MSc. Integrated Product Design
Industrial Design Engineering
Delft University of Technology
Amsterdam UMC

Designing a Dignified Experience for the Water Method for Stillborn Babies between 28 and 42 Weeks Gestation

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PROGRAM
MSc. Integrated Product Design
Industrial Design Engineering
Delft University of Technology

MASTER THESIS
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April 2026

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“The baby may no longer be with us, but this memory remains with the parents. Even if you’re 30 when you lose your baby, you won't suddenly have forgotten it by the time you’re 90. It stays with you for the rest of your life. ”

Bereavement Specialist, 2026

ACKNOWLEDGEMENTS

I would like to thank many people, as this project would have not been the same without them.

I would like to thank my supervisors from the TU Delft, Marijke Melles and Marieke Sonneveld, for their support and advice during coaching sessions and key stages of this project, where I always felt calm and understood. Marijke's approach to design for hospital context was very valuable and she always gave detailed feedback that helped improve my academic writing. Marieke's experience of designing for the end of life inspired me. This graduation team made this project so much more enjoyable and I felt supported in every meeting.

Julia de Jong made me feel welcome in the design studio, always taking the time to brainstorm design ideas with me, show me prototyping techniques and support me during co-creation sessions. I'm grateful for all the stand-up meetings and feedback on how to communicate with nurses, but I'm also grateful for walking through the park, lunching together, singing karaoke together and taking me along to an operating room to observe how innovations are used in practice. I would like to thank Suzanne Janson for always being available to answer logistical questions and for being present at all the presentations. Thank you for your enthusiasm and looking out for future implementation of the project. Thank you, Ingrid Vetter, for your support, for arranging contacts with nurses and the obstetrics department, and for offering your perspective as a nurse during important meetings.

I would also like to thank the obstetrics department and all the nurses for their open participation, sharing their experiences and knowledge during interviews, evaluations, and co-creation sessions, and planning sessions during clinical hours, so that the entire department could be included. Thank you to Steunpunt NOVA for always making me feel welcome and at ease, and for taking the time to help me understand the parental perspective. I have so much respect for your passion in caring for parents who have experienced stillbirth. Your encouragement felt very special.

I would like to thank the entire prototyping and development team. Working in an environment where innovations for the hospital are created is very inspiring, and I have learnt a lot from you. Thank you for participating in the co-creation sessions and for offering your design expertise on my project. But also on a personal level, where I was always included and had fun during department events like the Christmas party and playing padel. Thank you, Coen and Robin, for the stand-up meetings and your feedback and helping me think about the next steps for this project. Thank you, Mark and Meindert, for explaining how the machines work in the workplace and for helping with 3D printing and vacuum forming. Thank you to Pim and Tim for giving advice on producibility and feasibility, and to Ad for taking the time to assist with 3D modelling and stability calculations. Thank you, Rosemijne, for giving feedback on academic writing and helping me with report structure. Thanks to Jaiden, Maimoona, Loes and Sanne, my fellow interns, for the fun conversations and lunches, and for the advice on my project.

I would like to thank everyone at PMB at the IDE faculty, with a special thanks to Don, for their patience, assistance with foam cutting my molds, insightful advice on prototyping, and helping with vacuum forming my final prototype. Thank you, Noor Doucet, for taking the time to brainstorm with me during the concept development stage.

Thank you to my friends for always listening and offering advice, and to my IDE buddies Charlotte, Liza, Laetitia, Faye, Jasmijn and Sarah, who I have known since the first day of IDE, for working with me on our graduation projects and enjoying walks and coffee breaks together. It was really special having you all there during these last years, and finishing this phase together was wonderful. Thank you, Sarah, for proofreading my report before my midterm. Thank you, Amber; as my roommate, you were always there for me on days when I was tired and you gave me so much support.

Finally, I would like to thank my family, who have supported me throughout this project. My sister Fleur offered her design expertise and helped me when I was stuck. Thank you, Bram, for proofreading my report and helping me to improve the academic level of my writing. And finally I want to thank my parents, who cooked for me, picked me up from Delft when I was tired, and always supported me in my project.

