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PERCEIVED BARRIERS TO WATERBIRTH:

A SURVEY OF MEMBERS OF THE AMERICAN COLLEGE OF NURSE-MIDWIVES

by

Susan Elizabeth Way

THESIS

Submitted in partial satisfaction of the requirements for the degree of

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PERCEIVED BARRIERS TO WATERBIRTH:
A SURVEY OF MEMBERS OF THE AMERICAN COLLEGE OF NURSE-MIDWIVES

Susan E. Way

ABSTRACT

Introduction: Maternity care providers around the world offer warm water immersion for pain relief in labor and birth, but there are scant data regarding waterbirth availability, utilization, and outcomes in the United States. A 2014 joint committee opinion by the American Academy of Pediatrics and American College of Obstetricians and Gynecologists called for restricting waterbirth to experimental settings; the impact of this statement was explored in this survey.

Methods: 7,374 members of the American College of Nurse-Midwives were invited to take an online survey about experiences with waterbirth, including barriers to and concerns about waterbirth, perceived colleague support for intrapartum immersion, and practice changes resulting from the 2014 AAP-ACOG committee opinion. Surveys were administered over 4 weeks, with weekly reminder emails to the membership; items varied according to respondents' answers to questions about their current clinical practice.

Results: 1,827 individuals accepted the study invitation and 1,565 met inclusion criteria, for a net response rate of 20.9%. Respondents reported high levels of exposure to waterbirth (81% have seen at least one) and low levels of concern about it (medians 1-2 on a 5-point Likert scale). They also reported moderate to significant barriers to waterbirth, mainly in lack of support from medical and administrative colleagues, and commonly linked to the AAP-ACOG statement. Midwives who currently attend waterbirths perceived lower barriers, higher colleague support, and lower concerns related to waterbirth than providers who do not currently attend waterbirths.

Discussion: Survey results are consistent with the social amplification of risk framework, in that respondents' perceptions of barriers to, support for, and concerns about waterbirth vary with

their current practices. The AAP-ACOG statement reinforced some existing barriers to waterbirth, whereas day-to-day experience of clinicians currently providing waterbirth reinforces their perception of it as a reasonable practice. Respondents would like ACNM to engage actively in waterbirth research, education, and development of practice guidelines, generating an authoritative source of pro-hydrotherapy knowledge.

TABLE OF CONTENTS

INTRODUCTION 1

MATERIALS AND METHODS 11

RESULTS 14

DISCUSSION 20

DISCLOSURES 27

REFERENCES 28

LIST OF TABLES

Table 1 - Respondent Demographics 34

Table 2 - Geographic Distribution of Respondents 35

Table 3 - Respondent Experience with Intrapartum Hydrotherapy 36

Table 4 - Waterbirth Practice Considerations and Provider Preferences 37

Table 5 - Main Barriers to the Use of Hydrotherapy during Labor or Birth 38

Table 6 - Narrative Responses: Other Barriers to Waterbirth in Practice or Community 39

Table 7 - Perceived Barriers to Waterbirth among Current Providers and Non-Providers: Group Means and Wilcoxon Rank-Sum Tests 40

Table 8 - Perceived Barriers to Waterbirth by Willingness to Introduce Waterbirth at a New Site: Group Means and Wilcoxon Rank-Sum Tests 41

Table 9 - Narrative Responses: Practice Changes Due to the AAP-ACOG Committee Opinion on Waterbirth 42

Table 10 - Colleague and Client Support for Labor in Water 43

Table 11 - Colleague and Client Support for Birth in Water..... 44

Table 12 - Perceived Support for Water Labor among Current Providers and Non-Providers of Waterbirth: Group Means and Wilcoxon Rank-Sum Tests 45

Table 13 - Perceived Support for Waterbirth among Current Providers and Non-Providers: Group Means and Wilcoxon Rank-Sum Tests 45

Table 14 - Perceived Support for Waterbirth by Willingness to Introduce Waterbirth at a New Site: Group Means and Wilcoxon Rank-Sum Tests 46

Table 15 - Waterbirth Concerns 47

Table 16 - Concerns about Waterbirth among Current Providers and Non-Providers: Group Means and Wilcoxon Rank-Sum Tests 48

Table 17 - Concerns about Waterbirth by Coverage in Basic Midwifery Education: Group Means and Wilcoxon Rank-Sum Tests 48

Table 18 - Concerns about Waterbirth by Past Observation of Waterbirth: Group Means and Wilcoxon Rank-Sum Tests 49

Table 19 - Concerns about Waterbirth by Past Attendance at Waterbirth: Group Means and Wilcoxon Rank-Sum Tests 49

Table 20 - Concerns about Waterbirth by Willingness to Introduce Waterbirth at a New Site: Group Means and Wilcoxon Rank-Sum Tests 50

INTRODUCTION

Intrapartum hydrotherapy is widely recognized as a safe and effective technique for pain relief in labor. It is offered by a range of maternity care providers throughout the world but most strongly associated with midwifery care and physiologic birth promotion. [1] In the United States, availability of intrapartum hydrotherapy is known to vary across facilities and providers, with several hundred hospitals thought to offer the option of waterbirth, [2] but no nationwide, systematic survey of facilities or providers on this subject could be located in the current health sciences literature. Waterbirth is a topic of particular interest both because it has become more popular over the past three decades and because of a 2014 joint committee opinion by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists recommending restriction of the practice to experimental settings. [3] Water immersion during labor and birth is strongly desired by a proportion of birthing patients, but not available in all settings. These practices, especially waterbirth, are championed by some clinicians and opposed by others. In 2015, the American College of Nurse-Midwives (ACNM) Hydrotherapy Working Group undertook a survey of ACNM member perceptions of intrapartum hydrotherapy, described in part in this thesis. A review of the known benefits and risks of waterbirth, and of the current debate over its advisability, informs the context and content of this survey.

Definitions and Prevalence

The umbrella term *intrapartum hydrotherapy* refers to the use of water for relaxation and/or pain relief at any time during labor and birth, via a shower, bathtub, specially designed labor pool, or any similar mechanism. There are several distinct practices covered by the term and potential for confusion in the research and clinical literature when the practice is not clearly described. Intrapartum immersion specifically means maternal submersion, usually covering the abdomen, in warm water. Water labor refers to intrapartum immersion at any time during labor before emergence of the fetal presenting part, but not during the birth itself. For the purpose of

this discussion, waterbirth is defined as the birth of the presenting part (most commonly the head) underwater, whether or not the delivery of the infant and placenta was completed in the tub. In contrast, a labor and birth that does not include any immersion in water is often called a conventional, air, land, or bed birth. [1] Water labor is reported to be more common than waterbirth, and women having waterbirths typically also labored in water.[4,5]

When defined broadly as use of water at any time during labor, including simply taking a shower after the first contraction, intrapartum hydrotherapy is probably quite common in the developed world. Availability of water labor and waterbirth, however, varies greatly among countries and care settings. It may be most common in the United Kingdom, where its use is broadly accepted and water labor has been promoted in national health policy and infrastructure since the early 1990's. [6-8] Both the first case report of waterbirth in the obstetric literature, published in 1805, and the first modern case series of 100 hospital waterbirths, described in *The Lancet*, came from France. [9] A 1998 survey of obstetric units in Germany, Austria, and Switzerland found that 25% offered waterbirth in 1997 and another 22% planned to start offering it in the near future. [10] More recently, a consumer-oriented birth website listed more than 130 midwifery practices and more than 300 hospitals offering waterbirth in Germany. [11] In Australia, water labor and waterbirth are officially offered to any low-risk woman who has signed an informed consent document, but actual availability is limited by administrative obstacles. [12] Reported rates of waterbirth vary widely among settings where it is offered, from less than 1% to more than 50% of laboring women.[8,10,13,14]

In the United States, waterbirth is available in some birth settings but not others. Waterbirth is a common option in planned homebirths and in freestanding birth centers. The Midwives Alliance of North America (MANA) Division of Research reportedly has a manuscript in press that describes excellent outcomes of more than 18,000 home waterbirths. [15] Preliminary analysis from the American Association of Birth Centers (AABC) indicates that about one

quarter of births in AABC-member centers between 2007 and 2010 took place underwater, with outcomes as expected for a low-risk population.[16] However, the vast majority (98.6%) of U.S births take place in hospitals. Most of these births are attended by physicians (85.4% by doctors of medicine, 6.3% by doctors of osteopathy); just 7.8% of hospital births nationwide are attended by certified nurse-midwives (CNMs).[17] Recent estimates put the number of U.S. hospitals offering waterbirth at between 200 and 500, with at least twice that number offering water labor.[1,2] Using a 2008 estimate of 3,265 U.S. hospitals with labor and delivery services,[18] this puts the proportion of maternity hospitals offering waterbirth at the end of the last decade between 6% and 15%. Researchers looking at individual U.S. hospitals with the option of waterbirth have reported utilization rates from 5.8% to 33%.[19,20] From the consumer perspective, intrapartum hydrotherapy appears less common in the U.S. than in Europe; the large, representative *Listening to Mothers III* survey found that only 10% of mothers reported showering and 8% reported using immersion for pain relief during labor.[21]

Although prior research suggests that midwives are more likely to attend waterbirths and suggest intrapartum hydrotherapy to their clients than physicians, very few data are available regarding U.S. midwives' attitudes, knowledge, or practice of intrapartum hydrotherapy.[22,23] In the most recent task analysis by the American Midwifery Certification Board (AMCB), which directs the content of the national certification exam for CNMs and certified midwives (CMs), respondents rated waterbirth management relatively high in importance (3.74 on a scale of 1 to 5) but low in frequency (2.02 on a scale of 1 to 6).[24] Meyer and colleagues surveyed Georgia CNMs in 2009, in the first known report that "focuses on the perceptions, exposure to, and experience of" midwives with waterbirth. They found overall approval of the practice, with one third of respondents currently providing waterbirth and over 80% providing water labor.[22] Their questionnaire provided the foundation for the survey developed by the ACNM Hydrotherapy

Working Group to systematically assess ACNM members in this area for the first time. Select findings of the survey are the focus of this thesis.

