

Clinical Guidance Statement

Prevention, detection, and management of subgaleal haemorrhage in the newborn

This statement has been developed and reviewed by the Women's Health Committee and approved by the RANZCOG Board and Council.

A list of Women's Health Committee Members can be found in [Appendix A](#).

Disclosure statements have been received from all members of this committee.

Disclaimer This information is intended to provide general advice to practitioners. This information should not be relied on as a substitute for proper assessment with respect to the particular circumstances of each case and the needs of any patient. This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The document has been prepared having regard to general circumstances.

First endorsed by RANZCOG: July 2009

Current: November 2021

Review due: November 2026

Objectives:

To provide advice on the prevention, detection and management of subgaleal haemorrhage in the newborn.

Target audience:

All health professionals providing maternity care, and patients.

Values:

The evidence was reviewed by the Women's Health Committee (RANZCOG), and applied to local factors relating to Australia and New Zealand.

Background:

This statement was first developed by Women's Health Committee in July 2009 and reviewed in November 2015. The statement was reviewed in May 2021 and subsequent consultation with neonatologists among other specialists.

Funding:

The development and review of this statement was funded by RANZCOG.

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1. Summary of recommendations

Recommendation 1	Grade
The intensity of neonatal surveillance should be determined by the perceived risk for subgaleal haemorrhage, based on both the clinical circumstances and the neonatal condition.	Consensus-based recommendation
Recommendation 2	Grade
Level 1 Surveillance (as outlined in Appendix D) is required for all newborn infants born by instrumental delivery or second-stage caesarean section with formal structured assessments between 1-6 hours and at 24 hours after birth, with escalation where abnormalities are observed.	Evidence-based recommendation Grade B
Recommendation 3	Grade
Symptomatic subgaleal haemorrhage is a medical emergency with a high mortality. Immediate discussion with a Neonatologist experienced in the management of actual or potential haemorrhagic shock is recommended. Prompt evaluation, resuscitation and supportive treatment is essential once the diagnosis is suspected. With timely diagnosis and appropriate resuscitation, full recovery can be anticipated.	Consensus-based recommendation
Recommendation 4	Grade
All neonates delivered instrumentally should have intramuscular Vitamin K prophylaxis as soon as practicable after birth.	Consensus-based recommendation
Good Practice Point	
Minimising the morbidity and mortality of SGH following an operative birth (whether forceps, vacuum extraction or second stage caesarean section following failed operative birth) requires a multifaceted approach, with the engagement of obstetricians, delivery suite and postnatal midwives, special care unit/nursery and paediatric staff.	

2. Introduction

Subgaleal (or subaponeurotic) haemorrhage (SGH) is a potentially lethal condition in newborns. It is the result of bleeding into the space between the epicranial aponeurosis and the periosteum, caused by rupture of the emissary veins (which are connections between the dural sinuses and scalp veins). The morbidity and mortality associated with subgaleal haemorrhage is due to the potential space beneath the aponeurosis being large and therefore blood loss into this space can be significant and life threatening.

It is important to be able to differentiate between a subgaleal haemorrhage and the other (almost entirely benign) neonatal extra-cerebral fluid collections, as described below.

Caput succedaneum is caused by pressure on the head during labour and birth. It is a serosanguinous, extra-aponeurotic collection that may extend across the midline and over suture lines. Use of the vacuum extractor is associated with a prominent artificial caput at the site of the chignon, but the size and firmness of the chignon start to decrease within an hour of birth, and it is not associated with neonatal haemorrhage.

A cephalohaematoma occurs when friction forces generated during the birth process result in bleeding between the periosteum and the underlying skull. It may occur during an unassisted vaginal birth but is more common with instrumental delivery. Because the blood is confined by the periosteum, the swelling does not cross the suture lines, resulting in a soft, fluctuant, localised swelling with a well-defined outline. Although it may increase in size over 12-24 hours, and may take several weeks to completely resolve, it almost never requires any specific medical treatment.

