms of reference of the Subcommittees (Maternal, Perinatal and Education) are provided in Appendix 1. Under the provisions of the *Health Care Act 2008*, members of the Committee and its Subcommittees are authorised, under strict confidentiality rules, to conduct research into the causes of mortality and morbidity in the state, and legal protection is given to notifiers who provide information.

The Subcommittees receive notifications of deaths from the following sources:

1. Data linkage with the Births, Deaths and Marriages Division, from medical certificates of cause of perinatal death
2. Data linkage with the Births, Deaths and Marriages Division, from medical certificates of cause of death for maternal deaths
3. Notification from the Supplementary Birth Record, both electronic and paper
4. The Coroner's Office, from Coroner's findings

Legislation governing the registration of births, deaths and marriages in South Australia requires that the medical certificate of cause of death identifies pregnancy within three months before death and *whether the deceased was of Aboriginal or Torres Strait Islander origin*.

Further information is obtained from practitioners identified as having been in charge of clinical care through the completion of confidential medical reports (Appendix 2), and these are supplemented by autopsy information from the Coroner's Office and hospital pathology services. Case summaries are prepared by the Committee's secretariat for discussion by the Subcommittees. These do not contain any identifying information but the members are made aware of the type of health services available in each case, for example, location (metropolitan or country) and hospital category. Where certain aspects of a case require clarification, a member of the Subcommittee may seek clarification from the practitioner concerned. The discussions aim to identify the factors associated with the death, and to assign a cause or causes of death in each case. Comments or recommendations made by the Subcommittees are included in the Committee Report.

Reporting of deaths to the State Coroner

The following are some categories of death which must be reported to the State Coroner under the *Coroner's Act 2003*:

- a death by unusual, unexpected, unnatural, violent or unknown cause
- a death during, as a result of or within 24 hours of a surgical, invasive or diagnostic procedure including the administration of an anaesthetic for the carrying out of the procedure
- a death within 24 hours of being discharged from a hospital or having sought emergency treatment at a hospital
- a death in a hospital or treatment facility for the treatment for a drug addiction
- a death of a child subject to a custody or guardianship order under the Children's Protection Act 1993
- a patient death in an approved treatment centre under the Mental Health Act 1993

Definitions used by the Committee are provided in the Methods and Terminology section of this report. The Committee receives notifications of maternal and perinatal deaths occurring in South Australia. However, statistics presented for perinatal deaths relate only to babies born in South Australia. Deaths of South Australian born babies occurring in other states are also included in the statistics where information is available for them. This Thirty-third report of the Committee incorporates information on maternal deaths in South Australia in the year 2018 and perinatal deaths of babies born to mothers in South Australia in 2018.

The term Aboriginal is used respectfully in this report as an all-encompassing term for Aboriginal or Torres Strait Islander people living in South Australia. Data relating to Aboriginal mothers and babies have been italicised for easy identification in response to the request of the Aboriginal Health Council of South Australia. The Aboriginal Health Division of SA Health has a nominee on the Committee to address areas of concern in relation to Aboriginal maternal and perinatal health.

Maternal Mortality

Maternal mortality statistics

The World Health Organization (WHO) defines maternal death as the death of a woman during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. This definition includes both direct and indirect maternal deaths (see Methods and Terminology).

The Australian Institute of Health and Welfare National Advisory Committee on Maternal Mortality complies with international reporting protocols and reports a maternal mortality ratio (see Methods and Terminology) which only includes pregnancy-related deaths, that is, direct and indirect maternal deaths, per 100,000 women who gave birth. The South Australian Maternal and Perinatal Mortality Committee will continue to review incidental deaths to ensure that indirect deaths are not missed. It will, however, report only maternal mortality ratios for pregnancy-related deaths, to be consistent with national and international protocols. Deaths of women occurring from 42 days to within a year of the end of pregnancy (late maternal deaths) are also reviewed, but these are not included in the South Australian statistics on maternal deaths or maternal mortality ratios. There were three late maternal deaths in South Australia in 2018. In 2017, the South Australian Maternal and Perinatal Mortality Committee commenced using data linkage to improve detection and enhance reporting on maternal deaths occurring in the state. This has resulted in an increased number of maternal deaths being reviewed, particularly late maternal deaths.

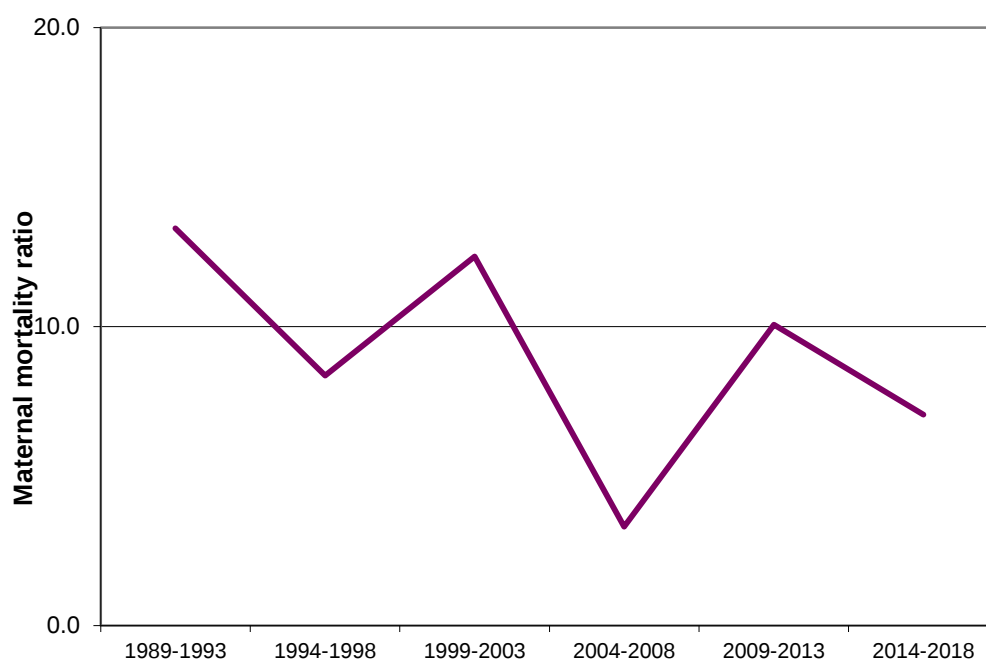
Maternal deaths in South Australia for the three categories of deaths from 1989 to 2018 are presented in Table 1 by five-year periods. Maternal mortality ratios have been calculated for direct and indirect deaths (Table 1 and Figure 1). The maternal mortality ratio for the last five-year period 2014-2018 was 7.1, which was slightly higher than the Australian maternal mortality ratio of 6.7 per 100,000 women for the period 2008-2017. The number of deaths in South Australia is small and has not changed greatly in the last three decades. Of a total of 52 pregnancy-related maternal deaths in the period 1989-2018, 26 were direct deaths and 26 were indirect deaths. *In the five year period from 2014-2018, there have been two indirect deaths of Aboriginal women.*

Table 1: Maternal mortality by category of death, in 5-year periods, South Australia, 1989 – 2018

	Direct deaths	Indirect deaths	Incidental deaths	Total deaths	Direct and indirect maternal deaths	
Years	Number	Number	Number	Number	Number	Maternal mortality ratio*
1989-1993	4	9	3	16	13	13.3
1994-1998	4	4	6	14	8	8.4
1999-2003	5	6	1	12	11	12.3
2004-2008	3	0	2	5	3	3.3
2009-2013	8	2	3	13	10	10.1
2014-2018	2	5	0	7	7	7.1

*Expressed as deaths per 100,000 women who gave birth

Figure 1: Maternal Mortality Ratio, South Australia 1989-2018



Confidential enquiries into all maternal deaths in South Australia have been conducted since 1961 with the Minister of Health appointing a Special Medical Committee on Maternal Mortality. Reports published since this time show that between 1961 and 1969 there were 15 maternal deaths related to induced abortion. Following the 1970 legislative amendment requiring induced abortions to be conducted under medical supervision, there were 4 deaths due to induced abortion in the following decade 1970 to 1979. Over the past 36 years, since 1980, there was one maternal death in 2003 associated with an induced abortion.

Causes of maternal deaths

The causes of the three maternal deaths in 2018 were:

- One direct maternal death was due to amniotic fluid embolism
- One indirect maternal death was related to cardiac complications
- One indirect maternal death was a result of postpartum sepsis, in a woman with a background of cardiac complications

The causes of the three late maternal deaths in 2018 were as follows:

- Two late maternal deaths were attributed to cancer
- One late maternal death was attributed to an ischaemic stroke

Key Learning Points

1. Cardiovascular disease is one of the leading causes of maternal death in Australia. The 2018 review of maternal deaths highlighted the importance of early identification and judicious antenatal and postnatal management of women who are experiencing cardiac conditions. Clinicians caring for affected women should consider the need for birth to occur in an intensive care setting; assess women carefully prior to considering early discharge; and facilitate regular postnatal review by a physician.