Benefits and Risks

Debate about the relative benefits and risks of water labor and waterbirth has appeared in peer-reviewed and popular press since at least the 1980s, albeit with more public attention recently. The most current Cochrane review of water immersion during labor assessed 12 randomized controlled trials (n = 3,243), conducted in Australia, Belgium, Brazil, Canada, Finland, South Africa, Sweden, the United Kingdom, and the United States between 1990 and 2007 and published between 1994 and 2009.[25] Of the 12 trials, nine examined water immersion in the first stage of labor only, two studied the first and second stages, and one the second stage only; none reported on water immersion during the third stage of labor. The Cochrane review found that immersion in warm water during the first stage of labor reduces the use of epidural analgesia (RR 0.90, 95% CI 0.82 to 0.99, 6 trials) and modestly shortens the duration of the first stage (mean reduction 32.4 minutes, 95% CI 6.13 to 58.7 minutes), with no differences in rates of operative delivery, intravenous oxytocin use, perineal trauma, maternal or neonatal infection, five-minute Apgar scores less than seven, or NICU admissions. The only significant difference identified between waterbirth and conventional birth, among the three trials that compared these, was increased maternal satisfaction in the waterbirth group of one trial. The authors acknowledged the limitations of this relatively small body of RCTs and called for more research, but concluded that there is "no evidence of increased adverse effects to the fetus/neonate or woman from labouring in water or waterbirth."[25]

The most recent and comprehensive review of the literature on waterbirth was provided by Nutter and colleagues in 2014.[1] They examined 38 studies published in English-language peer-reviewed journals between 1983 and 2013 and describing 31,453 waterbirths. Nearly half of the studies were conducted in the United Kingdom; the remainder came from Australia, Austria,

France, Germany, Iran, Italy, South Africa, Switzerland, Turkey, and the United States. Two studies were randomized controlled trials; 36 involved prospective or retrospective case-control studies, cohort studies, and/or clinical audits. Both RCTs were small, underpowered pilot studies that concluded that it is technically feasible, if difficult, to conduct an RCT of waterbirth. [1,26,27] Benefits seen across multiple studies included decreased or equivalent rates of episiotomy and severe perineal laceration, less reported pain and use of intravenous and/or epidural analgesia, and higher maternal satisfaction compared to demographically matched low-risk women experiencing conventional birth. Additional proposed benefits of intrapartum immersion that have been reported include increased maternal cardiac output and uteroplacental perfusion, decreased maternal cortisol levels, improved maternal mobility, and a calming effect on mothers and babies. [2,9,25,28] Those who support the availability of waterbirth frequently cite women's autonomy as a reason; there is ample evidence that some laboring women strongly desire and seek out intrapartum immersion, and those who experience it tend to rate it highly.[4,5,29-32]

Nutter et al. did not find statistically significant differences in rates of maternal or neonatal infection or antibiotic use, postpartum hemorrhage, Apgar scores, cord blood gases, or NICU admission rates in their review. [1] A possible risk of waterbirth identified was umbilical cord avulsion, with reported rates between 1 and 6 per 1000 waterbirths, but it is unclear whether this risk exceeds that of conventional birth. [1,4,25,33] Reported sequelae of cord avulsion are NICU admission (23% of avulsion cases in a 2014 systematic review) and blood transfusion (13% of avulsions); no studies found an association between cord avulsion and neonatal mortality or long-term morbidity.[33]

In contrast to the above findings, Pinette, Wax, and Wilson published a literature review in 2004 that set out to identify "complications that could be attributed potentially to" waterbirth. [34] They found the reported benefits of water labor and/or waterbirth to be absent, unconvincing, or not causally linked to water immersion. The review cited an earlier Cochrane review to state that

although water immersion may help with maternal pain relief, "underwater births failed to demonstrate any benefit to the neonate" and "there appear to be cases of possible harm as a result of underwater birth."[34,35] Potential harms listed include maternal and neonatal infections, cord avulsion and hemorrhage, neonatal drowning or near-drowning, hyponatremia, hypoxic ischemic encephalopathy, impaired thermoregulation, seizures, asphyxia, and death. However, nearly all of these adverse neonatal outcomes following waterbirths were case reports. Many of these cases involved circumstances such as concealed and/or accidental waterbirths,[36] unattended births, contaminated hospital water supplies,[37] intrauterine meconium aspiration, and/or failure to bring the baby to the surface promptly after birth, or were not described fully enough to assess for confounding factors.[29,34,36,38] Others involved transient findings, such as short-term fetal tachycardia, without sequelae.[39] The review authors did not attempt to quantify any of the reported risks of waterbirth, but called for both a large RCT of waterbirth and for informing all women considering waterbirth that they could be putting their newborns at risk for serious adverse outcomes.[34]

Practice Guidelines and Political Context

Intrapartum hydrotherapy is neither explicitly included nor excluded in the core competencies for midwifery practice developed by ACNM, though it is a technique included within "facilitation of physiologic labor process" and "non-pharmacologic strategies to facilitate maternal coping."[40] ACNM has supported the judicious use of water labor and waterbirth in multiple published position statements,[41,42] which define intrapartum hydrotherapy as within the CNM/CM scope of practice. The 2014 literature review by Nutter et al. and its companion ACNM-approved patient education handout called for more research on waterbirth, but found the current published evidence sufficient to continue offering waterbirth with routine informed consent and without any extraordinary conditions or restrictions.[1,43] Similarly, after review of

member data and research literature, AABC concluded that properly conducted waterbirth is a safe option for healthy women and their attendants. [16]

In 2014, the American Academy of Pediatrics (AAP) Committee on Fetus and Newborn and the American College of Obstetricians and Gynecologists (ACOG) Committee on Obstetric Practice released a widely-read joint report on intrapartum immersion. While not precluding water labor for select low-risk women under strictly controlled conditions, the AAP-ACOG statement called for waterbirth to be considered an "experimental procedure" and abandoned unless part of "an appropriately designed clinical trial with informed consent." [3] Characterizing waterbirth as a risky procedure without maternal or neonatal benefit, the report cited a 2005 AAP committee opinion, the review article by Pinette et al. described above and several of the case reports cited therein, two additional case reports, a letter to the editor, a study of the effects of exercise on pregnant rats, and a clinical physiologist's explanation of the reasons waterbirth would *not* typically present a drowning risk. [3,34,37,44-48] The joint statement was consistent with AAP's previous position, but at odds with a number of other professional organizations and, many have argued, at odds with the evidence itself. [1,4,12,13,29,31,38] As AAP and ACOG are influential in shaping U.S. maternity care practice and policy, the survey reported here asked ACNM members to describe any effects of this statement on their waterbirth practices.

International attention to waterbirth has also risen in recent years, with mixed responses. One of the strongest and swiftest critiques of the AAP-ACOG statement came from the British Royal College of Midwives (RCM), reaffirming its previous findings that water labor does convey meaningful benefits and that "there is no reliable available evidence to indicate that waterbirth presents an increased risk factor compared with land birth for women who experience a straightforward pregnancy." [49] The Royal College of Obstetricians and Gynaecologists also recognizes benefits of water labor and, in an earlier joint statement with the RCM, agreed that

"[a]ll healthy women with uncomplicated pregnancies at term should have the option of water birth available to them and should be able to proceed to a water birth if they wish." [6] The most recent position statement on the issue by the Deutsche Gesellschaft für Gynäkologie und Geburtshilfe (German Society for Gynecology and Obstetrics) identified water labor as a safe pain relief method and waterbirth as a reasonable consumer-driven choice for low-risk pregnancies; [10] this statement was allowed to expire in 2013, but has not been replaced by any other official position. The Sociedad Española de Neonatología (Spanish Society of Neonatology) and Perinatal Section of the Sociedad Española de Obstetricia y Ginecología (Spanish Society of Obstetrics and Gynecology) have adopted the 2014 AAP-ACOG opinion. [50] The Royal Australian and New Zealand College of Obstetricians and Gynaecologists officially supports water labor, but emphasizes the need for provider training and careful monitoring to avoid unplanned waterbirth, and urges caution and more research to assess the safety of planned waterbirth.[51]

Practical Considerations and Barriers

Like any labor and birth support technique, waterbirth should be conducted with skilled attendants following best practices for candidate selection, equipment maintenance, and appropriate safety precautions. These can be learned from published clinical practice guidelines[31,52] and via continuing education workshops. Russell and colleagues reported on a successful training and mentoring program that improved midwives' hydrotherapy competence and confidence in a large British hospital practice, which could be emulated elsewhere. [8] This 2015 survey of ACNM members included questions about these matters, including pre-licensure and post-graduate continuing education, initial and ongoing competency assessment, and hospital credentialing for waterbirth, which will be reported separately.