Emma

Delft, 2026

ABSTRACT

This report presents the design of a new, dignified experience for the water method for stillborn babies between 28 and 42 weeks that supports parents in their grieving process and fits within clinical practice. After a stillbirth, parents are given the opportunity to spend time with their baby and create memories. One method that can support this is the water method. The water method is a preservation technique where the baby is placed in cold water and laid in a water basin, which helps slow down deterioration and has a positive effect on the baby's skin. However, babies between 28 to 42 weeks are too large to fit inside the water basins. Nurses express the need for a solution that offers care and respect. The goal of this thesis is to design the technical requirements for the water basin and to design the interaction between primary stakeholders, nurses and parents.

This project follows a user-centered approach, involving nurses from the obstetrics department and bereavement specialists to include the parental perspective. Interviews, co-creation sessions and evaluations were carried out to understand stakeholders needs.

The final design, Memora, is a transparent water basin that is partially recessed into a base that provides space for personalisation and memory-making. Designed to fit into hospital environments, Memora has a tilting mechanism so that the basin can be easily emptied. The mobile stand ensures that the water basin can be positioned close to the parents, even when the mother is less mobile.

This project serves as a foundation for further development of Memora. The current design offers a warm, dignified and personal experience that supports parents in creating memories with their baby and fits within clinical practice. However, future work is still recommended to improve visual stability, optimize water outflow, integrate storage and to further develop the frame structure.

AI STATEMENT

AI tools were used to improve fluency and academic level in writing in text that was already written. Furthermore, DeepL was used to help translate quotes from interviews and evaluations, improve academic writing and help translate text that was written in Dutch.

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DELIVER converging

OUTCOME

01

INTRODUCTION



01 INTRODUCTION

This project is a collaboration between the Amsterdam university Medical Centre (Amsterdam UMC) and the faculty of industrial Design Engineering at TU Delft.

The collaboration originated at the obstetrics department from Amsterdam UMC, location AMC, where healthcare professionals support and care for mothers, babies and partners throughout pregnancy, labour, delivery and the postpartum period.

The obstetrics department approached the Verbeterde Zorgstudio, an internal design studio at Amsterdam UMC, location AMC, that develops and implements innovations to improve healthcare experiences. In collaboration with the Verbeterde Zorgstudio and TU Delft, this project explores how the experience of the water method after stillbirth can be improved for both families and healthcare professionals by designing a dignified and supportive water basin for use within the clinical context.

1.1 Background

More than 1.9 million babies worldwide are stillborn each year (UNICEF, 2025). In the Netherlands, four out of 1000 babies are born without signs of life (IGME, 2025). As a result, caring for families after stillbirth is a daily experience for nurses at the obstetrics department at Amsterdam UMC. Around 2550 babies are born at Amsterdam UMC each year, of which 270 baby's are stillborn between 12 and 42 weeks, and 42 baby's are stillborn between 24 and 42 weeks (personal communication, 2026).

Perinatal loss has deep psychological effects, in which care practices play an important supportive role. Perinatal loss has a lasting impact on parents, and can be experienced as unique and deeply intense. It is often accompanied with depression, anxiety, extreme fear and PTSD symptoms (Burden et al., 20216; Li et al., 2024). The quality of care provided by healthcare professionals, like nurses, midwives and obstetricians, before, during, and after birth plays an important role on perinatal bereavement (Jansen, 2025). Nurses within the Amsterdam UMC can support parents in memory-making rituals such as cutting the umbilical cord, making hand- and feet impressions and encouraging physical contact. These rituals can help parents create memories, strengthen their sense of parenthood and validate their child's existence. For some families, these rituals helped soften the immediate shock of death (Burden et al., 2016).

The time available for these rituals is limited by fast physical changes in the baby's body after birth. After birth, the baby's skin may begin to shrivel, change colour, darken, or part of the skin can come loose (Pantein Maasziekenhuis, n.d.). A stillborn baby has delicate, soft and very sensitive skin that can be sticky and dent easily (personal communication, 2025).

