Safety and Underwater Birth – What Every Risk Manager Should Know

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Introduction

According to a published account of underwater birth practice in America, about 250 hospitals and 70 percent of all birth centers support water birth (here referred to as underwater birth).[i] This statistic refers to the practice of actually delivering the baby underwater, which is different from the concept of water labor (also called hydrotherapy or water immersion during the first stage of labor). Although spawned by the growth in popularity of natural and alternative medicine, it appears that underwater births are occurring in many institutions absent mainstream validation as a safe obstetrical practice.

A review of MEDLINE-referenced articles reveals no substantial controlled research or randomized control trials of underwater births. Although there have been studies assessing water immersion during labor that have shown a reduction in the use of epidural, spinal and paracervical analgesia; insufficient data exists to determine the outcome and safety for women and infants from randomized trials of underwater birth.

A recent Cochrane Review came to the following conclusion: "Overall, the evidence indicates that immersion in water during the first stage decreases maternal uptake of epidural/spinal analgesia, and that water immersion during the first stage of labour can be supported for women at low risk of complications. Immersion during the second stage of labour needs further investigation, but at present there is no clear evidence to support or not to support a woman's decision to give birth in water."[ii]

In particular, the following questions remain unanswered:

- Is the efficacy and safety of underwater birth at least equal to conventional birth?
- Is there objective information to support each claim of benefit?
- Does outcome vary by setting (i.e., home underwater birth, birthing center water birth or hospital-based underwater birth)?
- Is water labor (immersion) without underwater birth efficacious and safe?
- Does immersion add risk to conventional birth?
- What are the risk factors in pregnancy or labor in which even immersion should be avoided?

Safety information related to underwater birthing is available in the form of anecdotal case studies that underscore adverse events, including, but not limited to, water aspiration and subsequent pulmonary edema, water intoxication, hyponatremia, hypoxic ischemic encephalopathy, cord rupture with neonatal hemorrhage and pneumonia. Of significant note in the literature review is the disparity of opinion and practice that exists among the medical community and the proponents of underwater birth, as evidenced by the strong position statements of leading medical professional organizations and those organizations promoting underwater birth.

One of the chief concerns regarding underwater birthing is an apparent lack of consensus on safety guidelines established by way of peer-reviewed publications, conferences and evidence-based clinical protocols. Safe parameters of care at the national level for water-quality assessments, temperature and maintenance of water, water depth and fetal and maternal assessments, among other imperatives, are lacking. At present it appears that mainstream acceptance of underwater birth will depend on whether its advocates can satisfy the traditional medical community's questions of safety and efficacy. A collaborative, randomized study to either establish or rule out the possible benefits and harmful effects of underwater births to the mother and her newborn infant would help to establish its overall legitimacy.

If, after review of the literature and study of the safety issues associated with underwater birth, an organization wishes to implement underwater birthing (in addition to hydrotherapy or immersion during the first stage of labor), this article offers assistance in crafting safety guidelines, checklists and operational protocols.

It will also review:

- Suggested benefits
- Reported risks
- Several position statements from professional organizations
- Contraindications to underwater birthing
- Common safety guidelines
- A self-assessment tool and checklist on underwater births
- Resource articles

Benefits of Underwater Birth

- **Comfort:** Many research studies have corroborated the fact that women using water for childbirth request less or no methods of pain relief
- **Buoyancy:** Giving birth in water counteracts the effects of gravity, making it easier for the mother to change positions and avoid placing pressure on the uterus
- **Lower blood pressure:** This effect can result from a calm environment, increased relaxation and anxiety reduction
- **Less trauma:** Giving birth in water can halt the fear-tension-pain cycle, allowing the perineum to gently stretch and reducing the incidence of tearing
- **Fewer interventions:** Water birthing is viewed as a natural process, free of routine IVs, internal fetal monitors, time limits on labor and pitocin protocols
- **Environmental control:** Increased control over the maternal environment is advocated, from lighting choices and background noise to personal attire
- **Shorter labor:** Smoother transitions are due in part to the relaxed state of the mother and the water's insulating effects.[iii]