Maternal Subcommittee recommendations

The Committee's previous recommendations have been incorporated into South Australian policies, practices, standards or guidelines. A document containing previously-made recommendations, together with the relevant code of practice is available from the Pregnancy Outcome Unit website.

Perinatal Mortality

Perinatal mortality statistics

In 2018 there were 19,332 births in South Australia reported to the Pregnancy Outcome Unit. These included all births of at least 400g birthweight or 20 weeks gestation. There were 134 stillbirths and 19,198 live births. Forty-three live born infants died within 28 days of birth (neonatal deaths). Table 2 shows the numbers of stillbirths and neonatal deaths for specified birthweights or gestations.

The perinatal mortality rate for all births in 2018 was 9.2 deaths per 1,000 births. The stillbirth rate was 6.9 per 1,000 births and the neonatal mortality rate 2.2 per 1,000 live births. Fifty-three of the 177 perinatal deaths (29.9%) were induced terminations of pregnancy and their exclusion would have resulted in a perinatal mortality rate of 6.4 deaths per 1,000 births.

The perinatal mortality rates for other specified minimum birthweights or gestational ages (where birthweight was unavailable) are provided in Table 2. The WHO recommends that fetuses and infants weighing between 500 grams and 1,000 grams should be included in national perinatal mortality statistics. For international comparison, fetuses and infants weighing at least 1,000g or 28 weeks gestation is recommended. It is recommended that early neonatal deaths include neonatal deaths that occur during the first seven days of life (0-6 days). Using the WHO classification for international reporting, the perinatal mortality rate was 3.8 per 1,000 births in South Australia, with a stillbirth rate of 2.6 per 1,000 births, and neonatal mortality rate of 1.2 per 1,000 live births.

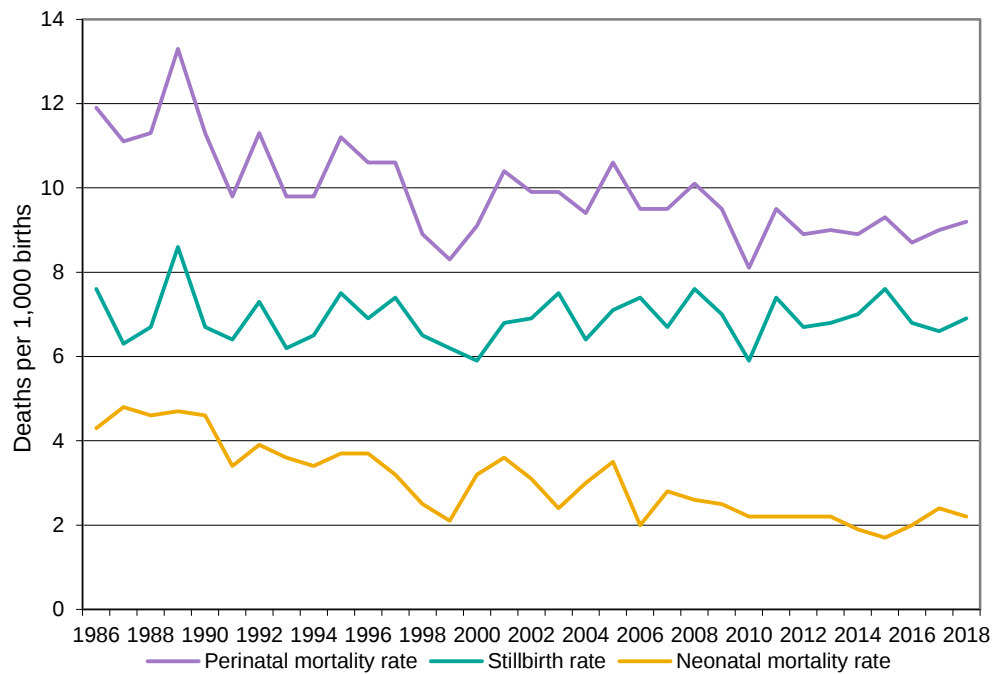
Table 2: Perinatal mortality, South Australia, 2018 (all births of specified birthweight/gestation)*

Specified birthweight/gestation	Total births	Live births	Stillbirths		Neonatal deaths		Perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
≥400g/ 20 weeks	19,332	19,198	134	6.9	43	2.2	177	9.2
≥500g/ 22 weeks	19,297	19,193	104	5.4	38	2	142	7.4
≥1,000g/ 28 weeks	19,182	19,132	50	2.6	23	1.2	73	3.8

*Includes 2 cases of unknown birthweight and 3 cases of unknown gestation

South Australian perinatal mortality rates, including stillbirth and neonatal mortality rates for all births, for 1986-2018 from Committee data are presented in Figure 2. The stillbirth rate for all births has not changed markedly over the last two decades.

Figure 2: Perinatal mortality rate (births $\geq$ 400g or 20 weeks gestation), South Australia 1986-2018



Perinatal mortality rates for births of at least 1,000g birthweight (or when birthweight was unavailable, 28 weeks gestation) are presented in Figure 3. Figure 3 includes only early neonatal deaths, occurring within the first seven days of life (WHO recommendation for international statistics). The early neonatal mortality rate for infants weighing at least 1000g or 28 weeks of gestation was 1.2 per 1,000 live births. If only births of at least 1,000g birthweight are considered, a decrease in the stillbirth rate is evident from 4.2 deaths per 1,000 births in 1986 to 2.6 in 2018 (Figure 3).

Figure 3: Perinatal mortality rate (births $\geq$ 1,000g or 28 weeks gestation & early neonatal deaths within the first seven days of life), South Australia 1986-2018



National comparisons of perinatal mortality rates

Perinatal mortality rates for Australian States and Territories from the Australian Bureau of Statistics (ABS) are shown in Table 3. The ABS derives this information from the State and Territory Births, Deaths and Marriages Registry data. In **South Australia, ABS records do not include stillbirths resulting from termination of pregnancy**. This difference most likely accounts for the lower South Australian perinatal mortality rates published by the ABS.

Table 3: Perinatal mortality rate* by State or Territory of usual residence of mother, Australian states, 2008 – 2018

Year	NSW	VIC	Qld	SA	WA	Tas	NT	ACT	AUSTRALIA
2008	7.8	7.9	9.9	6.5	8.1	9.1	7.8	6.4	8.2
2009	7.9	8.9	10.4	6.2	8.8	10.6	14.8	7.0	8.8
2010	7.6	8.0	10.5	6.1	8.0	10.9	12.5	16.7	8.6
2011	8.0	8.1	9.1	6.0	9.7	10.1	12.8	7.2	8.4
2012	7.5	7.7	10.0	5.9	8.4	10.1	9.4	10.0	8.2
2013	8.1	8.2	9.1	6.1	7.5	9.5	14.4	7.0	8.2
2014	7.0	7.4	9.8	5.9	8.1	15.5	11.3	9.7	8.0
2015	7.8	6.4	9.5	6.5	8.4	9.6	14.1	7.5	7.9
2016	6.8	7.4	9.5	5.5	8.2	11.5	11.4	6.6	7.7
2017	7.1	8.1	9.4	5.1	8.6	9.6	15.1	8.6	8.1
2018	6.9	8.2	7.8	5.5	7.9	10.2	16.8	9.4	7.6

*Rates are expressed as stillbirths and neonatal deaths within the first 28 days of life per 1,000 births for births of at least 400g birthweight (or if birthweight is unavailable, 20 weeks gestation), based on registered births according to the usual residence of the mother.

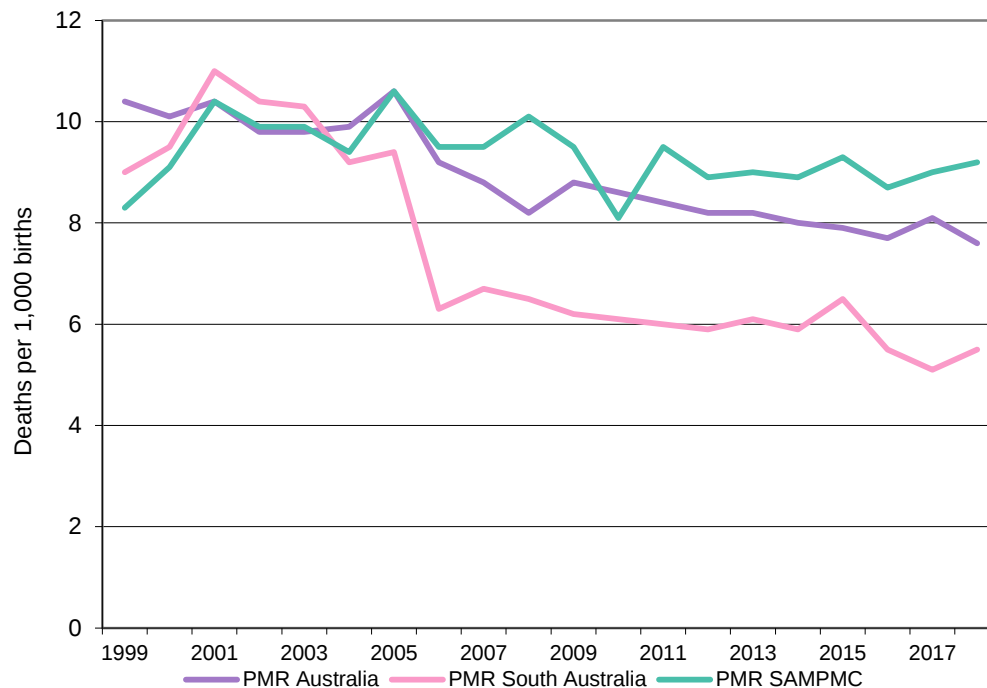
Source: Australian Bureau of Statistics. Catalogue No 3303.0 – Causes of Death, Australia, 2018, 20th December 2019