Several postmortem care methods are offered by nurses at Amsterdam UMC to slow down the physical deterioration of the baby. This thesis focuses on the water method. In the water method, the baby is gently placed in cold water within a water basin (Figure 1). The skin absorbs water and becomes smoother, the colour may return to a lighter shade, bruises even out, and the limbs become more movable (De Watermethode, 2025). In addition, the cold water surrounds and preserves the body evenly. Nurses at the obstetrics department describe the water method as a gentle and beautiful way for parents to stay close to their baby for as long as possible (Personal Communication, 2025).

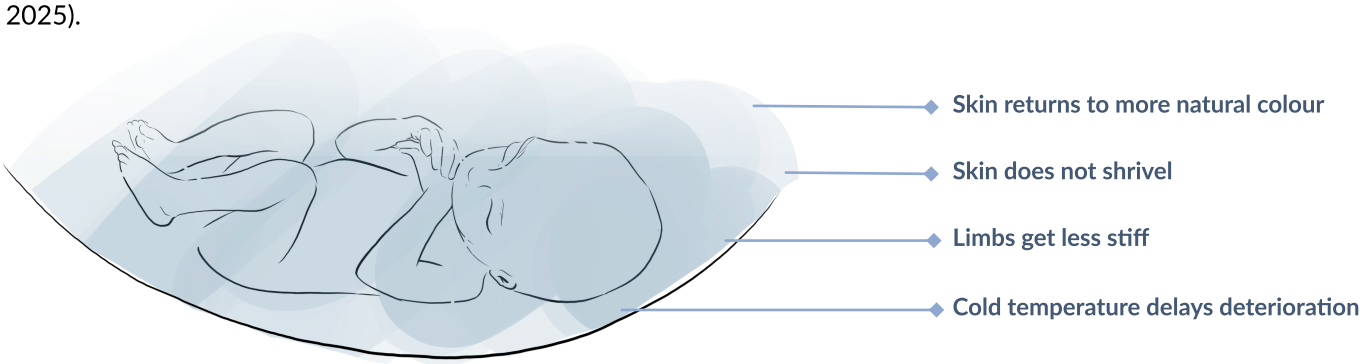


Figure 1, The effects of the water method on a baby's skin

1.2 Problem

The current water basins used for premature babies under 28 weeks are visually and emotionally appropriate (Figure 2 and 3). The smaller, round, glass bowls are appreciated by nurses, because they support the baby's natural position and are transparent (personal communication, 2025).

Unfortunately, no comparable water basin for babies between 28 and 42 weeks gestation is available. These larger babies are too large to fit inside the smaller basins, and are sometimes laid out in a large plastic container filled with water (Figure 4).



Figure 2, water basins for stillborn babies under 12 weeks



Figure 3, water basins for stillborn babies under 28 weeks



Figure 4, water basin for stillborn babies after 28 weeks

The current plastic container used for babies between 28 weeks and 42 weeks does not provide a dignified or supportive experience for parents or nurses. This container is not aesthetically pleasing, oversized, has rough edges on the bottom that leave dents and marks on the baby's skin, and is not sufficiently transparent for parents to see their baby clearly. In contrast to the smaller, round water basin, this solution feels practical rather than dignified (Personal communication, 2025).

Nurses express the need for a water basin that offers the same level of care and respect for larger babies. Therefore, a new water basin for babies between 28 and 42 weeks should be developed that meets the hospital requirements, is functional for nurses of the obstetrics department, and contributes to a respectful experience for parents.

Three key design challenges were identified in this thesis. First, hospital standards, infection prevention regulations, health regulations, and safety demands may cause restrictions for the design. Second, important stakeholders may have contradicting demands: for example nurses might prioritize usability, while parents need emotional support, and their perspectives may not always align. Finally, parents who have lost their child are a vulnerable group. To create a design that fits their needs, it is important to gather user information sensitively without adding to their grief. Furthermore, each parent has an individual grieving style, so the new experience should cater for these different needs.

"Design a water basin for deceased babies after 28 weeks that support parents in their grieving process and fits with care professionals in their nursing work. Take in account the technical requirements for the waterbasin, (emotional) interaction between parents, water basin, baby and care professionals."