Reported Risks Associated with Underwater Birth

The following neonatal complications are some of the adverse effects potentially associated with underwater birth:[iv]

- Water drowning
- Hyponatremia induced seizures
- Waterborne infectious disease
- Cord rupture with hemorrhage
- Hypoxic ischemic encephalopathy
- Pneumonia and respiratory distress syndrome
- Death

Published Statements

American Congress of Obstetricians and Gynecologists (ACOG)

"ACOG does not feel there is enough information, specifically concerning rates of infection, to recommend warm water immersion as a safe and appropriate birthing alternative. There are concerns that an infant can develop an infection if he or she begins breathing while underwater and inhales the soiled birthing water. The procedure should be performed only if a facility is compliant with Occupational Safety and Health Act standards regarding infection, including the use of specific tub and water recirculation systems. Further, warm water exposure over time can cause hypotension, and careful attendance by an assistant is necessary to prevent drowning. ACOG maintains that water birthing should only be performed under the strictest measures of infection control, and should be considered only for healthy moms and babies."[v]

American Academy of Pediatrics

"The safety and efficacy of underwater birth for the newborn has not been established. There is no convincing evidence of benefit to the neonate,

but some concern for serious harm. Therefore, underwater birth should be considered an experimental procedure that should not be performed except within the context of an appropriately designed randomized clinical trial after informed parental consent."[vi]

Centers for Disease Control

"Water births are increasingly being used. The perceived infection problem is that the birthing-pool water becomes contaminated with amniotic fluid, blood, and fecal material, all of which contain large quantities of maternal bacteria and viruses. Risks include blood borne viruses, e.g., hepatitis B and C, HIV-1, and HIV-2, and fecal-orally transmitted viruses, e.g., the enteroviruses and adenoviruses. Many of these concerns may be unfounded, and calls for maternal testing for HIV have not been supported. A more reasonable approach is to ensure that infection control policies for water births include instructions for pool maintenance and decontamination, use of universal precautions and use of personal protective equipment for staff. Postnatal surveillance of mothers and babies should be conducted to define infection rates."[vii]

American College of Nurse-Midwives (ACNM) and Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN)

These organizations currently have not, to date, published position statements on either hydrotherapy or water births.

The following are examples of medical and obstetrical conditions that might be reasonably considered contraindications to underwater birthing. A musltidiciplincary team should help develop a list for each perinatal unit considering establishing an underwater birth protocol:

- Preterm labor, two weeks or more prior to due date
- Breech presentation (or other malpresentations)
- Past diagnosis of excessive bleeding, post partum hemorrhage or active maternal infection
- Presence of thick meconium
- Preeclampsia
- History of herpes, HIV or other infectious diseases
- Comprehension or language difficulties (where interpreter service is not available)
- Lack of appropriate back up personnel

Common Safety Guidelines

Currently, there are no national guidelines ensuring the consistent use of birthing pools. Each organization must determine its own protocols and policies taking into account available research and the institution's level of resource support. When contemplating underwater births, there are several issues that organizations must consider and plan for. The following worksheet may be helpful for organizations are based on the recommendations of underwater birthing resource organizations, such as The Global Maternal/Child Health Association and Waterbirth International at www.waterbirth.org. In addition, there are numerous for-profit organizations host websites dedicated to the discussion of safe underwater birthing that provide additional information on the topic.