There are other minor differences between the perinatal deaths that the ABS include, compared with the Committee:

- > The ABS rates report State and Territory perinatal deaths according to the usual residence of the mother, whereas the Committee rates include all perinatal deaths occurring in South Australia, irrespective of the mother's usual State or Territory of residence.
- > The ABS rates are based on deaths registered in Australia in the year in which they are registered, whereas the Committee rates include all perinatal deaths which occurred in South Australia in the year in which the birth occurred.
- > The South Australian ABS data includes all live births of any gestation and since 2006 has only included fetal deaths of at least 400 grams birthweight or at least 20 weeks gestation. Prior to 2011, the Committee's perinatal mortality rate also included all live births which resulted in a neonatal death, irrespective of birthweight or gestation. From 2012 and onwards, only live births of at least 400 grams birthweight or 20 weeks gestational age which resulted in neonatal death have been included in the perinatal mortality data.

The Australian Bureau of Statistics (ABS) rates for South Australia and Australia for 1999-2018 are presented in Figure 4, together with the perinatal mortality rate in South Australia based on notifications to the South Australian Maternal and Perinatal Mortality Committee (SAMPMC).

Figure 4: Perinatal Mortality Rates South Australia, Australia and SAMPMC 1999-2018
Deaths per 1,000 births



Birthweight-specific perinatal mortality

The birthweight-specific rates of stillbirths, neonatal deaths and perinatal deaths for 2018 are provided in Table 4. Of the 177 perinatal deaths, 148 (83.6%) were of low birthweight (<2,500g) and 33 (76.7%) of the 43 neonatal deaths were low birthweight babies. Forty of the perinatal deaths (22.6%) were less than 400g birthweight.

Table 4: Perinatal mortality by birthweight, all births, South Australia, 2018

Birthweight (grams)	Total births	Live births	Stillbirths		Neonatal deaths		Perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
<400	40	4	36	900.0	4	100.0	40	1,000.0
400-499	26	8	18	692.3	7	269.2	25	961.5
500-749	57	28	29	508.8	8	140.4	37	649.1
750-999	44	38	6	136.4	2	45.5	8	181.8
1,000-1,499	131	121	10	76.3	3	22.9	13	99.2
1,500-1,999	276	268	8	29.0	7	25.4	15	54.3
2,000-2,499	910	902	8	8.8	2	2.2	10	11.0
2,500-2,999	3,231	3,224	7	2.2	2	0.6	9	2.8
3,000-3,499	7,256	7,249	7	1.0	5	0.7	12	1.7
3,500-3,999	5,606	5,603	3	0.5	3	0.5	6	1.1
4,000-4,499	1,543	1,543	0	0.0	0	0.0	0	0.0
≥4,500	210	210	0	0.0	0	0.0	0	0.0
Unknown	2	0	2	1,000.0	0	0.0	2	1,000.0
Total	19332	19198	134	6.9	43	2.2	177	9.2

Table 5: Time of perinatal death by birthweight, South Australia, 2018 (>=400g birthweight or 20 weeks gestation)

Birthweight (grams)	Stillbirths			Neonatal deaths	Total
	Antepartum	Intrapartum	Uncertain if antepartum or intrapartum		
<500	13	36	5	11	65
500-749	15	14	0	8	37
750-999	6	0	0	2	8
1,000-1,499	10	0	0	3	13
1,500-1,999	8	0	0	7	15
2,000-2,499	8	0	0	2	10
2,500-2,999	7	0	0	2	9
3,000-3,499	7	0	0	5	12
3,500-3,999	3	0	0	3	6
4,000-4,499	0	0	0	0	0
≥4500	2	0	0	0	2
Total	79	50	5	43	177

Of the 50 intrapartum deaths, all were under 750g birthweight (Table 5).

Gestation-specific perinatal mortality

The distribution of perinatal deaths by gestational age is provided in Table 6. There were 152 preterm births (<37 weeks gestation) that resulted in a perinatal death, accounting for 85.6% of all perinatal deaths

Table 6: Perinatal mortality by gestational age at birth, South Australia, 2018 (=> 400g or 20 weeks gestation)

Gestational age at birth (weeks)	Total births	Live births	Stillbirths		Neonatal deaths		Perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
<24	86	15	71	825.6	12	800.0	83	965.1
24-27	87	72	15	172.4	10	138.9	25	287.4
28-31	153	140	13	85.0	5	35.7	18	117.6
32-36	1,550	1,531	19	12.3	7	4.6	26	16.8
37-41	17,417	17,401	16	0.9	9	0.5	25	1.4
42+	36	36	0	0.0	0	0.0	0	0.0
Unknown	3	3	0	0.0	0	0.0	0	0.0
TOTAL	19,332	19,195	134	6.9	43	2.2	177	9.2

Classification of perinatal deaths

The Perinatal Subcommittee classified each of the 177 perinatal deaths, which occurred in 2018 according to the Perinatal Society of Australia and New Zealand – Perinatal Death Classification (PSANZ-PDC). This hierarchical classification, together with the Australian birthweight/gestation percentile charts (for singletons and twins), is available on the Perinatal Society of Australia and New Zealand (PSANZ) website. The Committee has used this classification system for deaths from 1999 onward. In 2018 perinatal deaths were coded according to PSANZ version 2.2. From 1st January 2019 all perinatal deaths will be classified in version 3 of the PSANZ codes. Table 7 presents the classification of perinatal deaths in 2018 according to PSANZ-PDC.

Table 7: Classification of perinatal deaths, PSANZ-PDC, South Australia, 2018

	PSANZ-PDC	Number	Percent	Deaths per 1,000 births
1.	Congenital anomaly	56	31.6	2.9
2.	Perinatal infection	13	7.3	0.7
3.	Hypertension	1	0.6	0.1
4.	Antepartum haemorrhage (APH)	10	5.6	0.5
5.	Maternal conditions	5	2.8	0.3
6.	Specific perinatal conditions	26	14.7	1.3
7.	Hypoxic peripartum death	4	2.3	0.2
8.	Fetal growth restriction	21	11.9	1.1
9.	Spontaneous preterm	14	7.9	0.7
10.	Unexplained antepartum death	23	13.0	1.2
11.	No obstetric antecedent	4	2.3	0.2
	Total	177	100	9.2

The PSANZ-PDC for perinatal deaths in 2018 is shown in Table 7 and its breakdown by subgroups in Appendix 3. PSANZ perinatal cause of death by birthweight is located in Appendix 5.

Congenital anomalies were the leading cause of perinatal death in 2018, accounting for 31.6% of all deaths. The next leading cause was specific perinatal conditions such as cervical incompetence and twin to twin transfusion syndrome (14.7%), followed by unexplained antepartum deaths (13.0%). Fetal growth restriction remains unchanged from 2017 (11.9%). The proportion of perinatal deaths from spontaneous preterm birth has decreased from 13.1% in 2017 to 7.9% in 2018.

A brief description of each of the 11 PSANZ categories follows.

Congenital anomaly – fifty-six deaths

This group of 56 deaths included 53 terminations of pregnancy, at 20 weeks gestation or more, of fetuses with congenital anomalies. The types of anomalies were as follows:

Central nervous system – ten deaths

- Two had anomalies of the corpus callosum
- Three had neural tube defects
- Three had anomalies of the cerebellum
- Two others had various other CNS anomalies

Cardiovascular – six deaths

- One had hypoplastic left heart syndrome
- One had Tetralogy of Fallot
- Four had various other cardiovascular complications including truncus arteriosus and mitral valve anomalies

Urinary System – no deaths

Gastrointestinal system – one death

- One had an intestinal malrotation and volvulus

Chromosomal – twenty five deaths

- Five had Trisomy 18
- Six had Trisomy 21
- Three had 22q deletion syndrome, with an associated Tetralogy of Fallot defect
- Three had Turner's syndrome
- Three had Trisomy 13
- Six had other chromosomal anomalies such as Jacob's syndrome, Trisomy 12 and Trisomy 10

Metabolic – no deaths

Multiple – nine deaths

- Nine had multiple congenital anomalies

Other – five deaths

- These deaths were attributed to conditions such as thanatophoric dysplasia and diaphragmatic hernia

Perinatal infection – thirteen deaths

Bacterial – nine deaths

- These deaths were attributed to various bacteria including Group B Streptococcal infection, and Escherichia coli amongst others