- Problem statement

1.3 Approach

This graduation project follows the human-centered design approach, where the end-users were involved in each step of the design process. This approach was chosen because designing within the context of stillbirth involves highly emotional experiences and multiple stakeholders with differing needs. Actively involving these stakeholders helps make sure that the design fits to both the practical requirements and listens to the emotional needs.
In this project, nurses from the obstetrics department were involved through interviews, co-creation sessions, and evaluation moments. In addition, two bereavement specialists from Steunpunt NOVA, who support parents during the water method, were consulted to incorporate perspectives related to parental experiences. This thesis is structured using the four phases of the double diamond method: ***discover, define, develop and deliver*** (van Boeijen et al., 2020; Design Council, n.d.) (Figure 5).

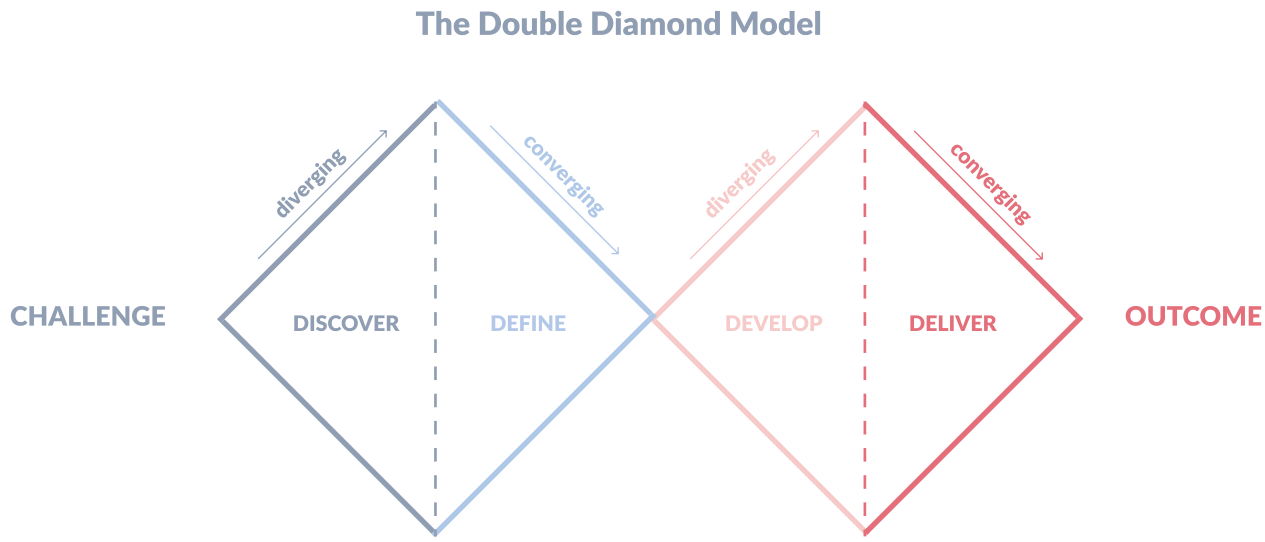


Figure 5, the double diamond model (van Boeijen et al., 2020; Design Council, n.d.)

In the ***discover*** phase of this human-centered interaction design project, the problem space is explored through literature, context visits, interviews and co-creations with nurses in order to understand the current context, practices, and stakeholder needs. Results of the discover phase are discussed in Chapter 2 until 6: Chapter 2 discusses the parents, Chapter 3 the nurses, Chapter 4 other relevant stakeholders, Chapter 5 existing interventions that are used in hospitals, and Chapter 6 discusses the experience of stillbirth at Amsterdam UMC.

During the ***define*** phase, main findings and conclusions are interpreted to a refined problem statement in Chapter 7. This problem statement, together with four design drivers, are a starting point for the ***develop*** phase. Chapter 8 contains the results of the ideas, sketches and LoFi prototypes that were developed into four concepts, the concept selection and its further development.

For the ***deliver*** phase, Chapter 9 discusses the chosen design direction and the development towards the final design. Chapter 10 presents the final design and the new dignified experience of the water method for stillborn babies between 28 and 42 weeks gestation. Chapter 11 discusses the results of a final evaluation with nurses and bereavement specialists regarding the design and user interaction. Chapter 12 discusses the final design and connects the findings from the evaluation to previous research. Additionally, this chapter contains a personal reflection and a message to fellow designers. Finally, Chapter 13 provides recommendations for further research before the final design can be introduced into a clinical setting.