Waterbirth practices, like most aspects of clinical decision-making, are influenced by more factors than just evidence-based care guidelines. Consumer demand, respect for patient

autonomy and shared decision-making, provider knowledge and past experience, cost and reimbursement structures, community standards, administrative policy, facility logistics, medicolegal concerns, convenience, and individuals' assessment and tolerance of risk are among the many issues that determine the prevalence of any care practice. [8,12,22,41,53-56] Specific barriers previously identified in the limited literature on waterbirth provision include limited tub availability; the cost of tub installation and maintenance; staffing issues; lack of support from physician, nurse, and/or administrative colleagues; lack of suitable patient information materials; concerns about water temperature, provider ergonomics, and difficulty viewing or reaching the perineum; limited access to waterbirth-related continuing education; midwives' lack of confidence in their ability to advocate for the practice; restrictive or unclear practice guidelines; preferential promotion of practices, such as epidural analgesia, that are not compatible with water immersion; and general resistance to change.[1,8,12,22,31,53,57]

The current national survey of ACNM members queried U.S. midwives about many of these factors as they relate to water labor and waterbirth. This thesis will specifically examine perceived barriers to attending waterbirth as reported by survey respondents. This focus is timely in light of the ongoing international conversation about intrapartum hydrotherapy and about best practices in maternity care more broadly. It is useful to assess the barriers to any practice that is in demand but not universally available, either to modify the practice where indicated, or to work toward removing barriers that are not grounded in the best available evidence.

Theoretical Framework

Previous authors have noted that risk perception is central to modern medical decision-making, particularly in maternity care. [12,55,58,59] Moreover, risk assessment is not a purely data-driven process, but is inextricably bound to providers', patients', and societies' value systems. [59,60] Even when individuals strive or claim to assess risk objectively, as a product of the

probability of an adverse event multiplied by the magnitude of its consequences, both of these components are subject to individual interpretation. [59,61]

The social amplification of risk framework provides a lens through which to view the current climate of professional debate about intrapartum hydrotherapy generally, and waterbirth in particular. This framework offers an explanation of the perception and communication of risk by and among experts and the public, in which individuals rely on their own experience, education, peer networks, and selected sources of authoritative knowledge (e.g., professional organizations, news media, government agencies) to filter information and assess risk. Because the human psyche is not capable of tracking and addressing all sources of risk at all times, individuals selectively take in information about potential hazards in their environments, compare that information to existing knowledge and values, validate their assessment against those of their culture and peer groups, then select "group or individual actions to accept, ignore, tolerate, or change the risk," thus propagating the social "signal" for how to respond to the hazard. [61] The ACNM member survey asked respondents to articulate and quantify several of these factors based on their own experiences, clinical practices, and opinions of intrapartum hydrotherapy.

MATERIALS AND METHODS

This paper presents a subset of a larger survey of the ACNM membership, titled "Waterbirth knowledge, practices and preferences among American College of Nurse-Midwives members." The online questionnaire was developed by the ACNM Hydrotherapy Working Group and based partly on Meyer and colleagues' survey of Georgia CNMs.[22] The survey was not formally validated, but was developed and reviewed by a committee of CNMs with research experience throughout the United States. The study's aims were to assess CNM and CM views of and experiences with water labor and waterbirth, perceived facilitators and barriers to water labor and waterbirth in the U.S., the impact of AAP-ACOG and/or other published guidelines on the availability of waterbirth, and ACNM members' preferences about the organization's engagement with intrapartum hydrotherapy.

An email invitation to take the survey, containing a non-individualized internet link, was sent by staff at ACNM national headquarters and followed by three reminder emails. The subject line was "ACNM Research Survey - Hydrotherapy During Labor and Birth." The email included links to the relevant ACNM and AAP/ACOG position statements and asked ACNM members to take a 10-30 minute anonymous "survey about labor and birth in water." The invitation went to all 7,374 current members for whom the organization had valid email addresses, of a total membership of approximately 7,800. The survey was administered using the secure, encrypted Qualtrics software platform. It was available for a period of four weeks, from mid-May through mid-June 2015. Eligible participants were those who self-identified as a practicing or retired CNM or CM, student in a CNM or CM program, midwifery education faculty member, and/or clinical preceptor for midwifery students. The current membership of ACNM was taken as a convenience sample to represent the 11,018 CNMs and 88 CMs who attend 7.9% of vaginal births in the U.S.[17,62]

The study received ethical approval from the University of California San Francisco Committee on Human Research and the ACNM Board of Directors. Respondents gave informed electronic consent to participate after reading an explanatory cover letter at the beginning of the questionnaire. The survey used a branching structure, such that respondents encountered variable sets of 39 to 61 items (some with several sub-questions) depending on their answers to prior questions. For example, respondents who reported that they do not currently attend waterbirths were not asked detailed questions about their waterbirth practices. All participants were asked questions about demographics; past experience with waterbirth; perceived barriers, advantages, and disadvantages of water labor and waterbirth; sources of information about waterbirth; and preferences for ACNM engagement on the subject. Participants who stated that they currently attend births were asked about their practice settings, whether they attend waterbirths, and if their practice has changed since the publication of the 2014 AAP-ACOG committee opinion on waterbirth. Those who said they currently attend waterbirths were asked for additional information about their practice type, volume, location, and policies. Respondents who practice in group settings were asked to rate the support of colleagues and clients for water labor and waterbirth. All participants were invited to contact the Hydrotherapy Working Group, separate from their survey responses, if they wished to engage further in ACNM's research and discussion of waterbirth.

This thesis focuses on participant responses to five subsets of survey questions about perceived barriers to water labor and waterbirth, impacts of the 2014 AAP-ACOG committee opinion on waterbirth practices, degree of perceived support or opposition from colleagues and clients, and providers' own concerns about risks or inconveniences of waterbirth. Questions and answers were formatted according to the types of information sought, including yes/no responses, Likert scales, check boxes for multiple choice items, and free text fields. Responses were downloaded into a secure file for analysis with Stata version 14. Analyses performed and

reported here included descriptive statistics, frequency distributions, and nonparametric measures of correlation. When assessing correlations between ordinal and categorical variables, Spearman's rho was selected over Pearson's R to account for skewness values >1 in some Likert scale items. Wilcoxon rank-sum tests were used to assess for differences in perception between binary subgroups. Free-text responses to select questions were manually categorized and tabulated. For analyses that generated *p* values, ≤.01 was considered significant given the large sample size and risk for type I error.

There was no mechanism to prevent an individual from responding to the survey more than once because the internet link was anonymous and not associated with a specific user. However, the study invitation and consent requested that participants respond only once, and data were manually screened for identical responses after survey closure.

RESULTS

The survey web page received a total of 1,839 unique views during the study period, a gross response rate of 24.9%. Of these page views, 1,827 respondents consented to join the study, 1,747 met the study inclusion criteria, and 1,644 participated through the end of the questionnaire. No duplicate responses were identified. Respondents identifying as student midwives (n = 161) were excluded from analysis for the purpose of this thesis because students, particularly those early in their midwifery education, were assumed to be less knowledgeable about intrapartum hydrotherapy barriers and concerns considered here, and less influential in policy decisions than practicing or retired midwives or midwifery educators. As participants were free to opt out of most individual questions, items from incomplete surveys were included in analyses if the respondent consented to study participation, met inclusion criteria, and answered at least 10% of the survey questions overall. After applying these inclusion and exclusion criteria, a total of 1,565 responses remained for analysis, yielding a net response rate of 20.9%. Because respondents could choose not to answer individual questions, and because some questions were presented only to a subset of participants based on prior responses, the n reported for individual questions within the survey differs from the overall number of survey responses. The majority of respondents (58%) took between 10 and 20 minutes to complete the survey (range of time with survey window open: 2 minutes to 11 days).

Respondent Demographics and Hydrotherapy Experience

Tables 1 and 2 summarize the demographic characteristics and locations of survey respondents. Participants were predominantly female (99.5%), white (94.7%), non-Hispanic (96.6%), and educated at the Master's (84.1%) or Doctorate (10.5%) level. The median age was 52 years, and the median length of time in midwifery practice was 11-20 years. Participants were distributed across all seven ACNM geographical regions, with at least 10% of respondents located in each. More than two-thirds (70.1%) practice midwifery in a hospital setting.

Participants' past and present experience with intrapartum hydrotherapy is summarized in Table 3. Every respondent answered "yes" to at least one question indicating past experience with or education regarding waterbirth, and the majority of respondents (81%) have been present for at least one waterbirth. Most survey respondents (82%) currently attend births; of those, nearly half currently attend waterbirths. Table 4 displays additional information about respondents' waterbirth-related practices and preferences. Of note, most participants state that they would be willing to introduce waterbirth to a new practice site if given the opportunity (76%); view management of labor and birth in water as a basic midwifery competency (64%); and are in favor of ACNM both distributing information about (94%) and actively promoting (89%) labor and birth in water. Midwives' willingness to introduce waterbirth at a new site was positively associated with currently offering waterbirth ($n = 1,225$; $\chi^2 = 11.21$; $p = .001$) and with respondents feeling that their participation in administrative affairs matters in how practice policies are made ($n = 1,178$; $\chi^2 = 6.56$; $p = .01$). Providing waterbirth currently was also positively associated with feeling like one's participation in administrative affairs affects practice policy ($n = 1,027$; $\chi^2 = 29.17$; $p<.001$).