Viral – four deaths

- These deaths were attributed to Cytomegalovirus and Parvovirus

Hypertension – one death

- This death was associated with complications of pre-eclampsia or eclampsia

Antepartum haemorrhage – ten deaths

- These deaths were due to placental abruption

Maternal Conditions – five deaths

- Four deaths were due to maternal diabetes
- One death was due to a ruptured splenic artery

Specific perinatal conditions – twenty-six deaths

- Five deaths were associated with cervical incompetence
- Eight deaths were due to twin to twin transfusion syndrome
- Four deaths were due to fetomaternal haemorrhage
- The other deaths were due to various conditions such as hydrops and cord complications

Hypoxic peripartum death – four deaths

- There were two hypoxic peripartum deaths with evidence of non-reassuring fetal status
- There were two deaths related to traumatic births

Fetal growth restriction – twenty-one deaths

- There were fifteen deaths associated with placental pathology such as reduced vascular perfusion on Doppler studies or placental histopathology
- The other deaths were associated with other placental pathology, including chronic villitis

Spontaneous preterm (<37 weeks gestation) – fourteen deaths

- Five of these deaths were due to chorioamnionitis
- The other deaths include babies whose membranes were ruptured for longer than 24 hours and babies who had unknown duration of membrane rupture

Unexplained antepartum deaths – twenty-three deaths

- Ten of these deaths were associated with evidence of reduced vascular perfusion
- Two deaths with chronic villitis
- Six of the deaths were associated with other specified placental pathology
- Five of the deaths had no placental pathology

No obstetric antecedent – four deaths

- One death was due to postnatally acquired infection
- One death was unable to be classified
- Two deaths were due to a specific condition

Classification of neonatal deaths

The classification of the 43 neonatal deaths according to the Perinatal Society of Australia and New Zealand – Neonatal Death Classification (PSANZ-NDC) is provided in Appendix 4. This classification is also available, together with PSANZ-PDC, on the PSANZ website.

A brief description of these neonatal deaths by gestational age grouping follows:

20-23 weeks gestation – twelve neonatal deaths

- Nine neonates had no resuscitation, or resuscitation was ultimately unsuccessful
- The others died from complications such as intraventricular haemorrhage and congenital anomalies

24-31 weeks gestation – fifteen neonatal deaths

- Three deaths were attributed to intraventricular haemorrhage
- Four deaths were due to congenital anomalies
- The other deaths were attributed to necrotising enterocolitis, and cardio-respiratory disorders

32-37 weeks gestation – seven neonatal deaths

- Four of these deaths were attributed to hypoxic ischaemic encephalopathy
- Some of these deaths were secondary to intrauterine growth restriction, intracranial haemorrhage and congenital anomalies

37 weeks and greater gestation – nine neonatal deaths

- Four of these deaths were attributed to congenital anomalies
- The other deaths were due to events such as acquired infection and multisystem failure

Aboriginal perinatal deaths

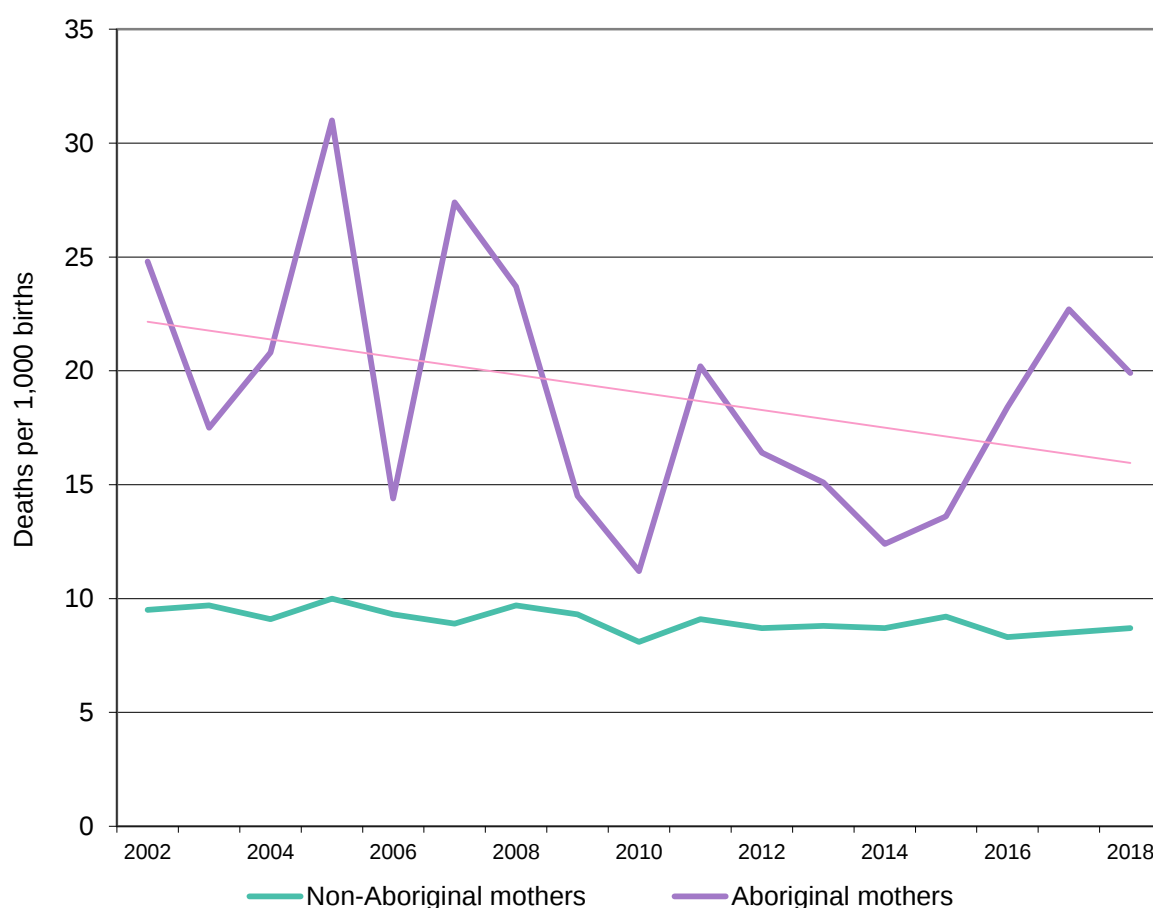
There were fifteen perinatal deaths (12 stillbirths and 3 neonatal deaths) among the births to 739 Aboriginal women.

In 2018 the perinatal mortality rate for births to Aboriginal women was 19.9 per 1,000 births, compared to 8.7 per 1,000 births for births to non-Aboriginal women. The perinatal death rate has decreased for Aboriginal women in 2018. Although the perinatal mortality rate for Aboriginal births fluctuates widely due to the small number of deaths, recent years show a decreasing trend (Figure 5).

Eleven of the seventeen infants were born in public metropolitan hospitals and four infants were born in a country hospital. Thirteen of the infants were preterm births, with five born at or before 23 weeks gestation. Four of the fourteen mothers were country residents.

The causes of the fifteen deaths were attributed to such causes as spontaneous preterm birth, perinatal infection, Twin to Twin Transfusion syndrome and fetomaternal haemorrhage.

Figure 5: Perinatal mortality by maternal Aboriginal status, South Australia, 2002 - 2018



Autopsies in perinatal deaths

Pathological examinations were undertaken at the State Perinatal Autopsy Service, provided by SA Pathology at the Women's and Children's Hospital. The different types of pathological examinations were categorised as follows:

- full autopsy – examination of all cavities and dissection of all organs
- limited autopsy – examination of one or more cavities (such as chest and/or abdomen) and dissection of one or more organs, but not the whole body
- other examination – external examination of the body and growth parameters in conjunction with any other relevant investigations such as radiological survey, genetic testing, placental histology, virology and microbiology

Autopsies were performed for 81 of the 177 perinatal deaths (46.0%), including four 'limited' autopsies. One death was excluded from the calculation as it is unknown whether an autopsy was undertaken. This proportion of autopsies undertaken has decreased from 2017 (51.7%). The stillbirth investigations algorithm from the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death is located at Appendix 7.

Additionally, 'Other examinations' were performed for 10 (5.7%) of the perinatal deaths. Placental histological examinations were undertaken for 168 perinatal deaths (94.9%). Please see Appendix 7 for placental histology guidelines.

The distribution of autopsies by place of death is presented in Table 8. Both Women's and Children's and Flinders Medical Centre hospitals have Level 6 neonatal services, and Lyell McEwin has a Level 5 neonatal service. Service delineations in South Australia are set out in the Standards for Maternal and Neonatal Services in South Australia document, available from the SA Health website [here](#).