Safety and Underwater Birth Checklist

Safety Initiative	Considerations	Policy in Place?	Comments
Staffing	• Members of the birthing team may include: obstetrician, nurse midwife, registered nurse, doula and/or other birthing companion • Staffing levels should be adequate to ensure the mother can be removed from the bath if she is unable to do it herself • A comprehensive educational curriculum for medical and nursing staff should be initiated on underwater birthing		
Equipment	• Appropriate underwater birthing site in proximity of the labor and delivery unit, tubs specifically built for underwater birthing and with the ability to rapidly lower water levels in an emergency • Water thermometer • Maternal thermometer • Waterproof Doppler or waterproof telemetry for electronically monitoring the fetus • Gloves sufficiently long enough to cover bare skin when there is potential for contact with amniotic fluid or blood • Waterproof gown or apron for attendants • Protective eye-wear, mask • Kneeling pads and patient lifting device, including patient sling (and battery/charger for lifting device) • Bath tub plug with chain attached • Neonatal resuscitation equipment in the immediate birthing area		
General Safety	• A midwife or support person remains with the mother while she is in the bath • Ordinary tap water, free of additives and oils, should be used, • Before the mother enters the tub, ensure the hoist battery is charged and placed in the hoist device • For privacy and to ensure appropriate monitoring by staff, the bathing area should be appropriately identified as occupied when in use • Equip the tub with an emergency call light that is visible outside the bathing area • Remove the mother from the tub if it becomes heavily contaminated		

Safety Initiative	Considerations	Policy in Place?	Comments
Employee Safety	• Follow hospital policies on safe handling, lifting and patient transport • Document ongoing electrical and safety maintenance of bathing tubs, as well as any required, repairs per hospital policy • Install overhead hoist tracking in birthing room and make portable lifting devices readily available • Design tubs to ensure compliance with OSHA standards and requirements for access		
Establishment of Criteria for Inclusion and Exclusion	Please refer to patient selection criteria		
Documentation of Informed Consent	• Disclose in writing the known risks associated with underwater births • Inform the mother that, per empirical research, underwater birth is not a validated obstetrical practice • During the informed consent discussion and on the written consent form, clearly state that the mother will agree to leave the birthing tub at the request of the midwife or other staff for any reason of safety		
Water Temperature and Quality	• The bath water should remain between 89.6 to 98.6 degrees F or 32-37 degrees C • Maintain the water quality so the mother and birth companion are able to see the infant and assess the progression of labor • Murky water will make it difficult to determine if the umbilical cord is around the infant's neck or to detect other risk factors		
Amount of Water	• The level of water should not be above the mother's axilla • Water levels should not be so deep that a birth companion cannot see clearly to the bottom • The mother must be able to stabilize her position in the water		
Imfection Control	• Protective clothing should be worn by staff, as appropriate • Gloves should be used when in contact with maternal blood and body fluids in the bath water per the hospital's policy on standard precautions • Follow the hospital protocol for blood and bodily fluid spills and document maintenance and clean-up		

Safety Initiative	Considerations	Policy in Place?	Comments
Housekeeping	• Establish clear policies and procedures on cleaning and terminal cleaning		
Biomedical Engineering Department	• Open lines of communication with Biomedical Engineering Department and maintain regular interaction regarding maintenance of all components of the process		
Degree of Immersion	• Monitor and document how much of the mother's body is under water • Change positions or remove extremities from the water to increase comfort and enhance labor progress		
Duration of Immersion	• Caution against entering the tub too early, since prolonged immersion can lower the level of oxytocin in the body and slow labor • Immersion before 5 cm dilatation correlates to longer labor in some women • After 90 to120 minutes, the positive effects of the birthing technique generally wane and labor may slow		
Written Policies and Procedures	• Distinguish between hydrotherapy during labor and actual birthing underwater • Who and how many can be in the pool • How long the baby stays underwater • Criteria for moving the mother out of the pool • Monitoring temperature • Monitoring the fetus • Staffing ratios • Neonatal Resuscitation Program (NRP) certified staff in attendance • Contraindications • Medication use and limitations, • What may or not be brought into the hospital to use as a birthing tub or bath		

Safety Initiative	Considerations	Policy in Place?	Comments
Delivery Protocol	• Whenever possible, support a hands-off birth philosophy via quiet verbal guidance • The cord should be loosened and disentangled in the customary manner as the infant is born • If the cord is around the infant's neck and needs to be cut, the mother is to be assisted to a standing position out of the water and remain standing for the duration of the delivery • Under no circumstances should the cord be clamped and cut under water, since this action can stimulate the infant to breathe • The infant must be born completely underwater, with no air contact until it is brought gently to the surface • An APGAR score should be recorded at 1 and 5 minutes after birth (as for normal land births), not upon removal from the bath		
Management of Emergencies	Drills and simulations for common emergencies that may occur in the water during birth. For example: • Shoulder dystocia • Hemorrhage • Need for neonatal resuscitation and special issues such as water inhalation • Maternal collapse • Moving patients out of the tub • Fall prevention		
Analgesia	• Nitrous oxide and oxygen may be used in the bath if required • The mother can not receive opiate analgesia four hours prior to entering the bath • Opiate analgesia is not administered while the mother is in the bath • Intramuscular injection should not be given under water, but should be given in the deltoid while the mother is in the bath		