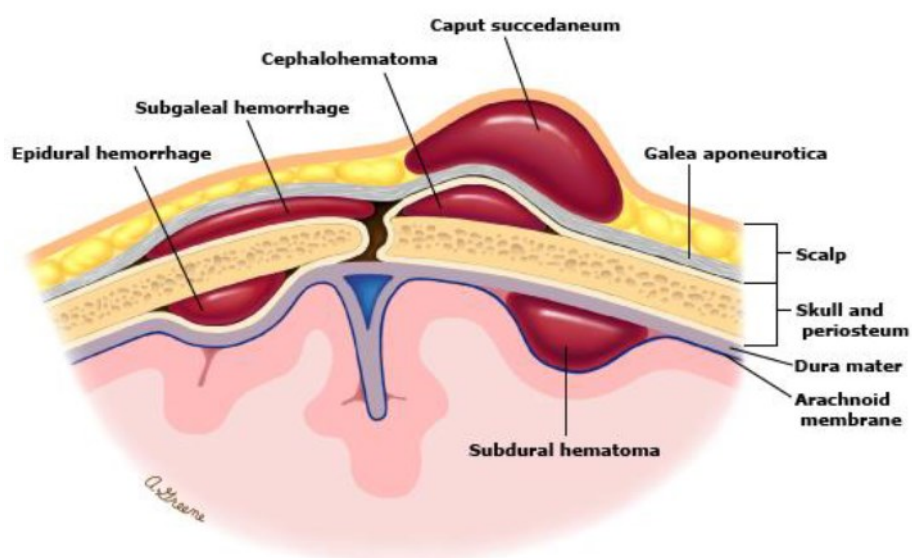


Figure 1 Extra-cranial haemorrhage in the newborn

Source: Reproduced with kind permission of Child and Adolescent Health Service, King Edward Memorial Hospital, Government of Western Australia. Clinical Guideline - Subgaleal Haemorrhage (SGH) Detection and Management in the Newborn, Government of Western Australia Child and Adolescent Health Service.

3. Discussions and Recommendations

3.1 Anatomy of subgaleal haemorrhage and potential consequences

The epicranial aponeurosis is a sheet of fibrous tissue covering the entire cranial vault, extending from the orbital ridges to the nape of the neck and laterally to the ears. Separation of the epicranial aponeurosis from the underlying periosteum thus creates a compartment large enough that up to 250 ml of blood could be accommodated, with only a 1 cm increase in scalp thickness.¹ The circulating blood volume of a newborn is approximately 90ml/ kg so in a 3kg baby a serious 20% reduction in circulating blood volume occurs with a haemorrhage of only 54ml.² Given the large capacity of the sub-aponeurotic space, some infants can lose as much as 50-75% of their blood volume resulting in hypovolaemic shock, anaemia, coagulopathy and death. Among babies admitted to NICU with SGH, neonatal mortality ranges from 12%³ to 25%.⁴

3.2 Clinical Features

The clinical features of a SGH may be of insidious onset and therefore a high index of clinical suspicion is required. The mean time of diagnosis is 1-6 hours after birth, which means observations often need to be performed overnight, given that most births (other than elective caesarean sections) occur out of hours, and specifically- assisted births following induction are clustered around midnight.⁵ Generalised signs of a SGH relate to blood loss and the diagnosis should be immediately considered in the setting of a newborn with a 5-

minute Apgar score < 7, without evidence of asphyxia; particularly if delivery was affected by prolonged or complicated vacuum extraction.

Later signs relating to haemodynamic instability include tachycardia, tachypnoea, poor activity and pallor, anaemia, coagulopathy, hypotension, acidosis and death.