Perceived Barriers to Waterbirth

Barriers to waterbirth previously identified in the health sciences literature are presented in Table 5 with survey results; respondents rated each factor on a 5-point Likert scale ranging from "Not a barrier" (1) to "Complete barrier" (5). The highest-ranked barriers were "Lack of medical colleagues' support, including obstetricians" and "Lack of support from administrative or risk management colleagues," each with a median rating of "Significant barrier" (4). The item least likely to be seen as a barrier was "Lack of client preference and information about waterbirth," with a median rating of 1, followed closely by physical or logistic concerns such as difficulty maintaining water temperature, viewing the perineum, or obtaining payment for waterbirth services. Respondents could also comment on barriers to waterbirth in their practice sites or

communities in a free-text field; themes repeated in 5 or more responses are listed in Table 6. The most frequently named additional barrier, cited by 67 individuals, was the 2014 AAP-ACOG committee opinion.

Perceived barriers to waterbirth were further examined by whether or not respondents currently attend waterbirths, and by whether or not they indicated willingness to introduce waterbirth at a new practice site in the future if given the opportunity; these results are shown in Tables 7 and 8. Although absolute effect sizes were modest, typically one-third to one-half of a point on the 5-point Likert scale, midwives who currently provide waterbirth services gave nearly every listed barrier a lower average rating by a statistically significant margin. The data are less clear on comparisons of respondents who stated they would or would not be willing to bring waterbirth to a new practice in the future; fewer perceived barriers reached a statistically significant difference between the two groups. Of note, the barrier “Concerns about body mechanics or physical stress on the provider” was rated significantly higher by those unwilling to introduce waterbirth in the future compared to those who were willing, but there was no difference in this perceived barrier between midwives who do and do not currently attend waterbirths.

Impacts of the 2014 AAP-ACOG Committee Opinion

A separate section of the questionnaire asked participants who currently attend births whether and how their practices had changed in response to this joint statement. Almost one-fifth (19%) said their practices had changed as a result. Table 9 summarizes explanations accompanying the “yes” answers (n = 245). In more than half of these cases, respondents reported that the committee opinion prevented them from offering waterbirth; among these midwives, restrictions either permanently (33%) or temporarily (9%) halted an existing waterbirth practice, or prevented implementation of a waterbirth protocol that had been under development at the time of publication (13%). A sizable number of others mentioned needing to enroll

childbearing women in a research study in order to continue offering waterbirth services (16%), adding or revising patient education and/or informed consent documents to reflect the AAP-ACOG position statement (23%), or revising patient eligibility criteria for waterbirth to become more stringent or conservative (7%). No respondents indicated that the AAP-ACOG committee opinion had a positive effect on their waterbirth practices, or that they had started offering waterbirths after publication of the position statement.

Perceived Colleague Support for Intrapartum Hydrotherapy

Participants who reported working in a group practice were also asked to rate support for water labor and waterbirth among various members of their health care organizations, using a 5-point Likert scale ranging from “Not at all supportive” (1) to “Strongly supportive” (5). These results are presented in Tables 10 and 11. Midwife colleagues and childbearing clients were rated most supportive of both water labor and waterbirth; more than three-quarters of each of these groups were rated “Moderately supportive” or “Strongly supportive” of waterbirth. Pediatricians were perceived to be the least supportive members of the organization, with 23% “Not at all supportive” of water labor and 65% “Not at all supportive” of waterbirth. For each question, support was rated greater for water labor than for waterbirth, with the starkest difference in degree of perceived support among obstetricians (median support for water labor = “Moderately supportive” (4), vs. median support for waterbirth = “Not at all supportive” (1)).

Perceived support among colleagues and clients for both water labor and waterbirth was statistically significantly higher among respondents who currently attend waterbirths than among those who do not (Tables 12 and 13). In particular, perceived support for waterbirth by medical, nursing, and administrative colleagues averaged a full point higher on the 5-point Likert scale among current waterbirth providers versus those who do not attend births in water. Directional relationships and differences were similar but generally less pronounced when comparing support for waterbirth perceived by midwives who would versus would not be willing to introduce

waterbirth at a new practice site (Table 14). The largest perceived differences between these two groups were in perceived support by peers – other CNMs and CMs – and by childbearing clients.

Participant Concerns about Waterbirth

In addition to external barriers to waterbirth, all respondents were also invited to rate their own concerns related to waterbirth, again drawing from the existing literature and using a Likert scale ranging from "Not concerned at all" (1) to "Extremely concerned" (5). As shown in Table 15, the majority of study participants reported low levels of concern about each consideration listed (52% to 92% "Not concerned at all" or "A little concerned," depending on the item); no item received a median score higher than 2 ("A little concerned"). The two concerns rated highest were "Difficult to get mother out of the tub for complications or delivery of placenta" (median = 2, mean = 2.61) and "Stress on the midwife related to body mechanics" (median = 2, mean = 2.56).

Participants' degree of concern about various aspects of waterbirth were compared by several dichotomous variables reflecting experience with and attitude toward waterbirth; these results are detailed in Tables 16 to 20. As noted previously, overall levels of concern were low across all issues and sub-groups. The most consistent predictor of concern measured was past direct observation of waterbirth: although effect sizes were modest, ranging from one-third to one-half of a point on the 5-point Likert scale, respondents who said they had witnessed a waterbirth at some time in the past reported significantly lower levels of concern about every aspect assessed, compared to those who had never seen a waterbirth. Interestingly, theoretical exposure to waterbirth, i.e., having learned about it during one's CNM/CM education program, did not have this effect. With the exception of slightly lower concern about newborn water aspiration among midwives who learned about waterbirth in school, there were no measurable

differences in concern between groups of respondents who were or were not exposed to waterbirth content during their Certified Nurse-Midwife or Certified Midwife education programs.

Finally, each of the variables described above, rating barriers, support, and concerns related to waterbirth, was examined for associations with time in practice, to assess whether respondents' perceptions differed over the course of a midwifery career and length of clinical experience. However, there were no moderate or strong correlations between years in practice and perceived barriers (Spearman's rho range -.061 to .074), colleague support (rho -.176 to .001), or concerns about labor and birth in water (rho -.038 to .072).

DISCUSSION

Survey results indicate widespread experience with intrapartum hydrotherapy, including waterbirth, and low levels of concern about waterbirth among CNMs and CMs in the United States. At the same time, participants reported sometimes insurmountable barriers to offering waterbirth in their practices and communities. The most formidable barriers identified were lack of support from medical, administrative, and risk management colleagues, directly attributed in many cases to the 2014 AAP-ACOG joint committee opinion. The vast majority of respondents would like to see ACNM actively engage in developing and disseminating high-quality information about labor and birth in water, and in publicly promoting water labor and waterbirth as safe and effective pain relief options.

Social Amplification of Risk

The social amplification of risk framework helps to explain the formation of expert opinions on which many maternity care practice decisions are based, and the wide range in level of evidence called upon to support or oppose a practice. For instance, lack of randomized controlled trials clearly demonstrating the safety and efficacy of waterbirth has been cited as a reason not to permit the practice.[34] However, clinical trials involving pregnant women are comparatively rare, and the RCT criterion is not consistently applied to other maternity care practices. If the lack of RCTs strongly supporting both maternal and neonatal safety and benefits is enough reason not to offer waterbirth, then we must also consider abandoning, for example, the ubiquitous practices of manual cervical examinations[63] and electronic fetal monitoring upon admission or continuously throughout labor[64,65] for low-risk pregnant women.

Social amplification of risk also provides a context for understanding why critics of water labor and waterbirth often characterize these options, and women who choose them, as reckless or selfish. Authors of cautionary editorials may concede that hydrotherapy improves maternal comfort and satisfaction with childbirth, but primarily emphasize the absence of

measured physiologic benefits to the fetus or newborn and the potential for additional neonatal risk. [3,34,44,45] This is a commonly held value in American obstetrics: that fetal risk trumps maternal benefit, especially psychological benefit, and the avoidance of perceived neonatal risk takes precedence over maternal autonomy. [55,58]

On the other hand, epidural analgesia for labor is typically offered for maternal (not fetal) benefit and is known to pose some risk to both mother and baby, [12,66] yet there is no clamor in the obstetric or pediatric literature to limit its widespread use. The *Listening to Mothers III* survey found that 67% of U.S. women received epidurals for pain relief in labor, [21] and thus experienced increased risk of instrumental vaginal delivery (RR 1.42), maternal hypotension (RR 18.23), motor blockade (RR 31.67), fever (RR 3.34), urinary retention (RR 17.05), and Cesarean section for fetal distress (RR 1.43), compared to no analgesia. [66] These risks have been documented in rigorous research, a higher quality of evidence than the case studies and committee opinions presented as evidence of the potential harms of waterbirth.