Safety Initiative	Considerations	Policy in Place?	Comments
Removal of Infant	• The infant does not need to stay underneath the water for any specific period of time • Removal from the water in less than 10 seconds is recommended • Avoid undue traction on the umbilical cord as the infant's head surfaces from the water to avoid potential cord rupture • Safely remove the infant from the water and place it skin-to-skin on the mother's chest • Under no circumstances should the infant's head be re-submerged under water • Dry the infant thoroughly to reduce heat loss • Document any delayed cord clamping issues		
Documentation Parameters	• Maternal and fetal observations for all stages of labor should be guided by the hospital protocol for land births, with the exception of maternal temperature, which is monitored and documented hourly while the mother is in the tub • Bath water temperature is measured and documented every hour and after adding water to ensure that water temperature remains between 35 and 37 degrees Celsius • Document maternal exits from the bath for bladder management at least every two hours • Note oral fluid intake to ensure adequate hydration and to prevent overheating • Record times when mother enters or leaves the bath		
Emergency Management	• Enlist the support of the hospital's rapid response team as needed • Emergency equipment must be available inside or outside of the room and ready for use • Code blues should be run per hospital protocol • Remove the mother from the tub as soon as is reasonably practicable, utilizing the most appropriate means • If infant respiration is not facilitated within one minute of birth, the cord should be clamped and cut, and the infant removed from the bath for resuscitation		

A suggested checklist for underwater birth safety is suggested as follows:

- In house legal review, IRB assessment, and strategic planning regarding initiation of underwater birthing service
- Dedicate resources to space and equipment specifically for this service.
  - Address issues of allowing outside equipment, tubs etc
- Establish criteria for inclusion and exclusion of patients for underwater birthing
- Write specific consents with risks and benefits explained
- Write specific policies and procedures governing underwater birthing at the institution.
  - Distinguish between hydrotherapy during labor and actual birthing underwater, who and how many can be in the pool, how long the baby stays underwater, criteria for moving the mother out of the pool, monitoring temperature of the water, monitoring the fetal status (electronically or by auscultation), nursing staffing ratios, incications for resuscitation team attendance, contraindications, medication use and limitations.
- Ensure the technology to perform intrauterine fetal monitoring in water with appropriate waterproof equipment.
- Interact with various departments that will interface with equipment
  - Infection control
  - Biomedicine
  - Housekeeping
  - OSHA
- Develop protocols and simulation training for potential emergencies occurring in the water birth environment, for example,
  - Shoulder dystocia
  - Hemorrhage
  - Need for neonatal resuscitation and special issues such as water inhalation
  - Maternal collapse
  - Moving patients out of the tub, prevention of maternal falls
- Develop a program of occupational health for professionals who work in the environment with regard to infection protection, musculoskeletal work related injuries associated with delivery and moving patients in and out of the water birth tubs.

[i] "What's New in Water Birthing" published online at www.parenthood.com/article-topics/whats_new_in_waterbirth.html.