The initial localised signs of a SGH are of vague, generalised scalp swelling and a laxity of the scalp, most commonly seen at the site of cup application following vacuum assisted birth. As further haemorrhage accumulates, the lesion becomes fluctuant; the sensation on palpation having been likened to 'an old leather pouch filled with fluid'. A ballotable lesion that crosses the suture lines should alert the carer to the possibility of a SGH, as should the presence of 'pitting oedema' extending over the head, and in front of the ears. The fluid is gravity dependent, and will shift to the dependent side as the infant is repositioned. Crepitus, or a fluid 'thrill', may be noted, this sometimes being described as a "flick test".

With progressive haemorrhage, elevation and displacement of the ear lobes, and puffiness of the eyelids (peri-auricular and periorbital oedema) follows. An irritable cry or signs of pain may be noted with handling. Serial head measurements may be useful although it should be noted that large blood loss can occur despite a relatively small increase in head circumference (estimated 38 ml per cm increase in head circumference).

The incidence of SGH is variably reported. While it occurs following normal delivery, forceps delivery and caesarean section, it is most frequently associated with the rotation and traction forces applied with a vacuum assisted birth. To give an idea of relative frequency⁶ reported an incidence of 0.6/1000 of all deliveries, and 4.6/1000 of vacuum deliveries.⁶ Uchil and Arulkumaran⁶ reported a similar incidence of 0.4:1000 spontaneous vaginal deliveries, and 5.9/1000 vacuum assisted deliveries. Between 60-89% of SGH occur as a result of vacuum delivery.² Other risk factors include nulliparity (adjusted OR 4.0), 5 minute Apgar score < 8, (OR 5.0), cup marks on the sagittal suture (suggesting asynclitic placement) (OR 4.4), leading edge of cup < 3cm from anterior fontanelle (suggesting a deflexing application) (OR 6.0) or failed vacuum extraction (OR 16.4).⁶ Over the past 3 decades, increasing use of vacuum assisted births has resulted in an increase in the prevalence of SGH in Australia and internationally.² Nevertheless, SGH should be considered following any difficult assisted birth, whether delivery is ultimately completed by vacuum, forceps or failed instrumental/ second stage caesarean section.

The incidence of SGH is likely to be grossly underestimated because of difficulty in making the diagnosis, especially when the SGH is small.

Boo et al (2005)⁷ reported a 21% incidence of SGH following vacuum extraction in a Malaysian hospital where a formal surveillance program for SGH was in place. The diagnosis of SGH was made at a median of 1 hour of age, and the mortality of SGH in this series was only 2.8%. Their high incidence of SGH and low rate of associated mortality suggest that small undiagnosed SGHs are common and that a structured surveillance program following complicated delivery, with early diagnosis and prompt treatment may reduce mortality.

3.3 Prevention of SGH

3.3.1 Patient Selection

Vacuum extraction is absolutely contra-indicated in the following situations:

- a. < 34 weeks gestation (and relatively contraindicated at < 36 weeks), where shearing forces are more likely to be associated with tearing of fragile blood vessels resulting in excessive bleeding.
- b. Among infants diagnosed or suspected of having a bleeding disorder, such as haemophilia, or thrombocytopenia of any cause (e.g. alloimmune).

3.3.2 Technical aspects

The importance of adequate training and supervision in vacuum delivery cannot be over-emphasised. To minimise the risk of SGH, shearing forces on the scalp should be minimised.

This includes placing the centre of the cup over the flexion point which is situated on the sagittal suture three centimetres in front of the posterior fontanelle and six centimetres from the anterior fontanelle:

- a. Cup placement should be:
 - i. Placed evenly across the sagittal suture, rather than being applied to one or other parietal bone to avoid asynclitism with traction.
 - ii. The edge of the cup should be placed at least 3 cm from the anterior fontanelle to avoid extension of the fetal head during traction (assuming a standard 6cm cup is being used).
 - iii. Appropriate cup placement may be impossible if there is significant deflexion or asynclitism of the head and a “large soft-stemmed” device is being used, because it cannot be placed sufficiently posteriorly.
- b. Traction should be steady, applied only with contractions and only with maternal effort.
- c. Adequate descent should be verified (with the non-pulling hand) during each pull.
- d. Traction should not be unduly prolonged.