Newnham, McKellar, and Pincombe explored this apparent disconnect in their recent ethnography comparing the portrayal of the risks of intrapartum hydrotherapy to that of labor epidurals in Australia. Their findings illustrate social amplification of risk at work. Epidural analgesia and waterbirth are two pain relief modalities with, they argue, comparable inherent risks and benefits. In the hospital, obstetric culture treats epidurals as an essentially benign medical intervention with manageable side effects, freely offered to almost anyone. By contrast, waterbirth is seen as a potentially risky activity that can only be allowed under strictly limited conditions. These views are conveyed to pregnant patients through the educational materials and consent documents required for either intervention, as well as to and among midwives through institutional policies and administrative hurdles (informed consent processes, accreditation requirements, staffing rules, etc.) required for labor or birth in water but not for epidural analgesia. The difficulty of obtaining water immersion for labor and birth compared to

that of obtaining epidural analgesia feeds back into the perception of relative risk of these labor pain management options. [12] The ACNM member survey aimed to illuminate some of the perceived structural and social factors involved in the risk perception feedback loop by asking midwives in the United States about barriers to offering intrapartum hydrotherapy, including waterbirth.

Study Implications and Limitations

The results of this survey are clearly consistent with the social amplification of risk framework. Respondents who are already attending waterbirths perceive lower barriers to the practice, report more support for it among their colleagues, and state they are less concerned about potentially bothersome aspects of waterbirths than respondents who are not offering them. Whether constrained primarily by hospital policy, state law, personal preference, or the sheer inertia of red tape, those who do not attend waterbirths practice in a milieu that reinforces the perception that waterbirth is inaccessible or possibly even unsafe. The 2014 AAP-ACOG committee opinion on waterbirth was recognized by some providers and colleagues, especially pediatricians, obstetricians, and risk management professionals, as an outside source of authoritative knowledge boosting the inhibitive signal. Conversely, those who are able to offer waterbirths to their clients are bolstered in their positive perceptions of it by regular direct experience and, if they work in a group health care practice, by collaboration with other like-minded (or at least tolerant) clinicians. Should ACNM choose to speak strongly in favor of waterbirth, both in public and in its collaborative relationships with physician organizations, it could function as an effective alternative source of authoritative knowledge, boosting the pro-hydrotherapy signal.

The survey's net response rate of 20.9% is within the typical range for online surveys of healthcare professionals, especially those without a financial incentive for participation. [67] However, it is important to acknowledge a possible source of bias in this convenience sample of

ACNM members: respondents may overrepresent CNMs and CMs with stronger than average opinions about waterbirth, who were particularly motivated to complete the survey. If this was the case, one might expect strong negative opinions of waterbirth to be reflected in this anonymous questionnaire as well as positive views. The fact that strong negative views were rarely expressed (just 2%, or 28 individuals, stated that ACNM should not promote labor and birth in water; no more than 7%, or 107 individuals, said that they were "Extremely concerned" about any aspect of waterbirth) may indicate that strong negative opinions of waterbirth are also uncommon in the population of interest. Still, we cannot assume that the survey findings are generalizable to all U.S. CNMs and CMs.

Although direct statistical comparison was not feasible, the demographic characteristics of this sample are grossly similar to those reported in the most recently published ACNM membership survey. [68] Most survey respondents, like most non-student ACNM members, are practicing CNMs, and are white, non-Hispanic women with a graduate degree. The majority attend births and practice in hospital settings, and a sizable minority is involved in midwifery education. The current membership of ACNM is equal to roughly 70% of U.S.-licensed CNMs and CMs (approximately 7,800 members compared to approximately 11,100 CNMs and CMs), and the 1,565 respondents to this survey comprise just over 20% of ACNM members. Not all practicing U.S. midwives are CNMs or CMs, however; as of January 2014, there were 2,454 Certified Professional Midwives (CPMs) accredited by the North American Registry of Midwives [69] (an unknown number of whom are also CNMs or CMs), and several states also license or permit practice by midwives without national certification. [70] As such, this survey hopes to represent the views of ACNM members interested in waterbirth, but cannot claim to represent the midwifery profession as a whole. It will be interesting to compare these findings with forthcoming publications about intrapartum hydrotherapy as practiced by other types of midwives in a variety of settings.

The author is also aware of, and some survey respondents identified, limitations in the questionnaire. Umbilical cord avulsion is a reported potential risk of waterbirth, but it was not included among concerns that participants were asked to rate. Of 364 narrative responses to the survey's final question, "Is there anything else you think that we should have asked, or that you would like to share with us about warm water immersion hydrotherapy during labor and birth?," twelve individuals mentioned concerns about cord avulsion. Three other individuals stated that they believed cord avulsion was not a risk or that concern about it in the literature was exaggerated. Four participants stated that the question about concerns was itself confusing. Should this survey be repeated or adapted for other clinician groups, it would be appropriate to list cord avulsion among potential concerns, and to consider rephrasing the question about providers' levels of concern. Also, 25 respondents commented that they would have liked more complete separation of water labor and waterbirth in survey questions, or even different surveys about water labor and waterbirth. Each survey question did specify whether it referred to labor in water, birth in water, or both, but some participants would have preferred that no questions ask about both together. Future studies will need to balance clarity about the practice(s) being investigated against considerations of survey length and completion rates.

Conclusions

Among ACNM members who responded to a 2015 member survey about intrapartum hydrotherapy, most have attended at least one waterbirth and many routinely offer waterbirth in their current clinical practices. The majority of respondents are comfortable with water labor and waterbirth, and would like their professional organization to be actively engaged in research, education, and promotion of waterbirth as an option for healthy laboring women.

Reported barriers to waterbirth are various and not necessarily supported by the best available evidence. Overall, survey respondents perceived human factors – ranging from lack of support from an individual colleague, to policy decisions in large health care organizations, to

national recommendations from AAP and ACOG – to constitute more significant barriers than logistical concerns like tub cost or water temperature maintenance. This presents both a challenge and an opportunity to those who wish to see waterbirth more widely available among women's choices for labor pain relief in the United States. ACNM as a national organization, individual midwives, and supporters should engage in constructive conversation with AAP, ACOG, and individual physician colleagues about the impact of the 2014 position statement, the poor quality of evidence underlying it, and avenues for generating additional waterbirth data and developing and disseminating improved best-practice guidelines. The waterbirth conversation also fits into important ongoing discussions about midwives' scope of practice and autonomy as care providers for normal pregnancy and birth: should members of other professions have authority over labor pain relief options that women in midwifery care can or cannot choose after informed consent discussions with their care providers?

Although the AAP-ACOG committee opinion has had a chilling effect on many midwives' waterbirth services, it has also spurred new participation in clinical research on intrapartum immersion. The United States is now fertile ground for interprofessional waterbirth research collaboration among organizations such as ACNM; ACOG; AAP; AABC; MANA; the National Association of CPMs; the Association of Women's Health, Obstetric and Neonatal Nurses; and schools of nursing, midwifery, and medicine. The response to this ACNM member survey contains a clear call from members for the organization to support such research, and to develop high-quality materials related to waterbirth for midwives engaged in public and interprofessional outreach, clinical leadership, practice guideline development, and midwifery education.

As midwives, we know that open communication, collaboration, and education amongst ourselves and with our colleagues are the keys to ensuring safe clinical practice without barriers

to effective care. The highest quality of evidence should inform the care we provide, with women and families at the center of every action and recommendation we make.

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Table 1 - Respondent Demographics

"What is your current age?" n = 1,450 mean = 49.6 SD = 11.9 median = 52 range = 24 to 82	"How do you indicate your gender?" n = 1,451 99.5% Female 0.3% Male 0.2% Responded but did not indicate a gender
"How would you describe your race? Check all that apply." n = 1,444 94.7% White 2.2% Black/African-American 0.9% American Indian or Alaska Native 0.7% Asian 0.1% Native Hawaiian or Other Pacific Islander 3.3% Other	"How would you describe your ethnicity?" n = 1,421 96.6% Not Hispanic or Latino 3.4% Hispanic or Latino
"What is your level of education/academic degree?" n = 1,455 0.7% Associate's 3.7% Bachelor's 84.1% Master's 10.5% Doctorate 1.1% None of the above	Type of midwife, select all that apply n = 1,565 91.4% Practicing CNM 2.2% Practicing CM 4.7% Retired CNM <0.1% Retired CM 6.6% Midwifery education program faculty 27.3% Clinical preceptor for midwifery students
Number of years in practice n = 1,564 23.0% Less than 5 years 17.3% 6 to 10 years 31.0% 11 to 20 years 18.3% 21 to 30 years 10.5% More than 30 years (Median response = 11 to 20 years)	Current practice site, select all that apply n = 1,280 70.1% Hospital 32.9% Private practice 14.3% Academic medical center 13.2% Freestanding birth center 12.4% Clients' homes 10.8% Community clinic 1.0% International setting 3.2% Other

Note on tables: Percentages may not sum to 100 due to rounding and/or the option to select more than one response. "Not applicable" was a choice offered for some questions; these responses were excluded from analysis.