[ii] Cluett ER, Burns E. Immersion in water in labour and birth. Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD000111. DOI: 10.1002/14651858.CD000111.pub3

[iii] Waterbirth International, Protocols and Guidelines. Available at www.waterbirth.org/mc/page.do?sitePageId=38565&orgId=wi

[iv] Pinette, M., et. al. "The Risks of Underwater Birth" American Journal of Obstetrics and Gynecology (2004) 190, 1211- 5. Available at www.neonatologie.ugent.be/waterbirth.pdf

[v] Ehmann, L.C. "Birthing and Relaxation: Not Mutually Exclusive," posted on the website of Beth Israel Deaconess Medical Center. Available at www.bidmc.org/YourHealth/TherapeuticCenters/Pregnancy.aspx?ChunkID=13499

[vi] Underwater Births Committee on Fetus and Newborn, 2004–2005, FAAP AAP Committee On Fetus and Newborn Statement on Water Birth, 2005PEDIATRICS Vol. 115 No. 5 May 2005, pp. 1413-1414 (doi:10.1542/peds.2004-1738

[vii] CDC, "Emerging Waterborne Infections in Health-Care Settings." Emerging Infectious Diseases. April 2001, Volume 7, Number 2. Available at wwwnc.cdc.gov/eid/article/7/2/70-0272.htm

Additional Resources

Links have been provided to the abstracts of the resource articles listed below. In most cases, purchase and/or membership are necessary for the full text. Some sites offer the article in full PDF text.

1. Ridgway GL, Tedder RS. "Birthing pools and infection control." Lancet 1996; 347: pp. 1051-2. www.ncbi.nlm.nih.gov/pubmed/8606599?dopt=Abstract

2. Kingsley A, Hutter S, Green N, Spiers G. "Waterbirths; regional audit of infection control practices." J Hosp Infect 1999; 41: pp. 155-7. www.ncbi.nlm.nih.gov/pubmed/10063479?dopt=Abstract

3. Kassim Z, Sellars M, Greenough A. "Underwater birth and neonatal respiratory distress." BMJ 2005 May 7;330 (7499): pp. 1071–2. www.ncbi.nlm.nih.gov/pmc/articles/PMC557235/

4. Wu C, Chung U. "The decision-making experience of mothers selecting waterbirth." J Nursing Research 2003; 11: pp. 261-7. www.ucdenver.edu/academics/colleges/SPA/Documents/JMWH_2010.pdf

5. Hess S, Batton D, Lucey JF. "Strong opinions versus science in water-birth controversy." Pediatrics 2005; 116: pp. 522–3. http://pediatrics.aappublications.org/cgi/content/full/116/2/522-a

6. Schroeter K. "Water births: A naked emperor." Pediatrics 2004; 114: pp. 855–8. http://pediatrics.aappublications.org/cgi/content/full/114/3/855

7. Garland D. “Waterbirth–an international overview.”
Int Midwifery 2006; 19: pp. 24-5.
www.jmwh.com/article/S1526-9523(09)00044-0/abstract

8. Richmond H. “Women’s experience of waterbirth.”
The Practical Midwife 2003; 6: pp. 26-31.
www.ncbi.nlm.nih.gov/pubmed/12677840

9. Geissbuehler V, Stein S, Eberhard J.
“Waterbirths compared with landbirths: An observational study of nine years.”
J Perinatal Med 2004; 32: pp. 308-14.
www.ncbi.nlm.nih.gov/pubmed/15346814

10. Thoeni A, Zech N, Moroder L, Ploner F. “Review of 1600 water births.
Does water birth increase the risk of neonatal infection?”
J Matern Fetal Neonatal Med 2005; 17: pp. 357-61.
www.ncbi.nlm.nih.gov/pubmed/16147851

11. Zanetti-Dallenbach R, Lapaire O, Maertens A, Frei R, HolzgreveW, Hosli I.
“Water birth: Is the water an additional reservoir for group B streptococcus?”
Arch Gynecol Obstet 2006; 273: pp.236-8.
www.ncbi.nlm.nih.gov/pubmed/16208480

12. Nagai T, Sobajima H, Iwasa M, Tsuzuki T, Kura F, Amemura-Maekawa J, et al.
“Neonatal sudden death due to legionella pneumonia associated with water birth
in a domestic spa bath.” J Clin Microbiol 2003; 41: pp. 2227-9.
www.ncbi.nlm.nih.gov/pubmed/12734286

13. Zanetti-Dällenbach R, et al.
“Water birth, more than a trendy alternative: a prospective, observational study.”
(2006) Archives of Gynecology and Obstetrics, Volume274, Number 6,
October 2006 , pp. 355-365(11).
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