Experts vary in the maximum time allowed, number of pulls and number of allowable cup detachments.

i. Time

Vacca (2003)⁸ suggests an upper limit of 20 minutes from cup application. Where delivery is not imminent after 15 minutes, operators should evaluate whether further traction is warranted, and consider recourse to caesarean section. It should be noted that where the head is deeply engaged in the maternal pelvis (and macrosomia is not anticipated), that completion of vaginal delivery by vacuum extraction or forceps may still be safer than a caesarean section.

ii. Number of pulls

Many experts suggest a maximum of three pulls (defined as three contractions, even if there are multiple maternal ‘pushes’ within each contraction), although several more pulls may be acceptable if the head has descended to the level of the perineum especially if delivery is attempted without an episiotomy.⁸

iii. Cup detachments

Cup detachment should not be regarded as a safety feature of the vacuum extractor, as the rapid decompression may result in vessel damage and predispose to SGH. The acceptable number of detachments will depend on whether detachment was due to equipment failure, or to poor application and/or excessive traction. Two detachments (but certainly no more than three) would generally be considered acceptable, but re-application of the cup should only be considered where there has been definite progress with preceding pulls, or the head is on the perineum.

3.4 Early Diagnosis

3.4.1 Evaluation of delivery risk factors for SGH

SGH is most likely to follow vacuum extraction (OR 7.17; 5.43-10.25) or forceps (OR 2.66; 1.78-5.18).⁹ In the series of Boo et al (2005)⁷, risk factors for SGH following vacuum extraction included: nulliparity (adjusted OR 4.0), 5 minute Apgar \leq 7 (OR 5.0), cup marks on the sagittal suture (suggestive of paramedian application) (OR 4.4), leading edge of the vacuum cup too close (< 3 cm) to the anterior fontanelle (suggestive of deflexing application) (OR 6.0) and a failed vacuum extraction (OR 16.4). Similarly, Vacca (2003)⁸ concluded that significant SGH is almost always preceded by a difficult

vacuum extraction as evidenced by a prolonged extraction with excessive number or strength of pulls, multiple cup detachments, and/or completion of delivery with forceps.⁸

3.4.2 Intensity of neonatal surveillance regimen for babies born by instrumental delivery, according to the level of risk for SGH

The intensity of neonatal surveillance should be determined by the perceived risk for SGH, based on both the clinical circumstances and the neonatal condition. Mean time to diagnosis of SGH is 1-6 hours after birth.² A suggested regimen is given below and in attached clinical algorithm ([Appendix D](#)).

Level 1 Neonatal Surveillance

i. Indication:

- Minimum surveillance regimen for all infants delivered by instrumental delivery or second-stage caesarean section.

ii. Regimen:

- Baseline set of post-delivery observations including activity, colour, heart rate and respiratory rate at one hour of age.
- Hats and bonnets should be avoided (or removed frequently), so that changing head shape or size is noted.
- Changing head circumference and/ or scalp appearance is crucial to early diagnosis of subgaleal haemorrhage and should immediately prompt escalation to 'Level 2' surveillance.
- Concerns regarding neonatal behaviour (poor feeding, poor activity, pallor) should prompt a further full set of observations, and institution of 'Level 2' surveillance.