Table 8: Autopsy* status of perinatal deaths by place of death, South Australia, 2018

Place of death	Deaths	Autopsies performed	
	Number	Number	Percent of deaths
Women's & Children's Hospital	93	41	44.1
Lyell McEwin Hospital	30	14	46.7
Flinders Medical Centre	30	17	56.7
Other metropolitan public hospitals	1	0	0.0
Metropolitan private hospitals	9	4	44.4
Country hospitals	12	5	41.7
Home	1	0	0
Total	176	81	46.0

* Includes 4 autopsies with limited dissection and excludes 1 unknown interstate case

The low proportion of autopsies conducted in perinatal deaths remains a concern. A good quality autopsy is invaluable in confirming antenatal diagnoses, eliciting other findings of clinical significance, particularly significant negative findings, and determining the time course of events leading to death. It may thus be invaluable in alleviating parental guilt, helping with the grieving process and parental counselling, and gaining understanding of the patterns and evaluation of fetal and neonatal disease. Parental permission for autopsy should therefore be sought as often as possible by senior staff. There have been several cases in which an autopsy has identified a previously unsuspected cause of death. This is most valuable in the management of future pregnancies and counselling of parents, including grief counselling.

Medical practitioners are advised that the **State Perinatal Autopsy Service** is available at no cost to the parents and this includes transportation and return of the body from the place of death, including country regions. This Service may be contacted by telephone on **(08) 81616315**.

All hospitals with maternity services receive information on the State Perinatal Autopsy Service. The Department for Health and Wellbeing has produced an Autopsy Request and Authority form for use for all non-coronial autopsy examinations together with a booklet entitled "[The Hospital Autopsy Process. When a person dies - information for family and friends.](#)" These forms must be used and are available from the [State Perinatal Autopsy Service](#).

Key Learning Points

1. High quality morphology ultrasound is an essential component of antenatal care and allows health care providers and women access to critical information to inform decision making. The review of 2018 perinatal deaths demonstrated that, in a very small number of cases, ultrasonography was not high quality, contributing to delays in diagnosis and subsequent suboptimal outcomes for women and their families. The Subcommittee would like to highlight the role that appropriately timed morphology ultrasound, along with thorough assessment of the placenta and the fetus for structural anomalies, contribute to improved perinatal outcomes.
2. Women who live in rural and remote areas face additional barriers to care in comparison to women living in metropolitan areas. The 2018 perinatal mortality review highlighted that a small proportion of women in regional areas were deterred from accessing antenatal care due to increased out of pocket expenses for care. Women in rural and remote areas will benefit from contemporary approaches to maternity care, including increased access to fully bulk-billed models of care such as caseload midwifery care as well as telemedicine.

Perinatal Subcommittee recommendations

The Committee's previous recommendations have been incorporated into South Australian policies, practices, standards or guidelines (Appendix 6).

Education Subcommittee Report

The twenty-third annual educational meeting - 'The Annual Dr Brian Pridmore Perinatal Forum' - was held on the evening of 21st August 2019. The forum is organized by the Education Subcommittee of the Maternal and Perinatal Mortality Committee.

The forum was titled 'Stillbirth – an evolving conversation' and included an interactive forum reviewing the care of women and families impacted by the tragedy of stillbirth. The 2019 forum was held in the Queen Victoria Lecture Theatre at the Women's and Children's Hospital, attracting approximately 140 people.

Dr Aimee Wiltshire introduced the topic, followed by a short presentation by each of the panel members. The evening concluded with a question and answer session. Presenters were as follows:

- Professor Jodie Dodd - Obstetrician
- Dr Jill Lipsett – Pathologist
- Dr Jane Warland - Midwife
- Dr Brian Headley - Neonatologist

Feedback received from the audience was positive with the majority attendees agreeing that the subject matter was very useful for their clinical practice. The forum was again held at the WCH auditorium in line with popular request. The audience included midwives from the private and public sector, obstetricians, university staff and trainee medical officers. The feedback is used by the Subcommittee to guide future topic choices and improve the event.

New recommendations made by the Maternal and Perinatal Mortality Committee, following review of the deaths in 2018, were presented to the audience. These recommendations were published in the 32nd annual report in October 2019. This forum was filmed. An edited version with transcripts can be viewed on the SA Health online website by visiting www.sahealth.sa.gov.au/perinatal. The Subcommittee wishes to thank the panel and participants for their continued support and will endeavour to ensure that the event continues to be an important part of perinatal services within South Australia.

Useful links

- The SA Health Pregnancy Information website: www.health.sa.gov.au/pregnancy
- The South Australian Perinatal Practice Guidelines website:
<http://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+topics/perinatal>
- The Child Death and Serious Injury Review Committee reports:
www.cdsirc.sa.gov.au
- The Sudden Infant Death Syndrome website: <https://rednose.com.au/>
- The South Australian Parenting and Child Health website:
www.cyh.com.au
- The South Australian Safe Infant Sleeping Standards
<http://www.sahealth.sa.gov.au/wps/south+australian+safe+infant+sleeping+standards>
- The Courts Administration Authority of South Australia, Coroners Findings:
www.courts.sa.gov.au/CoronersFindings/Pages/default.aspx
- Gestation Network customised birthweight centile calculator: www.gestation.net/cc/about.htm
- Perinatal Society of Australia and New Zealand (PSANZ) website (www.psanz.org.au)

Methods and terminology

Live birth: the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which after such separation breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached.

This report does not include live births less than 20 weeks gestation and less than 400g birthweight.

Maternal death: the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.¹⁰

Maternal deaths are classified as follows:

- **Direct obstetric deaths:** resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.
- **Indirect obstetric deaths:** resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy.
- **Incidental deaths in pregnancy:** the pregnancy is unlikely to have contributed significantly to the death, although it may be possible to postulate a remote association. Examples of incidental deaths are drowning and road accidents.

In order to avoid missing indirect deaths which may be difficult to distinguish from incidental deaths occurring in pregnant women, the Maternal and Perinatal Mortality Committee reviews all deaths in pregnancy and within 42 days of the end of pregnancy. However, only direct and indirect deaths (pregnancy-related deaths) are included in the calculation of the maternal mortality ratio.

Late maternal deaths: deaths occurring from 43 days postpartum up to and including 365 days postpartum)

Maternal mortality ratio: the number of direct and indirect maternal deaths in a defined time period, divided by the total number of women who gave birth in the same time period, multiplied by 100,000

Neonatal death: death of a live born infant within 28 days of birth

Neonatal death rate: the number of neonatal deaths in a defined time period, divided by the total number of live births in the same time period, multiplied by 1,000

Perinatal death: stillbirths and neonatal deaths combined

Perinatal mortality rate: the number of stillbirths and neonatal deaths in a defined time period, divided by the total number of still births and live births in the same time period, multiplied by 1,000

Stillbirth: birth of a fetus at or after 20 weeks gestation or with a birthweight of 400g or more, with no signs of life at birth.

Stillbirth rate: the number of stillbirths in a defined time period, divided by the total number of live births and stillbirths in the same time period, multiplied by 1,000

Sudden Infant Death Syndrome (SIDS): the sudden unexpected death of an infant less than one year of age, with onset of the fatal episode apparently occurring during sleep, that remains unexplained after a thorough investigation, including performance of a complete autopsy and review of the circumstances of death and the clinical history.

Women who gave birth: women who gave birth after a pregnancy ending with the birth of one or more live births and/or stillbirths.

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Appendix 1

Terms of reference, Subcommittees of the Maternal and Perinatal Mortality Committee

In 2020, the Committee's Terms of reference were revised and updated.

Maternal Subcommittee

- To improve maternal outcomes during and after birth and institute systemic safety by providing advice on strategies for system improvement at a statewide level.
- To determine preventable factors involved with deaths associated with pregnancy through further investigation or research into the causes of mortality and morbidity in the state.
- To provide recommendations to the Chief Executive in an annual report through the Maternal and Perinatal Mortality Committee.
- To provide advice to the Chief Executive where requested regarding matters relevant to the safety and quality of health care.
- To support a culture of safety and quality where analysis of adverse events and continuous improvement are central.

Perinatal Subcommittee

- To improve perinatal outcomes during and after birth and institute systemic safety by providing advice on strategies for system improvement at a statewide level.
- To determine preventable factors involved with perinatal deaths associated with pregnancy through further investigation or research into the causes of mortality and morbidity in the state.
- To provide recommendations to the Chief Executive in an annual report through the Maternal and Perinatal Mortality Committee.
- To provide advice to the Chief Executive where requested regarding matters relevant to the safety and quality of health care.
- To support a culture of safety and quality where analysis of adverse events and continuous improvement are central.

Education Subcommittee

- To provide an annual interactive forum for the continuing education of midwives and medical practitioners involved in the provision of perinatal services within the metropolitan and regional South Australia.
- To act as an additional means of communication to the above providers, other health professionals and the community generally from the other subcommittees of the Maternal and Perinatal Mortality Committee.
- The membership and chairperson will be nominated by the chairperson of the Maternal and Perinatal Mortality Committee.
- The Subcommittee may co-opt members as required.