Table 2 - Geographic Distribution of Respondents

Which ACNM Region do you work (or did you most recently work) in? If you are currently a midwifery student, please select the region where you are attending school. If you are a student at a distance program, please select the region where you live.

n = 1,455

16.6%	Region I (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Puerto Rico and the Virgin Islands, Vermont)
12.8%	Region II (Delaware, District of Columbia, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia, International addresses)
13.5%	Region III (Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
15.7%	Region IV (Arkansas, Illinois, Indiana, Kentucky, Michigan, Missouri, Ohio)
10.2%	Region V (Iowa, Kansas, Minnesota, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin)
12.7%	Region VI (Arizona, Colorado, Montana, New Mexico, Texas, Utah, Wyoming, Indian Health Service/Tribal)
18.5%	Region VII (Alaska, California, Hawaii, Idaho, Nevada, Oregon, Washington, Uniformed Services)

Table 3 - Respondent Experience with Intrapartum Hydrotherapy

Question	n	Yes	No
Have you ever read an article on waterbirth?	1,565	1,531 (98%)	34 (2%)
Have you ever watched a video on waterbirth?	1,565	1,496 (96%)	69 (4%)
Were you taught about waterbirth in your CNM/CM education program?	1,564	679 (43%)	885 (57%)
Have patients ever asked you about waterbirth?	1,565	1,547 (99%)	18 (1%)
Have you ever suggested waterbirth to a patient?	1,565	1,160 (74%)	405 (26%)
Have you ever recommended waterbirth to a friend?	1,565	1,141 (73%)	424 (27%)
Have you ever proposed that waterbirth be an option at your practice site(s)?	1,558	1,268 (81%)	290 (19%)
Have you ever helped a woman labor in water?	1,565	1,480 (95%)	85 (5%)
Have you ever witnessed a waterbirth?	1,565	1,261 (81%)	304 (19%)
Have you ever helped deliver a baby in water?	1,565	1,177 (75%)	388 (25%)
Do you or a family member have personal experience with labor or birth in water?	1,565	782 (50%)	783 (50%)
Do you currently attend births?	1,565	1,280 (82%)	285 (18%)
Do you currently attend waterbirths? †	1,280	566 (44%)	714 (56%)
Has your practice changed as a result of the AAP/ACOG committee opinion on waterbirth? †	1,277	245 (19%)	1,032 (81%)

† Question limited to those who responded “Yes” to “Do you currently attend births?”

Table 4 - Waterbirth Practice Considerations and Provider Preferences

Question	n	Yes	No	Unsure
Is initial education or competency assessment required by your practice or birth setting *before* beginning to offer waterbirths? +	540	262 (49%)	278 (51%)	- -
Is *continuing* education or ongoing competency assessment related to waterbirth required by your practice or birth setting for *ongoing* practice? +	537	62 (12%)	475 (88%)	- -
Does one or more of your practice sites require separate credentialing or privileges for waterbirth versus other care practices? +	539	57 (11%)	455 (84%)	27 (5%)
Does your practice have written informed consent forms for waterbirth? +	542	318 (59%)	216 (40%)	8 (1%)
In the future, would you be willing to introduce waterbirth to a new practice site if you had the opportunity?	1,506	1,146 (76%)	360 (24%)	- -
Do you work in a group practice or health care services organization?	1,496	1,230 (82%)	266 (18%)	- -
Do you think your participation in administrative affairs makes a difference in how practice site policies are made? ^	1,189	897 (75%)	292 (25%)	- -
Do you consider the management of labor and birth in water to be a basic midwifery competency or do you view it as an expanded scope of midwifery practice? (basic = yes, expanded = no)	1,465	932 (64%)	416 (28%)	117 (8%)
Should ACNM facilitate the dissemination of information about labor and birth in water to midwives, colleagues, and the public?	1,457	1,375 (94%)	14 (1%)	68 (5%)
Should ACNM promote labor and birth in water as a safe and effective non-pharmacologic pain relief method in communications with midwives, patients, and colleagues?	1,456	1,295 (89%)	28 (2%)	133 (9%)

- - "Unsure" was not offered as an answer choice for this question

+ Question limited to those who responded "Yes" to "Do you currently attend waterbirths?"

^ Question limited to those who responded "Yes" to "Do you work in a group practice or health care services organization?"

Table 5 - Main Barriers to the Use of Hydrotherapy during Labor or Birth

	n	Not a barrier (1)	Minor barrier (2)	Moderate barrier (3)	Significant barrier (4)	Complete barrier (5)	Mean	Median
Financial considerations related to equipment	1,399	323 (23%)	450 (32%)	329 (24%)	267 (19%)	30 (2%)	2.45	2
Financial considerations related to payment of providers or facilities	1,302	621 (48%)	340 (26%)	200 (15%)	126 (10%)	15 (1%)	1.90	2
Staffing concerns	1,427	333 (23%)	378 (26%)	348 (24%)	321 (22%)	47 (3%)	2.56	3
Lack of medical colleagues' support, incl. obstetricians & pediatricians	1,467	57 (4%)	113 (8%)	207 (14%)	662 (45%)	428 (29%)	3.88	4
Lack of support from nursing colleagues	1,458	191 (13%)	341 (23%)	434 (30%)	413 (28%)	79 (5%)	2.90	3
Lack of support from administrative or risk management colleagues	1,447	116 (8%)	147 (10%)	253 (17%)	608 (42%)	323 (22%)	3.60	4
Lack of support from malpractice insurer	1,281	360 (28%)	228 (18%)	263 (21%)	298 (23%)	132 (10%)	2.70	3
Lack of client preference and information about waterbirth	1,407	806 (57%)	385 (27%)	151 (11%)	61 (4%)	4 (<1%)	1.63	1
Limited tub availability	1,412	365 (26%)	373 (26%)	270 (19%)	258 (18%)	146 (10%)	2.61	2
Concern about maintaining water temperature	1,407	698 (50%)	499 (35%)	141 (10%)	62 (4%)	7 (1%)	1.71	2
Concern about body mechanics or physical stress on the provider	1,446	384 (27%)	582 (40%)	316 (22%)	140 (10%)	24 (2%)	2.20	2
Concerns about emergency management in the water	1,470	144 (10%)	382 (26%)	446 (30%)	404 (27%)	94 (6%)	2.95	3
Difficulty viewing perineum during waterbirth	1,440	551 (38%)	525 (36%)	225 (16%)	122 (8%)	17 (1%)	1.98	2
Lack of access to training or opportunities to learn new waterbirth skills	1,441	357 (25%)	479 (33%)	324 (22%)	231 (16%)	50 (3%)	2.40	2

Table 6 - Narrative Responses: Other Barriers to Waterbirth in Practice or Community

n = 412 respondents described barriers not listed in Table 5. Additional barriers cited by >1% (≥5 individuals) are summarized here. Percentages do not sum to 100 because barriers described by <5 individuals are not reported.

Number (percent)	Barrier
67 (16%)	AAP, ACOG, and/or the 2014 joint statement
31 (8%)	Infection control, tub cleaning, or personal protective equipment-related concerns
27 (7%)	Corporate or government bureaucracy, institutional inertia, or general resistance to change
26 (6%)	Culture does not support physiologic birth or non-pharmacological pain management; preference for epidurals
22 (5%)	Problems with labor & delivery room layout, tub size, or the design of available tubs
18 (4%)	General lack of interest (by respondent or colleagues), e.g., “just don’t like to do it”
17 (4%)	Difficulty participating in a clinical trial and/or finding adequate published research on waterbirth safety
15 (4%)	Fear of lawsuits, liability, or other repercussions of a potential adverse outcome
14 (3%)	Provider inconvenience/too time consuming/tub makes extra work
14 (3%)	Engineering department objections and/or flood risk concerns
14 (3%)	Privileging/credentialing problems, perceived hostility to the midwifery model of care and/or competition
11 (3%)	Restrictive patient eligibility criteria
10 (2%)	Community standard/local politics, e.g., “we can’t do it because no one else in town does it”
8 (2%)	Typical unit census and/or patient acuity is too high for waterbirth
7 (2%)	Fear following a negative personal experience or based on case reports
7 (2%)	Concerns about keeping the water clean, e.g., “yuck factor”
7 (2%)	Problems with electronic fetal monitoring in the water
6 (1.5%)	State and local regulations prohibiting or restricting intrapartum immersion
5 (1.2%)	Lack of support from regional tertiary care center
5 (1.2%)	Lack of respect for patient autonomy

Table 7 - Perceived Barriers to Waterbirth among Current Providers and Non-Providers: Group Means and Wilcoxon Rank-Sum Tests

Perceived Barrier	n	Current Providers *Mean*	Non-Providers *Mean*	z Value	p Value
Financial considerations related to equipment	1,131	2.11	2.66	-7.80	<.001*
Financial considerations related to payment of providers or facilities	1,055	1.68	1.96	-3.94	<.001*
Staffing concerns	1,159	2.26	2.72	-6.36	<.001*
Lack of medical colleagues' support, incl. obstetricians & pediatricians	1,192	3.49	4.09	-9.07	<.001*
Lack of support from nursing colleagues	1,183	2.76	2.92	-2.05	.04
Lack of support from administrative or risk management colleagues	1,174	3.20	3.80	-7.76	<.001*
Lack of support from malpractice insurer	1,042	2.32	2.85	-6.26	<.001*
Lack of client preference and information about waterbirth	1,142	1.55	1.62	-1.53	.13
Limited tub availability	1,141	2.18	2.89	-8.55	<.001*
Concern about maintaining water temperature	1,144	1.54	1.76	-3.85	<.001*
Concern about body mechanics or physical stress on the provider	1,174	2.12	2.23	-1.49	.14
Concerns about emergency management in the water	1,194	2.75	3.05	-4.49	<.001*
Difficulty viewing perineum during waterbirth	1,168	1.92	2.00	-1.08	.28
Lack of access to training or opportunities to learn new waterbirth skills	1,171	2.24	2.41	-2.47	.01*