Level 2 Neonatal Surveillance

i. Indication; one or more of the following:

- Total vacuum extraction time > 20 minutes and/or > 3 pulls and/or > 2 cup detachments.
- 5 minute Apgar score < 7.
- At clinician request (e.g. if the delivery was felt to have been otherwise 'difficult' or the cup placement was found to be paramedian or non-flexing).
- Level 1 neonatal surveillance observations are causing concern (such as diffuse boggy head swelling, or increasing head circumference).

ii. Regimen:

If Level 2 surveillance established at delivery, neonatal blood should be taken for assessment of:

- Acid base status (cord pH and/or lactate levels).
- Haematocrit and platelet count.
- Formal neonatal observations for SGH should continue for at least the first 12 hours of life (the median time of diagnosis of SGH in the study of Chang et al (2007)³ was 7.8 hours of life).
- Hourly for the first 2 hours of life, and then 2-hourly for a further 6 hours. A pulse oximeter on the postnatal ward may assist staff with accurate recording of heart rate, so that the onset of progressive tachycardia may be more easily recognised.
- These infants should have a full set of observations performed (activity, colour, heart rate, respiratory rate, review of head size (formal measurement of head circumference) and shape for location and nature of swelling).

Level 3 Neonatal Surveillance

i. Indications

- Where there is a clinical suspicion of SGH immediately following birth.
- Where abnormalities are noted on Level 2 surveillance.

ii. Regimen

- The infant should be reviewed by a paediatrician. These infants will likely be admitted to the special care unit/nursery, with institution of resuscitation (if necessary) and further laboratory assessment including haematocrit, platelet count and coagulation profile.

Recommendation 1	Grade
The intensity of neonatal surveillance should be determined by the perceived risk for SGH, based on both the clinical circumstances and the neonatal condition.	Consensus-based recommendation
Recommendation 2	Grade
Level 1 Surveillance (as outlined in Appendix D) is required for all newborn infants born by instrumental delivery or second-stage caesarean section with formal structured assessments between 1-6 hours and at 24 hours after birth, with escalation where abnormalities are observed.	Evidence-based recommendation Grade B

3.5 Management of a possible Subgaleal Haemorrhage

Symptomatic SGH is a medical emergency with a high morbidity and mortality. Immediate discussion with a Neonatologist experienced in the management of actual or potential haemorrhagic shock is recommended. Prompt evaluation, resuscitation and supportive treatment is essential once the diagnosis is suspected. With timely diagnosis and appropriate resuscitation, full recovery can be anticipated.

- SGH is a clinical diagnosis. Stabilisation should not be delayed by any attempts to confirm the diagnosis with imaging.
- Aggressive resuscitation to restore circulating blood volume, provide circulatory support, correct acidosis and to correct coagulopathy is the mainstay of management.
- Head wrapping may be difficult to perform and does not appear to be of benefit.
- Frequent re-evaluation of haemodynamic stability and response to blood and blood products is necessary.

Recommendation 3	Grade
Symptomatic SGH is a medical emergency with a high mortality. Immediate discussion with a Neonatologist experienced in the management of actual or potential haemorrhagic shock is recommended. Prompt evaluation, resuscitation and supportive treatment is essential once the diagnosis is suspected. With timely diagnosis and appropriate resuscitation, full recovery can be anticipated.	Consensus-based recommendation

- Intramuscular Vitamin K prophylaxis should be encouraged in all neonates as soon as practicable after birth, but this is particularly important for babies that have had an instrument assisted birth.

Recommendation 4	Grade
All neonates delivered instrumentally should have intramuscular Vitamin K prophylaxis as soon as practicable after birth.	Consensus-based recommendation

All babies with suspected SGH who require fluid resuscitation should be transferred to a neonatal special care unit or NICU.

4. Conclusion

Minimising the morbidity and mortality of SGH requires a multifaceted approach, with the engagement of obstetricians, delivery suite and postnatal midwives, special care unit/nursery and paediatric staff. The following approaches are required:

- Prevention
 - Selection of patients - avoiding vacuum extraction in infants at high risk of SGH.
 - Appropriate technique - accurate positioning of the cup, application of traction and recognising when to abandon the procedure in favour of another mode of delivery.

- Early Diagnosis
 - Formally assessing the individual infant's risk of SGH following every instrumental delivery.
 - Institution of a neonatal surveillance regimen according to perceived risk.