Appendix 2

	Government of South Australia Affix patient label here	Confidential Report on Perinatal Death This form should be forwarded to the SOUTH AUSTRALIAN MATERNAL AND PERINATAL MORTALITY COMMITTEE PO BOX 6, Rundle Mall, ADELAIDE SA, 5000 Committee Secretary tel: 82266371
The Perinatal Subcommittee meet regularly to determine the cause of death and possible contributing factors for stillbirths and neonatal deaths with a gestation of at least 20 weeks or a birthweight of at least 400g in South Australia. This form complements data from the Medical Certificate of Cause of Perinatal Death and the Supplementary Birth Record. Where available, provide printed electronic records to supplement details. This may include discharge summaries, ultrasounds and pathology results. This is essential where details are not available through the SA Health data systems. For multiple gestation, complete a separate form for each baby.		
MOTHER DETAILS		
Surname _____ Given names _____ Date of birth _____ Clinician(s) responsible for antenatal care _____ Clinician(s) responsible for intra and postpartum care (if different to above) _____		
BABY DETAILS		
Surname (if different to above) _____ Date of birth _____ Hospital of birth _____ Intended place of birth (if different to above) _____ Clinician responsible for care _____ Multiple birth Yes ☐ No ☐ Birth order 1 ☐ 2 ☐ 3 ☐ Gestation at birth _____ in weeks+days Date of death _____ Time of death _____		
PREVIOUS OBSTETRIC MEDICAL AND SOCIAL HISTORY <i>If yes, provide all details below</i>		
Pre-existing medical conditions? Yes ☐ No ☐ _____ _____ _____ Previous obstetric complications? Yes ☐ No ☐ _____ _____ _____ Regular antenatal care attendance? Yes ☐ No ☐ _____ Referral to Aboriginal Birthing Clinic? Yes ☐ No ☐ _____ Describe any factors influencing antenatal care (psychosocial/geographic etc) _____ _____ _____		
ANTENATAL HISTORY AND IDENTIFIED RISKS <i>If yes is answered to any question, provide all details below or ensure details are available in OACIS</i>		
Presentations for abnormal fetal movements?	Yes ☐ No ☐	Number of Presentations /Comments _____
Antenatal CTG's	Yes ☐ No ☐	Results/Comment _____
GBS screening	Yes ☐ No ☐	Results/Comment _____
Early OGTT	Yes ☐ No ☐	Results/Comment _____
Other screening procedures	Yes ☐ No ☐	Comment _____
Medications taken during this pregnancy	Yes ☐ No ☐	List all medications _____ _____ _____
Describe other antenatal conditions / complications		Specify _____ _____ _____

Record gestation, where the scan was performed, and the results of each scan.

Scan No.	Date	Gestation (weeks)	Site/location	Results
1 st				
2 nd				
3 rd				
4 th				
5 th				
6 th				
7 th				
8 th				

Summary of events

Summary of events

Liquor appearance: ☐ Clear ☐ Pink ☐ Blood stained ☐ Green ☐ MSL ☐ Other/describe _____

Other/Describe:

Yes ☐ No ☐ If yes, provide details

Yes ☐ No ☐ If yes, provide details:

Yes ☐ No ☐ Attach all CTG's

Labour length	1 st stage		2 nd stage	
	hrs	mins	hrs	mins
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© 1997 American Water Works Association

A thorough summary of circumstances provided in this space will assist the committee to formulate recommendations to improve the safety and quality of maternity services in South Australia.

- circumstances of discovery ie presentation with decreased fetal movements or at a regular antenatal visit
- any treatments, procedures and complications
- all details of neonatal course
- details of retrievals or transfers

Describe details of events – this section cannot be left blank

[illegible]

Name and designation of person completing the form _____ Date _____

Appendix 3

Perinatal Society of Australia and New Zealand-Perinatal Death Classification (PSANZ-PDC), South Australian perinatal deaths, 2018

	Category No	Subcategory No	Category %
1 Congenital Anomaly	56		31.6
1.1 Central nervous system	10		5.6
1.2 Cardiovascular system	6		3.4
1.3 Urinary system	0		
1.4 Gastrointestinal system	1		0.6
1.5 Chromosomal	25		14.1
1.6 Metabolic	0		
1.7 Multiple/non chromosomal syndromes	9		5.1
1.8 Other congenital abnormality	0		
1.81 Musculoskeletal		1	0.6
1.82 Respiratory		0	
1.83 Diaphragmatic hernia		1	0.6
1.84 Haematological		1	0.6
1.85 Tumours		0	
1.88 Other specified congenital abnormality		2	1.1
1.9 Unspecified congenital abnormality		0	
2 Perinatal Infection	13		7.3
2.1 Bacterial	0		
2.11 Group B Streptococcus		2	1.1
2.12 E coli		3	1.7
2.13 Listeria monocytogenes		0	
2.14 Spirochaetal eg Syphilis		0	
2.18 Other bacterial		4	2.3
2.19 Unspecified bacterial		0	
2.2 Viral	0		
2.21 Cytomegalovirus		3	1.7
2.22 Parvovirus		1	0.6
2.23 Herpes simplex virus		0	
2.24 Rubella virus		0	
2.28 Other viral		0	
2.29 Unspecified viral		0	
2.3 Protozoal eg Toxoplasma	0		
2.5 Fungal	0		
2.8 Other specified organism	0		
2.9 Other unspecified organism	0		
3 Hypertension	1		0.6
3.1 Chronic hypertension: essential	0		
3.2 Chronic hypertension: secondary, eg renal disease	0		
3.3 Chronic hypertension: unspecified	0		
3.4 Gestational hypertension	0		
3.5 Pre-eclampsia	1		0.6
3.51 With laboratory evidence of thrombophilia		0	
3.6 Pre-eclampsia superimposed on chronic hypertension	0		
3.61 With laboratory evidence of thrombophilia		0	
3.9 Unspecified hypertension	0		

	Category No	Subcategory No	Category %
4 APH	10		5.6
4.1 Placental abruption	10		5.6
4.11 With laboratory evidence of thrombophilia		0	
4.2 Placenta praevia	0		
4.3 Vasa praevia	0		
4.8 Other APH	0		
4.9 APH of undetermined origin	0		
5 Maternal Conditions	5		2.8
5.1 Termination of pregnancy (other than for congenital fetal abnormality)	0		
5.2 Diabetes / Gestational diabetes	3		1.7
5.3 Maternal injury	0		
5.31 Accidental		0	
5.32 Non-accidental		0	
5.4 Maternal sepsis	0		
5.5 Antiphospholipid syndrome	1		0.6
5.6 Obstetric cholestasis	0		
5.8 Other specified maternal conditions	1		0.6
6 Specific Perinatal Conditions	26		14.7
6.1 Twin-twin transfusion	8		4.5
6.2 Fetomaternal haemorrhage	4		2.3
6.3 Antepartum cord complications	0		
6.31 Cord haemorrhage		0	
6.32 TRUE knot with evidence of occlusion		2	1.1
6.38 Other		2	1.1
6.39 Unspecified		0	
6.4 Uterine abnormalities, eg bicornuate uterus, cervical incompetence	5		2.8
6.5 Birth trauma	0		
6.6 Alloimmune disease	0		
6.61 Rhesus		0	
6.62 ABO		0	
6.63 Kell		0	
6.64 Alloimmune thrombocytopenia		0	
6.68 Other		0	
6.69 Unspecified		0	
6.7 Idiopathic hydrops	2		1.1
6.8 Other specific perinatal conditions	0		
6.81 Rupture of membranes after amniocentesis		0	
6.82 Termination of pregnancy for unconfirmed congenital abnormality		1	0.6
6.83 Fetal subdural haematoma		0	
6.88 Other		0	
6.89 Unspecified		2	1.1
7 Hypoxic Peripartum Death	4		2.3
7.1 With intrapartum complications	0		
7.11 Uterine rupture		0	
7.12 Cord prolapse		0	
7.13 Shoulder dystocia		0	
7.18 Other		2	1.1
7.2 Evidence of non-reassuring fetal status in a normally grown infant	2		1.1
7.3 No intrapartum comps and no evidence of non-reassuring fetal status	0		
7.9 Unspecified hypoxic peripartum death	0		