02

PARENTS



02 PARENTS

This chapter explores how parents experience bereavement after stillbirth, including differences between mothers and partners and the influence of societal and cultural factors. In Section 2.2, the broader context of stillbirth is explored and visualised into a flow diagram followed by a parent journey. The section concludes with a mother's story, which gives insight into stillbirth at a personal level.

2.1 Parental Bereavement

All parents have their own unique way of responding to and coping with grief following the loss of their baby (Burden et al., 2016; Nuzum et al., 2018). Parents each have their own coping mechanisms and grieving styles. These can include changes in physical activity, sexual intimacy, or religious practices (Burden et al., 2016). Some parents may seek isolation as a way to process their grief, while others actively look for support from family, friends, or professionals. This shows the importance of providing personalised care after stillbirth (Farrales et al., 2020; Bezerra et al., 2024).

Literature shows that being recognised as parents through the actions and language of healthcare professionals affects parental bereavement. Parents of stillborn babies want to be treated as parents, just like those with living babies. This is not necessarily about being placed in the same environment as parents with living babies, as some parents reported feeling jealousy or emotional distress when placed close to couples with healthy newborns (Nuzum et al., 2018; Kingdon et al., 2015). Rather, it is about being recognised as parents through the actions and language of the caregivers. This includes calling the baby by their name, acknowledging the baby's and their own identity as parents, and offering the parents a chance to hold, dress and hug their baby, just as what would be done with any newborn (Kingdon et al., 2015; Farrales et al., 2020; Nuzum et al., 2018; L. Smith et al., 2020).

Grief can significantly affect parents' decision-making and their ability to absorb information before and after stillbirth (Helps et al., 2022). In several studies, parents reported experiencing long-term regrets about their decisions made shortly after the loss. For example, some parents who initially declined the opportunity to see their baby later regretted this decision, while those who did choose to see their baby did not (Kingdon et al., 2015). Healthcare professionals should revisit these decisions and offer parents multiple opportunities to change their mind (Kingdon et al., 2015). Positive descriptions of the baby made by caregivers will increase the chance of parents deciding to see the baby, making it important for caregivers to choose their words carefully (Kingdon et al., 2015; L. Smith et al., 2020).

2.1.1 Parental Bereavement in Mothers

Mothers (Figure 6) often experience a strong bodily and emotional connection to the baby, which can influence feelings of grief, guilt, and identity after stillbirth. The connection between mother and child develops during the pregnancy through fetal movements and physical change, which creates a bond (Bial Foundation, 2026). After a stillbirth, mothers may experience emotional responses to their body image and are more likely to experience decreased sexual activity and pleasure compared to fathers. In addition, some mothers blame themselves or feel blamed by others for bodily failure in relation to the loss of the baby (Burden et al., 2016).

The physical process of giving birth during stillbirth can amplify emotional distress for mothers. Despite knowing that their baby has died, mothers often experience the full physical process of childbirth and pain, such as contractions, dilation, and postpartum bleeding. The combination of physical pain of childbirth and the emotional pain of the loss can intensify psychological distress (Bezerra et al., 2024).