- Treatment
 - Prompt evaluation, resuscitation and supportive treatment once the diagnosis is suspected.

Good Practice Point

Minimising the morbidity and mortality of SGH following an operative birth (whether forceps, vacuum extraction or second stage caesarean section following failed operative birth) requires a multifaceted approach, with the engagement of obstetricians, delivery suite and postnatal midwives, special care unit/nursery and paediatric staff.	
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5. References

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2. Colditz MJ, Lai MM, Cartwright DW, Colditz PB. Subgaleal haemorrhage in the newborn: A call for early diagnosis and aggressive management. *J Paediatr Child Health*. 2015;51(2):140-6.
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5. Martin P, Cortina-Borja M, Newburn M, Harper G, Gibson R, Dodwell M, et al. Timing of singleton births by onset of labour and mode of birth in NHS maternity units in England, 2005-2014: A study of linked birth registration, birth notification, and hospital episode data. *PLoS One*. 2018;13(6):e0198183.
6. Uchil D, Arulkumaran S. Neonatal Subgaleal Hemorrhage and Its Relationship to Delivery by Vacuum Extraction. *Obstet Gynecol Surv*. 2003;58(10):687-93.
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8. Vacca A. *Handbook of Vacuum Delivery in Obstetric Practice*. 2nd edition 2003.
9. Gebremariam A. Subgaleal haemorrhage: risk factors and neurological and developmental outcome in survivors. *Ann Trop Paediatr*. 1999;19(1):45-50.

6. Other suggested reading

- Modanlu HD. Neonatal subgaleal haemorrhage following vacuum extraction delivery. *The Internet Journal of Pediatrics and Neonatology* 2005; 5 (2).
- Davis D. Neonatal subgaleal haemorrhage following vacuum extraction delivery. *JAMC* 2001; 164: 1452-1453.
- Doumouchtsis SK, Arulkumaran S. Head injuries after instrumental vaginal deliveries. *Current Opinion in Obstetrics and Gynaecology* 2006; 18: 129-134.
- Parker LA. Early recognition and treatment of birth trauma: injuries to the head and face. *Advances in Neonatal Care* 2005; 288-97.

7. Links to other College statements

- Delivery of the Fetus at Caesarean Section (C-Obs 37)
<https://ranzcoг.edu.au/wp-content/uploads/2022/05/Delivery-of-the-fetus-at-caesarean-section.pdf>

8. Patient information

- A range of RANZCOG Patient Information Pamphlets can be ordered via:
http://ranzcoг.edu.au/resource-hub/?resource_audience=for-public

9. Appendices

Appendix A: Women's Health Committee Membership (11th Council)

Name	Position on Committee
Professor Yee Leung	Chair and Board Member
Dr Gillian Gibson	Deputy Chair, Gynaecology
Dr Scott White	Deputy Chair, Obstetrics
Dr Jared Watts	Member and EAC Representative
Dr Kristy Milward	Member and Councillor
Dr Will Milford	Member and Councillor
Dr Frank O'Keefe	Member and Councillor
Professor Sue Walker AO, Neonatologist	Member
Professor Steve Robson	Member
Dr Roy Watson	Member and Councillor
Dr Susan Fleming	Member and Councillor
Dr Sue Belgrave	Member and Councillor
Dr Marilyn Clarke	ATSI Representative
Professor Kirsten Black	Member
Dr Thangeswaran Rudra	Member
Dr Nisha Khot	Member and SIMG Representative
Dr Judith Gardiner	Diplomate Representative
Dr Angela Brown	Midwifery Representative, Australia
Ms Adrienne Priday	Midwifery Representative, New Zealand
Ms Ann Jorgensen	Community Representative
Dr Ashleigh Seiler	Trainee Representative
Dr Leigh Duncan	He Hono Wahine Representative
Prof Caroline De Costa	Co-opted member (ANZJOG member)
Dr Christine Sammartino	Observer

RANZCOG wishes to acknowledge the significant contribution of Professor Sue Walker AO (Member - Women's Health Committee) and Dr Steve Resnick, Neonatologist (incoming co-opted Member - Women's Health Committee) to the update of this statement.