	Category No	Subcategory No	Category %
8 Fetal Growth Restriction	21		11.9
8.1 Evidence of reduced vascular perfusion on Doppler studies and /or placental histo	15		8.5
8.11 With placental or laboratory evidence of thrombophilia		0	
8.12 With smoking		0	
8.13 With substance abuse		0	
8.14 With alcohol abuse		0	
8.15 With diabetes/gestational diabetes		0	
8.2 With chronic villitis	1		0.6
8.3 No placental pathology	1		0.6
8.4 No examination of placenta	1		0.6
8.8 Other specified placental pathology	2		1.1
8.9 Unspecified or not known whether placenta examined	1		0.6
9 Spontaneous Preterm	14		7.9
9.1 Spont preterm with intact membranes, or membrane rupture <24 hours before delivery	0		
9.11 With chorioamnionitis on placental histopathology		5	2.8
9.12 Without chorioamnionitis on placental histopathology		3	1.7
9.13 With clinical evidence of chorioamnionitis, no examination of placenta		0	
9.17 No clinical signs of chorioamnionitis, no examination of placenta		0	
9.19 Unspecified or not known whether placenta examined		0	
9.2 Spontaneous preterm with membrane rupture ≥24 hours before delivery	0		
9.21 With chorioamnionitis on placental histopathology		5	2.8
9.22 Without chorioamnionitis on placental histopathology		0	
9.23 With clinical evidence of chorioamnionitis, no examination of placenta		0	
9.27 No clinical signs of chorioamnionitis, no examination of placenta		0	
9.29 Unspecified or not known whether placenta examined		0	
9.3 Spontaneous preterm with membrane rupture of unknown duration before delivery	0		
9.31 With chorioamnionitis on placental histopathology		1	0.6
9.32 Without chorioamnionitis on placental histopathology		0	
9.33 With clinical evidence of chorioamnionitis, no examination of placenta		0	
9.37 No clinical signs of chorioamnionitis, no examination of placenta		0	
9.39 Unspecified or not known whether placenta examined		0	
10 Unexplained Antepartum Death	23		13.0
10.1 Evidence of reduced vascular perfusion on Doppler studies and /or placental histo	9		5.1
10.11 And thrombophilia		0	
10.12 And smoking		0	
10.13 And substance abuse		0	
10.14 And alcohol abuse		0	
10.15 And diabetes/gestational diabetes		0	
10.2 With chronic villitis	1		0.6
10.3 No placental pathology	6		3.4
10.4 No examination of placenta	1		0.6
10.8 Other specified placental pathology	6		3.4
10.9 Unspecified or not known whether placenta examined	0		
11 No Obstetric Incident	4		2.3
11.11 SIDS Cat IA: Classic features of SIDS present and completely documented	0		
11.12 SIDS Cat IB: Classic features of SIDS present but incompletely documented	0	0	
11.13 SIDS Cat II: Infant deaths that meet Category I except for one or more features	0	0	
11.2 Postnatally acquired infection	1	0	0.6
11.3 Accidental asphyxiation	0		
11.4 Other accident, poisoning or violence (postnatal)	0		
11.8 Other specified	2		1.1
11.9 Unknown/Undetermined	0		
11.91 Unclassified Sudden Infant Death	1		0.6
11.92 Other Unknown/Undetermined	0	1	0.6
TOTAL	177		100.0

Appendix 4

Perinatal Society of Australia and New Zealand-Neonatal Death Classification (PSANZ-NDC), South Australian neonatal deaths, 2018

	Category No	Subcategory No	Category %
1 Congenital Abnormality	11		25.6
1.1 Central nervous system	0		
1.2 Cardiovascular system	4		9.3
1.3 Urinary system	0		
1.4 Gastrointestinal system	1		2.3
1.5 Chromosomal	4		9.3
1.6 Metabolic	0		
1.7 Multiple/non chromosomal syndromes	1		2.3
1.8 Other congenital abnormality	0	0	
1.81 Musculoskeletal	1	1	4.7
1.82 Respiratory	0	0	
1.83 Diaphragmatic hernia	0	0	
1.84 Haematological	0	0	
1.85 Tumours	0	0	
1.88 Other specified congenital abnormality	0	0	
1.9 Unspecified congenital abnormality	0	0	
2 Extreme Prematurity	11		25.6
2.1 Not resuscitated	8		18.6
2.2 Unsuccessful resuscitation	3		7.0
2.9 Unspecified or unknown whether resuscitation attempted	0	0	
3 Cardio-Respiratory Disorders	4		9.3
3.1 Hyaline membrane disease / Respiratory Distress Syndrome (RDS)	1		2.3
3.2 Meconium aspiration syndrome	0		
3.3 Primary persistent pulmonary hypertension	0		
3.4 Pulmonary hypoplasia	2		4.7
3.5 Chronic neonatal lung disease (typically bronchopulmonary dysplasia)	0		
3.6 Pulmonary haemorrhage	1		2.3
3.7 Pneumothorax	0		
3.8 Other	0		
4 Infection	2		4.7
4.1 Bacterial	0		
4.11 Congenital bacterial		0	
4.111 Group B Streptococcus		0	
4.112 E coli		0	
4.113 Lysteria monocytogenes		0	
4.114 Spirochaetal, eg syphilis		0	
4.118 Other bacterial		1	2.3
4.119 Unspecified bacterial		0	
4.12 Acquired bacterial	0		
4.121 Group B Streptococcus		1	2.3
4.122 E coli		0	
4.125 Other Gram negative bacilli (other than E coli)		0	
4.126 Staphylococcus aureus		0	
4.127 Coagulase negative Staphylococcus		0	
4.128 Other specified bacterial		0	
4.129 Unspecified bacterial		0	

	Category No	Subcategory No	Category %
4.2 Viral	0		
4.21 Congenital viral		0	
4.211 Cytomegalovirus		0	
4.213 Herpes simplex virus		0	
4.214 Rubella virus		0	
4.218 Other specified viral		0	
4.219 Unspecified viral		0	
4.22 Acquired viral		0	
4.221 Cytomegalovirus		0	
4.223 Herpes simplex virus		0	
4.224 Rubella virus		0	
4.228 Other specified viral		0	
4.229 Unspecified viral		0	
4.3 Protozoal eg Toxoplasma	0		
4.5 Fungal	0		
4.8 Other specified organism	0		
4.9 Unspecified organism	0		
5 Neurological	10		23.3
5.1 Hypoxic ischaemic encephalopathy / Perinatal asphyxia	6		14.0
5.2 Intracranial haemorrhage	0		
5.21 Intraventricular Haemorrhage		4	9.3
5.22 Subgaleal Haemorrhage		0	
5.23 Subarachnoid Haemorrhage		0	
5.24 Subdural Haemorrhage		0	
5.28 Other Intracranial Haemorrhage		0	
5.8 Other		0	
6 Gastrointestinal	1		2.3
6.1 Necrotising enterocolitis	1		2.3
6.8 Other	0		
7 Other	4		9.3
7.1 Sudden Infant Death Syndrome (SIDS)	0		
7.11 SIDS Cat IA: Classic features of SIDS present and completely documented		0	
7.12 SIDS Cat IB: Classic features of SIDS present but incompletely documented		0	
7.13 SIDS Cat II : Infant deaths that meet category I except for 1 or more features		1	2.3
7.2 Multisystem failure	0		
7.21 Secondary to intrauterine growth restriction		1	2.3
7.28 Other specified		0	
7.29 Unspecified/undetermined primary cause or trigger event		1	2.3
7.3 Trauma	0		
7.31 Accidental		0	
7.32 Non-accidental		0	
7.39 Unspecified		0	
7.4 Treatment complications	0		
7.41 Surgical		0	
7.42 Medical		0	
7.8 Other specified	1		2.3
7.9 Undetermined/Unknown	0		
7.91 Unclassified Sudden Infant Death		0	
7.92 Other Unknown/Undetermined		0	
TOTAL	43		100.0

Appendix 5

Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC),
South Australian perinatal deaths by birthweight, 2018

PSANZ-PDC		Birthweight (g)							Total	
		<500	500-749	750-999	1000-1,499	1500-1,999	2,000-2,499	2,500+	No	%
1	Congenital anomaly	31	15	1	1	3	0	5	56	31.6
2	Perinatal infection	3	3	1	1	2	0	3	13	7.3
3	Hypertension	0	0	1	0	0	0	0	1	0.6
4	Antepartum haemorrhage	2	4	1	1	0	1	1	10	5.6
5	Maternal conditions	1	0	0	0	1	2	1	5	2.8
6	Specific perinatal conditions	9	4	1	2	4	1	5	26	14.7
7	Hypoxic peripartum death	0	0	0	1	2	0	1	4	2.3
8	Fetal growth restriction	9	2	1	3	2	4	0	21	11.9
9	Spontaneous preterm	8	6	0	0	0	0	0	14	7.9
10	Unexplained antepartum death	2	3	2	4	1	2	9	23	13.0
11	No obstetric antecedent	0	0	0	0	0	0	4	4	2.3
Total		65	37	8	13	15	10	29	177	100.0
Percent		36.7	20.9	4.5	7.3	8.5	5.6	16.4	100.0	%

Appendix 6

Archived recommendations

Many Committee recommendations have been incorporated into South Australian policies, standards or guidelines. For a complete list of recommendations made by the Committee in previous years, please see the Archived Recommendations document on the [Pregnancy Outcome Unit](#) web page.