Scale: 1 = Not a barrier; 2 = Minor barrier; 3 = Moderate barrier; 4 = Significant barrier; 5 = Complete barrier

* Statistically significant at $p \leq .01$

Table 8 - Perceived Barriers to Waterbirth by Willingness to Introduce Waterbirth at a New Site: Group Means and Wilcoxon Rank-Sum Tests

Perceived Barrier	n	Willing *Mean*	Unwilling *Mean*	z Value	p Value
Financial considerations related to equipment	1,382	2.39	2.66	-3.76	<.001*
Financial considerations related to payment of providers or facilities	1,288	1.84	2.15	-4.31	<.001*
Staffing concerns	1,410	2.48	2.81	-4.43	<.001*
Lack of medical colleagues' support, incl. obstetricians & pediatricians	1,450	3.88	3.86	-0.11	.91
Lack of support from nursing colleagues	1,441	2.89	2.93	-0.60	.55
Lack of support from administrative or risk management colleagues	1,430	3.60	3.63	-0.92	.36
Lack of support from malpractice insurer	1,267	2.67	2.84	-1.88	.06
Lack of client preference and information about waterbirth	1,391	1.56	1.85	-5.55	<.001*
Limited tub availability	1,395	2.56	2.77	-2.23	.03
Concern about maintaining water temperature	1,390	1.67	1.84	-2.97	.003*
Concern about body mechanics or physical stress on the provider	1,430	2.09	2.53	-6.37	<.001*
Concerns about emergency management in the water	1,454	2.87	3.19	-4.82	<.001*
Difficulty viewing perineum during waterbirth	1,425	1.88	2.32	-6.56	<.001*
Lack of access to training or opportunities to learn new waterbirth skills	1,425	2.33	2.66	-4.53	<.001*

Scale: 1 = Not a barrier; 2 = Minor barrier; 3 = Moderate barrier; 4 = Significant barrier; 5 = Complete barrier

* Statistically significant at $p \leq .01$

Table 9 - Narrative Responses: Practice Changes Due to the AAP-ACOG Committee Opinion on Waterbirth

n = 245 "yes." Percentages do not sum to 100 because some respondents cited >1 change in practice.

Number (percent)	Change in Practice
82 (33%)	Halted existing waterbirth practice
56 (23%)	Added or revised informed consent documents, patient education materials, or other waterbirth materials
38 (16%)	Joined or initiated a research study, or are in the process of doing so, as a new site requirement for waterbirth
31 (13%)	Prevented from starting waterbirth service that was under development or about to launch
22 (9%)	Temporary moratorium on waterbirth
18 (7%)	Increased restrictions on patient eligibility for waterbirth
9 (4%)	No longer offering or promoting waterbirth; advising more patients to get out of tub for second stage of labor
5 (2%)	Heightened institutional scrutiny of waterbirth practice
3 (1%)	Neonatologist must attend all waterbirths
2 (<1%)	More stringent tub cleaning protocol implemented
1 (<1%)	Waterbirth providers lost employer-sponsored malpractice insurance
11 (4%)	Respondent reported a change in practice but did not explain the change
0 (0%)	Started offering waterbirth after, or waterbirth practice was facilitated by, AAP/ACOG committee opinion

Table 10 - Colleague and Client Support for Labor in Water

	n	Not at all supportive (1)	Neutral (2)	Mildly supportive (3)	Moderately supportive (4)	Strongly supportive (5)	Mean	Median
Obstetricians	1,123	142 (13%)	134 (12%)	235 (21%)	344 (31%)	268 (24%)	3.41	4
Family practice physicians	606	41 (7%)	92 (15%)	131 (22%)	183 (30%)	159 (26%)	3.54	4
Maternal-fetal medicine physicians	811	157 (19%)	214 (26%)	130 (16%)	195 (24%)	115 (14%)	2.87	3
Pediatricians	1,019	238 (23%)	397 (39%)	126 (12%)	159 (16%)	99 (10%)	2.49	2
Nurses	1,164	72 (6%)	104 (9%)	246 (21%)	329 (28%)	413 (35%)	3.78	4
Other CNMs/CMs	1,144	5 (<1%)	27 (2%)	72 (6%)	180 (16%)	860 (75%)	4.63	5
CPMs, LMs, other midwives	422	2 (<1%)	14 (3%)	11 (3%)	48 (11%)	347 (82%)	4.72	5
Practice setting administration	1,111	193 (17%)	271 (24%)	166 (15%)	215 (19%)	266 (24%)	3.08	3
Childbearing clients	1,195	6 (1%)	45 (4%)	118 (10%)	277 (23%)	749 (63%)	4.44	5

Table 11 - Colleague and Client Support for Birth in Water

	n	Not at all supportive (1)	Neutral (2)	Mildly supportive (3)	Moderately supportive (4)	Strongly supportive (5)	Mean	Median
Obstetricians	1,106	568 (51%)	185 (17%)	185 (17%)	117 (11%)	51 (5%)	2.00	1
Family practice physicians	582	176 (30%)	174 (30%)	117 (20%)	81 (14%)	34 (6%)	2.35	2
Maternal-fetal medicine physicians	794	436 (55%)	194 (24%)	87 (11%)	61 (8%)	16 (2%)	1.77	1
Pediatricians	1,022	667 (65%)	251 (25%)	71 (7%)	25 (2%)	8 (1%)	1.49	1
Nurses	1,144	197 (17%)	198 (17%)	371 (32%)	221 (19%)	157 (14%)	2.95	3
Other CNMs/CMs	1,121	24 (2%)	60 (5%)	164 (15%)	286 (26%)	587 (52%)	4.21	5
CPMs, LMs, other midwives	414	4 (1%)	25 (6%)	24 (6%)	56 (14%)	305 (74%)	4.53	5
Practice setting administration	1,097	478 (44%)	252 (23%)	141 (13%)	98 (9%)	128 (12%)	2.22	2
Childbearing clients	1,173	8 (1%)	86 (7%)	188 (16%)	303 (26%)	588 (50%)	4.17	5

Table 12 - Perceived Support for Water Labor among Current Providers and Non-Providers of Waterbirth: Group Means and Wilcoxon Rank-Sum Tests

	n	Current Providers *Mean*	Non-Providers *Mean*	z Score	p Value
Obstetricians	969	3.84	3.30	5.94	<.001*
Family practice physicians	516	3.98	3.42	5.17	<.001*
Maternal-fetal medicine physicians	690	3.28	2.79	4.43	<.001*
Pediatricians	883	2.71	2.46	2.88	.004*
Nurses	1,007	4.29	3.58	9.18	<.001*
Other CNMs/CMs	994	4.81	4.56	5.15	<.001*
CPMs, LMs, other midwives	359	4.84	4.64	3.17	.002*
Practice setting administration	962	3.83	2.77	11.07	<.001*
Childbearing clients	1,036	4.77	4.33	8.51	<.001*

Scale: 1 = Not at all supportive; 2 = Neutral; 3 = Mildly supportive; 4 = Moderately supportive; 5 = Strongly supportive

Table 13 - Perceived Support for Waterbirth among Current Providers and Non-Providers: Group Means and Wilcoxon Rank-Sum Tests

	n	Current Providers *Mean*	Non-Providers *Mean*	z Score	p Value
Obstetricians	957	2.90	1.63	14.69	<.001*
Family practice physicians	500	3.14	1.94	10.63	<.001*
Maternal-fetal medicine physicians	680	2.41	1.49	10.08	<.001*
Pediatricians	889	1.98	1.28	12.14	<.001*
Nurses	992	3.84	2.53	15.62	<.001*
Other CNMs/CMs	977	4.68	3.98	10.90	<.001*
CPMs, LMs, other midwives	354	4.74	4.41	3.06	.002*
Practice setting administration	956	3.42	1.63	18.83	<.001*
Childbearing clients	1,019	4.65	3.97	11.30	<.001*

Scale: 1 = Not at all supportive; 2 = Neutral; 3 = Mildly supportive; 4 = Moderately supportive; 5 = Strongly supportive

* Statistically significant at p≤.01

Table 14 - Perceived Support for Waterbirth by Willingness to Introduce Waterbirth at a New Site: Group Means and Wilcoxon Rank-Sum Tests

	n	Willing *Mean*	Unwilling *Mean*	z Score	p Value
Obstetricians	1,096	2.04	1.87	2.17	.03
Family practice physicians	576	2.40	2.20	1.78	.08
Maternal-fetal medicine physicians	788	1.82	1.62	2.51	.01*
Pediatricians	1,013	1.50	1.46	1.58	.11
Nurses	1,134	3.00	2.78	2.39	.02
Other CNMs/CMs	1,111	4.34	3.77	7.15	<.001*
CPMs, LMs, other midwives	412	4.60	4.30	3.12	.002*
Practice setting administration	1,086	2.26	2.07	2.26	.02
Childbearing clients	1,162	4.31	3.71	8.18	<.001*