Appendix B: Overview of the development and review process for this statement

i. Steps in developing and updating this statement

This statement was developed in March 2013. The Women’s Health Committee carried out the following steps in reviewing this statement:

- Declarations of interest were sought from all members prior to reviewing this statement.
- Structured clinical questions were developed and agreed upon.
- An updated literature search to answer the clinical questions was undertaken.
- At the November 2021 Women’s Health Committee meeting, the existing consensus-based recommendations were reviewed and updated (where appropriate) based on the available body of evidence and clinical expertise. Recommendations were graded according to [Appendix B](#) part iii)

ii. Declaration of interest process and management

- Declaring interests is essential in order to prevent any potential conflict between the private interests of members, and their duties as part of the Women’s Health Committee.
- A declaration of interest form specific to guidelines and statements was developed by RANZCOG and approved by the RANZCOG Board in September 2012. The Women’s Health Committee members were required to declare their relevant interests in writing on this form prior to participating in the review of this statement.
- Members were required to update their information as soon as they become aware of any changes to their interests and there was also a standing agenda item at each meeting where declarations of interest were called for and recorded as part of the meeting minutes.
- There were no significant real or perceived conflicts of interest that required management during the process of updating this statement.

iii. Grading of recommendations

Each recommendation in this College statement is given an overall grade as per the table below, based on the National Health and Medical Research Council (NHMRC) Levels of Evidence and Grades of Recommendations for Developers of Guidelines. Where no robust evidence was available but there was sufficient consensus within the Women’s Health Committee, consensus-based recommendations were developed or existing ones updated and are identifiable as such. Consensus-based recommendations were agreed to by the entire committee. Good Practice Notes are highlighted throughout and provide practical guidance to facilitate implementation. These were also developed through consensus of the entire committee.

Recommendation category		Description
Evidence-based	A	Body of evidence can be trusted to guide practice
	B	Body of evidence can be trusted to guide practice in most situations
	C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
	D	The body of evidence is weak and the recommendation must be applied with caution
Consensus-based		Recommendation based on clinical opinion and expertise as insufficient evidence available
Good Practice Note		Practical advice and information based on clinical opinion and expertise

Appendix C Full Disclaimer

Purpose

This Statement has been developed to provide general advice to practitioners about women's health issues concerning the management of subgaleal haemorrhage in neonates and should not be relied on as a substitute for proper assessment with respect to the particular circumstances of each case and the needs of any person. It is the responsibility of each practitioner to have regard to the particular circumstances of each case. Clinical management should be responsive to the needs of the individual cases of subgaleal haemorrhage and the particular circumstances of each case.

Quality of information

The information available in the management of subgaleal haemorrhage is intended as a guide and provided for information purposes only. The information is based on the Australian/New Zealand context using the best available evidence and information at the time of preparation. While the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) had endeavoured to ensure that information is accurate and current at the time of preparation, it takes no responsibility for matters arising from changed circumstances or information or material that may have become subsequently available. The use of this information is entirely at your own risk and responsibility.