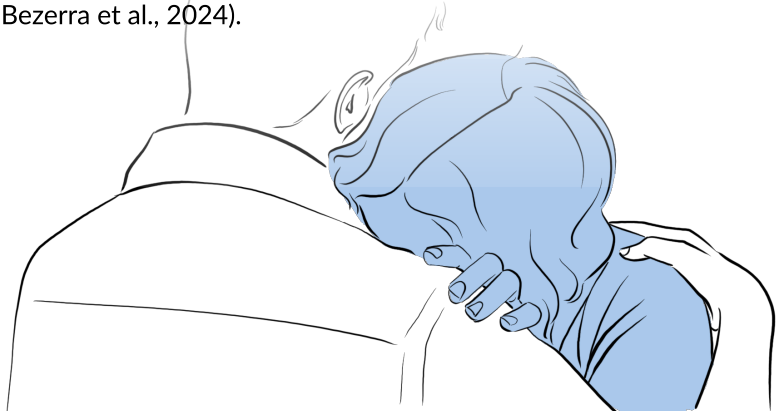


Figure 6, Perinatal bereavement in mothers

2.1.2 Parental Bereavement in Fathers and Partners

Fathers' grief after stillbirth is often overlooked, while they simultaneously experience strong emotional distress and role-related pressures (Figure 7). Men can experience high levels of grief and are more likely to suppress it (Bezerra et al., 2024; Obst et al., 2021). This suppressed grief can develop into complex grief, which is characterized as prolonged, non-linear, ongoing and persistent (Robinson and Robinson, 2022). Fathers are more likely to have to balance the protector role and provider role, where the protector role is only a negative contributor when it takes over father's needs (Burden et al., 2016; Obst et al., 2021).

Some fathers experience feelings of distance, jealousy, or tension in relation to their partner and their bond with the baby. In contrast to mothers, fathers generally begin bonding with the baby only after birth and therefore have had less time to physically bond with the baby (Nuzum et al., 2018). Some fathers feel envious of the mother, as she had more time to physically bond with the baby before the loss occurred (Nuzum et al., 2018). However, some fathers still felt a strong personal connection with the baby after a stillbirth (Robinson and Robinson, 2022; Nuzum et al., 2018).



Figure 7, Perinatal bereavement in fathers

2.1.3 Parental Bereavement in Society

Parental bereavement after stillbirth is not always acknowledged or validated by society. Some parents reported that mourning the death of a newborn is seen as a taboo and natural selection (Burden et al., 2016). Society does not always recognise parents as mothers and fathers after the loss of their child. Parents talked about how comments from others such as "Babies can be made again." devalidated their grief and feelings (Bezerra et al., 2024). Minimisation of parents' loss by others can cause shame and disenfranchisement (Obst et al., 2021).

Cultural beliefs can influence how parental bereavement is expressed and processed after stillbirth (Bezerra et al., 2024). For example, in Caribbean-African cultures, certain norms surrounding masculinity could potentially put additional pressure on fathers to stay strong and suppress their emotions. This would make it more difficult for men in these cultures to mourn openly (Robinson and Robinson, 2022).

2.2 The Experience of Stillbirth for Parents

This section explores the context of stillbirth for parents (Figure 8). First, we zoom out to the broader context, mapping out the different paths that families may go through. The overview presented in this section is informed by a combination of publicly available information, medical sources, and professional insights from nurses (Personal communication, 2025; Nhs, 2025a; Nhs, 2025b; Steunpunt Nova, 2025; VUMC, 2021).

Next, the focus shifts to one specific path within the broader context, which is elaborated as a journey. This journey explores the following phases: pregnancy, the period before birth, the birth itself, the immediate period after birth and the mourning phase. These phases are explored and mapped out in activities, challenges and touchpoints. The journey is based on a combination of the medical sources (Nhs, 2025a; VUMC, 2021) and blog posts that were shared by parents to understand their experiences and challenges (Reddit, 2025).

Finally, the section includes a reflection on a personal story shared by a mother, drawn from the newspaper column Leven na de Dood (Volkskrant, 2024). This personal experience can add depth and connect the overall journey to an individual perspective.