Appendix 7

South Australian Protocol for investigation of stillbirths

Working party members (August 2012):

Professor G Dekker (Chair)

Professor TY Khong

Professor W Hague

Dr Linda McKendrick

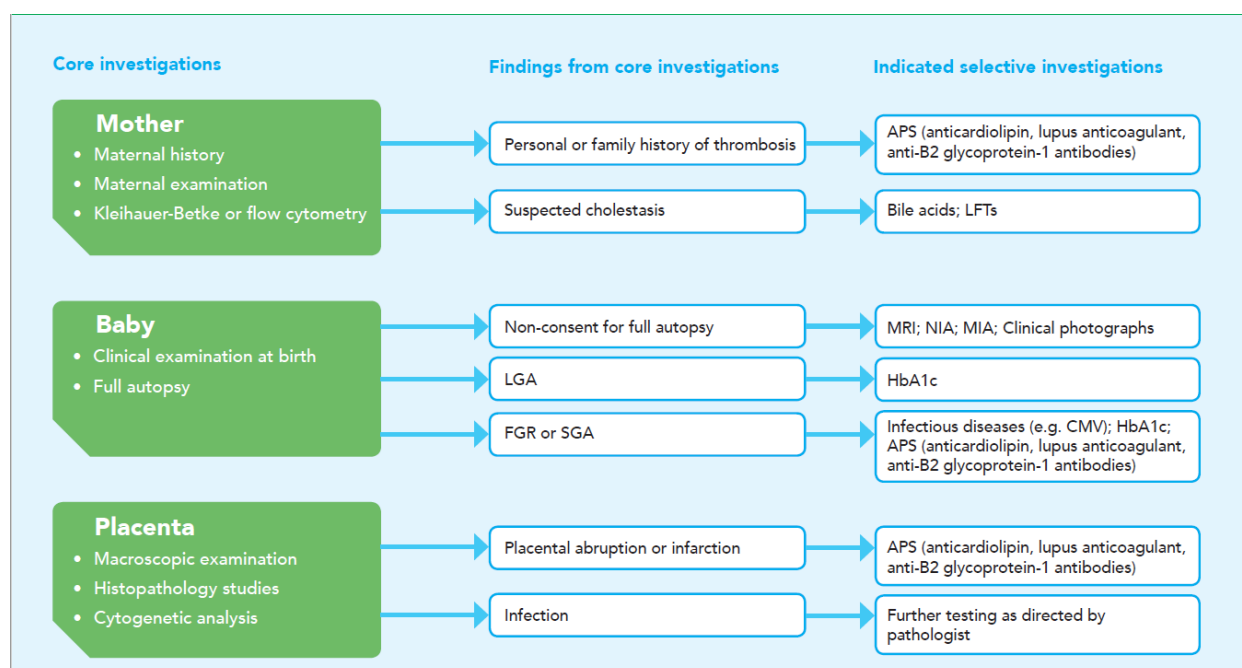
Introduction

About 75% of the overall perinatal mortality in South Australia is related to stillbirths. Over the past several years approximately 11% of stillbirths had no cause identified, possibly, in part due to the lack of a systematic and up-to-date approach to the investigation of stillbirths for which there is no immediate obvious cause. Currently protocols for investigating such cases vary markedly between hospitals and generally have not kept pace with advances in obstetric knowledge, particularly in the area of vasculopathy.

In 2020, the Perinatal Society of Australia and New Zealand (PSANZ) updated the investigation of stillbirths algorithm which has been published by the SAMPMC in previous annual reports. The new algorithm is included on the following page. South Australian Perinatal Practice Guidelines are currently being updated to reflect the new PSANZ flow chart. During this transition period, the committee has chosen to publish both the new PSANZ guideline along with the existing South Australian Core investigations guidelines.

It is important that clinicians initiate a comprehensive approach to all cases of stillbirth; however, as in all aspects of clinical medicine common sense should prevail. In order to adequately assess causative and contributing factors in cases of stillbirth, certain core investigations will be required in all cases as outlined in the 'Core Investigations of All Stillbirths' section in the 'Stillbirth investigations algorithm' on the following page. South Australian specific considerations are summarised in the pages following the 'Stillbirth investigations algorithm'. Some investigations are best suited to those cases in which no cause of death is apparent. The committee advises that all investigations should be discussed with a senior clinician to assist with decision-making prior to ordering selective investigations.

PSANZ Stillbirth Investigations Algorithm



Perinatal Society of Australia and New Zealand Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death, Third Edition, March 2018.

South Australian Core investigations (to be performed in all cases of stillbirth):

The following outlines the current South Australian recommended core investigations into stillbirth.

- **A detailed history and examination of the mother and careful review of the antenatal record** – This can often provide clues to intercurrent infection, previously undiagnosed pre-eclampsia, drug use, obstetric cholestasis or missed intrauterine growth restriction.
- **Maternal blood** - In addition to the blood tests listed in the core investigations section of the 'Stillbirth investigation algorithm', a blood glucose test should be done. Testing for fetomaternal haemorrhage involves a Kleihauer test at SA Pathology and, if positive, Fluorescence-Activated Cell Sorting (FACS, a type of flow cytometry) to quantify the fetomaternal haemorrhage.
- **Autopsy of the stillbirth** - With parental consent, an autopsy should be conducted by the State Perinatal Autopsy Service. In those cases where parents give full consent with regard to autopsy, the perinatal pathologists will take appropriate samples for genetic testing, and there is no need for the obstetrician to take separate fetal samples.
- **External examination of the baby** - In cases where parental consent for autopsy cannot be obtained, where possible, external examination of the baby by a pathologist experienced in this area should be sought. If this is not possible an X-ray of the baby and/or a clinical photograph should be taken and sent to a major centre for review.
- **Histopathology of placenta** - Whether or not an autopsy is performed the placenta should be placed in a dry sterile container (no formalin or saline), the container surrounded in ice and forwarded to the State Perinatal Autopsy Service. Histopathological examination combined with other investigations may provide a diagnosis and information that can be helpful in planning another pregnancy.
- **Guthrie card** - Where permission for an autopsy has been declined, parents should be asked if blood can be taken for the Newborn Screening Guthrie Card that is requested for all babies in Australia. This blood can be drawn from a heel prick or from the cut end of the umbilical cord of the placenta in the case of a fresh stillbirth (<7 days between intrauterine death and birth).

Termination of pregnancy for fetal abnormalities

In cases where a termination of pregnancy has been carried out for fetal malformation, *an autopsy may still be desirable* to confirm the diagnosis or discover unexpected associated malformations.

Congenital abnormality

Investigations to be performed when an intrauterine fetal death occurs in conjunction with a known fetal abnormality:

- **Genetic testing** - preferably on amniotic fluid obtained by amniocentesis since this provides the least contaminated sample, but if maternal consent for this cannot be obtained then on cord blood (if obtainable) or fetal skin.
- **Maternal serology** - for syphilis, cytomegalovirus, toxoplasma, herpes and parvovirus. Serum should be taken and forwarded with the baby. Investigation for congenital infection should be pursued if abnormalities indicative of infection are found (for example, hydrocephalus, hepatomegaly, cataracts, fetal hydrops, calcification of brain or placenta).
- **Maternal screen for blood group antibodies** – forward serum with baby for later investigation if hydrops is evident at autopsy.

Vasculopathies

Pre-eclampsia, placental abruption and intrauterine growth restriction.

All should have a thrombophilia screen comprising –

At time of delivery:

- Anti-cardiolipin antibody
- Lupus anticoagulant (Diagnosis of antiphospholipid antibody syndrome requires a least two positive tests of moderate to high titre)
- Factor V Leiden gene mutation, prothrombin gene mutation.

At three months post-partum:

- Homocysteine - may be done earlier if follow-up uncertain
- Protein S (a formal diagnosis of protein S deficiency requires 2 abnormal results at least six weeks apart outside of pregnancy).

Pre-eclampsia

Those with early onset pre-eclampsia (<28 weeks) should also have:

- Anti-nuclear antibody
- Fetal genetic testing (see "Congenital abnormality")

Placental abruption

In cases of placental abruption:

- A history of trauma, including domestic or other violence, should be sought.
- Testing for fetomaternal haemorrhage and D-dimers is indicated if the diagnosis is in doubt.

Intrauterine growth restriction (IUGR)

Where intrauterine growth restriction is evident, without further evidence of a vasculopathy, the following should be performed in addition to the thrombophilia screen:

- maternal serology for cytomegalovirus, toxoplasma and rubella (if not immune) on held maternal serum
- fetal genetic testing (see "Congenital abnormality")
- maternal urinary drug screen as well as a drug-related history.

Intrapartum stillbirths

- If associated with pre-eclampsia, intrauterine growth restriction and/or abruption follow the placental vasculopathy protocol.
- In the absence of obvious causes, test for fetomaternal haemorrhage and cord (or heart) blood for haemoglobin, platelets and nucleated red blood cells.

Unexplained stillbirths

In the absence of discernible factors pertaining to fetal demise, or any obvious congenital abnormality, in addition to the "Core investigations" the following should be conducted:

- cord blood bile acids if possible

- maternal thyroid stimulating hormone
- maternal serology for syphilis, cytomegalovirus, toxoplasma herpes, parvovirus and rubella (if not immune) on held maternal serum
- microbiology - fetal throat swab, placental intermembranous swab
- drug history and urine drug screen
- Cord or heart blood - haemoglobin, platelets, nucleated red blood cells, blood group (for anti-D if mother is Rhesus negative)
- maternal antibody screen
- fetomaternal haemorrhage testing
- check the mother's history for the possibility of tropical infectious disorders. Where there is a history of a recent visit to a tropical area, contact an infectious disease specialist with regard to required investigations.

For more information

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