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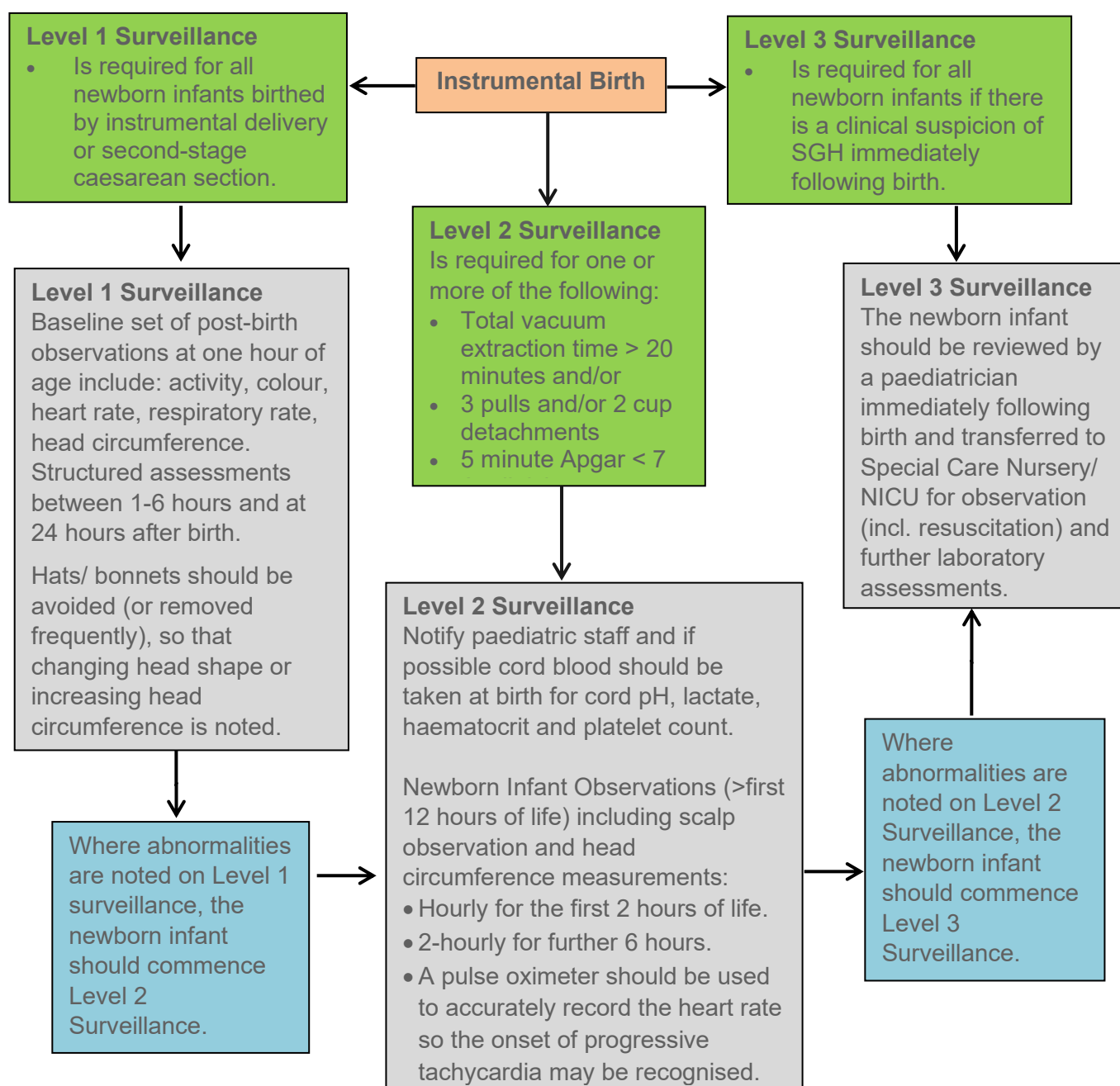
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These terms and conditions will be constructed according to and are governed by the laws of Victoria, Australia.

Appendix D Algorithm for Detection and Management of Subgaleal Haemorrhage in the Newborn Infant

Algorithm for Detection and Management of Subgaleal Haemorrhage (SGH) in the Newborn Infant



Source: With kind permission, adapted from Department of Paediatrics, Mercy Hospital for Women. Clinical Practice Guideline: Prevention, Detection and Management of Subgaleal Haemorrhage in the Newborn (2021).