Scale: 1 = Not at all supportive; 2 = Neutral; 3 = Mildly supportive; 4 = Moderately supportive; 5 = Strongly supportive

Table 15 - Waterbirth Concerns

	n	Not concerned at all (1)	A little concerned (2)	Moderately concerned (3)	A lot of concern (4)	Extremely concerned (5)	Mean	Median
Newborn water aspiration	1,464	523 (36%)	641 (44%)	193 (13%)	59 (4%)	48 (3%)	1.95	2
Maternal infection	1,465	904 (62%)	438 (30%)	86 (6%)	27 (2%)	10 (1%)	1.50	1
Newborn infection	1,464	829 (57%)	488 (33%)	101 (7%)	28 (2%)	18 (1%)	1.58	1
Hypothermia of newborn	1,465	608 (42%)	596 (41%)	203 (14%)	45 (3%)	13 (1%)	1.81	2
Maintenance of water temperature	1,465	443 (30%)	593 (40%)	215 (22%)	86 (6%)	28 (2%)	2.09	2
Stress on the midwife related to body mechanics	1,465	225 (15%)	562 (38%)	405 (28%)	181 (12%)	92 (6%)	2.56	2
Inconvenience of midwife getting wet	1,465	811 (55%)	383 (26%)	162 (11%)	73 (5%)	36 (2%)	1.73	1
Inconvenience of wearing shoulder length gloves	1,464	926 (63%)	322 (22%)	146 (10%)	45 (3%)	25 (2%)	1.58	1
Infection risk to provider	1,465	805 (55%)	437 (30%)	143 (10%)	45 (3%)	35 (2%)	1.68	1
Difficult to see the perineum and presenting part during waterbirth	1,465	523 (36%)	602 (41%)	217 (15%)	88 (6%)	35 (2%)	1.98	2
Difficult to get mother out of the tub for complications or delivery of placenta	1,465	192 (13%)	571 (39%)	423 (29%)	172 (12%)	107 (7%)	2.61	2
Difficult to estimate blood loss	1,463	290 (20%)	691 (47%)	333 (23%)	120 (8%)	29 (2%)	2.25	2

Table 16 - Concerns about Waterbirth among Current Providers and Non-Providers: Group Means and Wilcoxon Rank-Sum Tests

	n	Current Providers *Mean*	Non-Providers *Mean*	z Score	p Value
Newborn water aspiration	1,189	1.77	2.07	-5.23	<.001*
Maternal infection	1,190	1.35	1.57	-4.60	<.001*
Newborn infection	1,189	1.41	1.68	-5.05	<.001*
Hypothermia of newborn	1,190	1.74	1.88	-3.06	.002*
Maintenance of water temperature	1,190	2.07	2.09	-0.99	.32
Stress on the midwife related to body mechanics	1,190	2.41	2.64	-3.41	<.001*
Inconvenience of midwife getting wet	1,190	1.63	1.77	-3.02	.003*
Inconvenience of wearing shoulder length gloves	1,190	1.51	1.58	-2.36	.02
Infection risk to provider	1,190	1.61	1.70	-1.08	.28
Difficult to see the perineum and presenting part during waterbirth	1,190	1.90	2.04	-3.17	.002*
Difficult to get mother out of the tub for complications or delivery of placenta	1,190	2.39	2.77	-5.87	<.001*
Difficult to estimate blood loss	1,188	2.18	2.30	-2.28	.02*

Scale: 1 = Not concerned at all; 2 = A little concerned; 3 = Moderately concerned; 4 = A lot of concern; 5 = Extremely concerned

Table 17 - Concerns about Waterbirth by Coverage in Basic Midwifery Education: Group Means and Wilcoxon Rank-Sum Tests

	n	Covered *Mean*	Not Covered *Mean*	z Score	p Value
Newborn water aspiration	1,464	1.86	2.03	-2.62	.009*
Maternal infection	1,465	1.44	1.55	-1.75	.08
Newborn infection	1,464	1.51	1.63	-1.91	.06
Hypothermia of newborn	1,465	1.81	1.81	0.49	.62
Maintenance of water temperature	1,465	2.09	2.09	0.55	.58
Stress on the midwife related to body mechanics	1,465	2.59	2.54	1.10	.27
Inconvenience of midwife getting wet	1,465	1.70	1.75	-0.61	.54
Inconvenience of wearing shoulder length gloves	1,464	1.56	1.59	-0.32	.75
Infection risk to provider	1,465	1.71	1.66	1.75	.08
Difficult to see the perineum and presenting part during waterbirth	1,465	1.94	2.01	-0.98	.33
Difficult to get mother out of the tub for complications or delivery of placenta	1,465	2.57	2.64	-0.36	.72
Difficult to estimate blood loss	1,463	2.25	2.25	0.48	.63

Scale: 1 = Not concerned at all; 2 = A little concerned; 3 = Moderately concerned; 4 = A lot of concern; 5 = Extremely concerned

Table 18 - Concerns about Waterbirth by Past Observation of Waterbirth: Group Means and Wilcoxon Rank-Sum Tests

	n	Have Observed *Mean*	Never Observed *Mean*	z Score	p Value
Newborn water aspiration	1,464	1.85	2.37	-8.13	<.001*
Maternal infection	1,465	1.41	1.85	-8.28	<.001*
Newborn infection	1,464	1.49	1.93	-7.56	<.001*
Hypothermia of newborn	1,465	1.75	2.06	-5.34	<.001*
Maintenance of water temperature	1,465	2.02	2.37	-5.76	<.001*
Stress on the midwife related to body mechanics	1,465	2.49	2.85	-4.92	<.001*
Inconvenience of midwife getting wet	1,465	1.68	1.95	-4.66	<.001*
Inconvenience of wearing shoulder length gloves	1,464	1.54	1.72	-3.55	<.001*
Infection risk to provider	1,465	1.64	1.85	-3.37	<.001*
Difficult to see the perineum and presenting part during waterbirth	1,465	1.89	2.36	-8.03	<.001*
Difficult to get mother out of the tub for complications or delivery of placenta	1,465	2.51	3.02	-7.12	<.001*
Difficult to estimate blood loss	1,463	2.20	2.47	-4.62	<.001*

Scale: 1 = Not concerned at all; 2 = A little concerned; 3 = Moderately concerned; 4 = A lot of concern; 5 = Extremely concerned

Table 19 - Concerns about Waterbirth by Past Attendance at Waterbirth: Group Means and Wilcoxon Rank-Sum Tests

	n	Have Attended *Mean*	Never Attended *Mean*	z Score	p Value
Newborn water aspiration	1,464	1.82	2.34	-8.80	<.001*
Maternal infection	1,465	1.40	1.80	-8.35	<.001*
Newborn infection	1,464	1.47	1.89	-7.95	<.001*
Hypothermia of newborn	1,465	1.74	2.01	-5.25	<.001*
Maintenance of water temperature	1,465	2.02	2.30	-5.14	<.001*
Stress on the midwife related to body mechanics	1,465	2.48	2.76	-4.07	<.001*
Inconvenience of midwife getting wet	1,465	1.68	1.87	-3.46	<.001*
Inconvenience of wearing shoulder length gloves	1,464	1.55	1.68	-2.76	.006*
Infection risk to provider	1,465	1.65	1.78	-1.49	.14
Difficult to see the perineum and presenting part during waterbirth	1,465	1.87	2.31	-8.37	<.001*
Difficult to get mother out of the tub for complications or delivery of placenta	1,465	2.49	2.97	-7.31	<.001*
Difficult to estimate blood loss	1,463	2.19	2.45	-5.15	<.001*

Scale: 1 = Not concerned at all; 2 = A little concerned; 3 = Moderately concerned; 4 = A lot of concern; 5 = Extremely concerned

Table 20 - Concerns about Waterbirth by Willingness to Introduce Waterbirth at a New Site: Group Means and Wilcoxon Rank-Sum Tests

	n	Willing *Mean*	Unwilling *Mean*	z Score	p Value
Newborn water aspiration	1,449	1.83	2.35	-7.27	<.001*
Maternal infection	1,450	1.41	1.78	-5.81	<.001*
Newborn infection	1,449	1.48	1.91	-6.61	<.001*
Hypothermia of newborn	1,450	1.76	2.00	-3.66	<.001*
Maintenance of water temperature	1,450	2.06	2.19	-2.10	.04
Stress on the midwife related to body mechanics	1,450	2.44	2.94	-6.57	<.001*
Inconvenience of midwife getting wet	1,450	1.65	2.01	-4.50	<.001*
Inconvenience of wearing shoulder length gloves	1,450	1.51	1.81	-4.29	<.001*
Infection risk to provider	1,450	1.60	1.95	-4.35	<.001*
Difficult to see the perineum and presenting part during waterbirth	1,450	1.89	2.28	-5.40	<.001*
Difficult to get mother out of the tub for complications or delivery of placenta	1,450	2.49	3.01	-6.82	<.001*
Difficult to estimate blood loss	1,448	2.18	2.48	-4.90	<.001*

Scale: 1 = Not concerned at all; 2 = A little concerned; 3 = Moderately concerned; 4 = A lot of concern; 5 = Extremely concerned

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