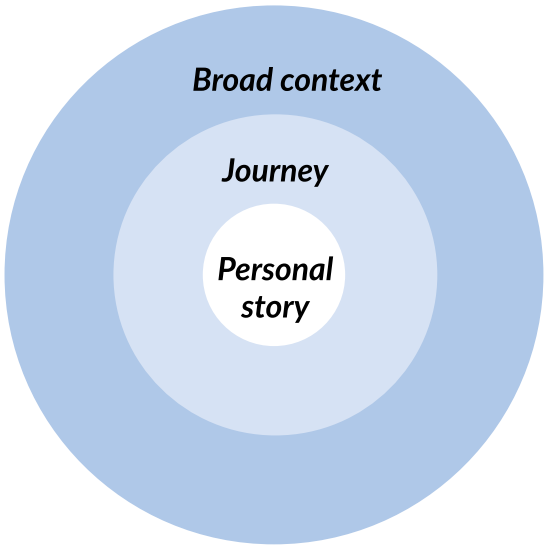


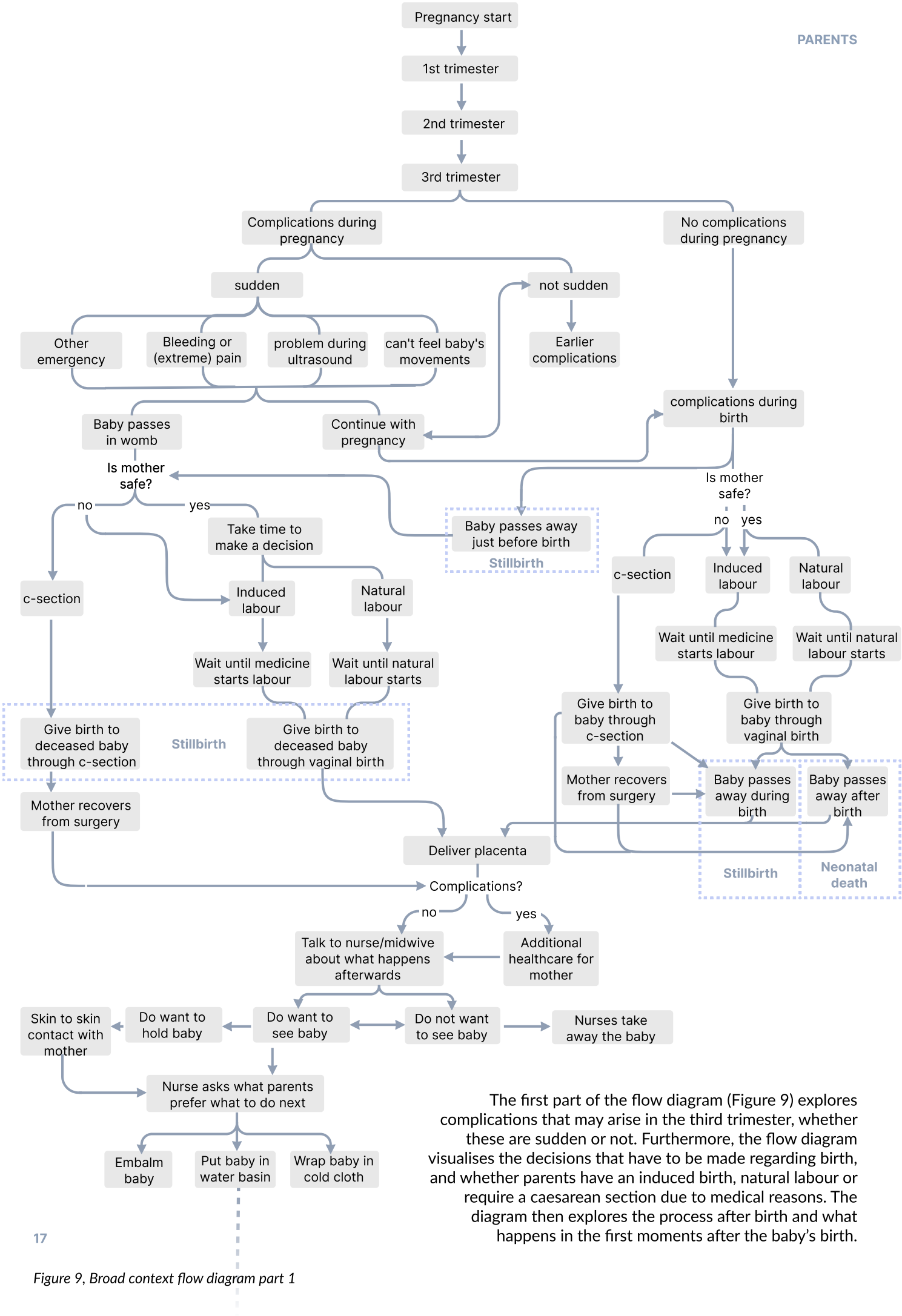
Figure 8, structure of the experience of stillbirth for parents

2.2.1 Broad Context

Every family follows its own path when a pregnancy ends in a stillbirth. It is important to emphasise that this emotional process can vary greatly from family to family. For example, some pregnancies might have earlier complications before the baby passes away, and some might not. This might impact the bereavement process and decision making capabilities.

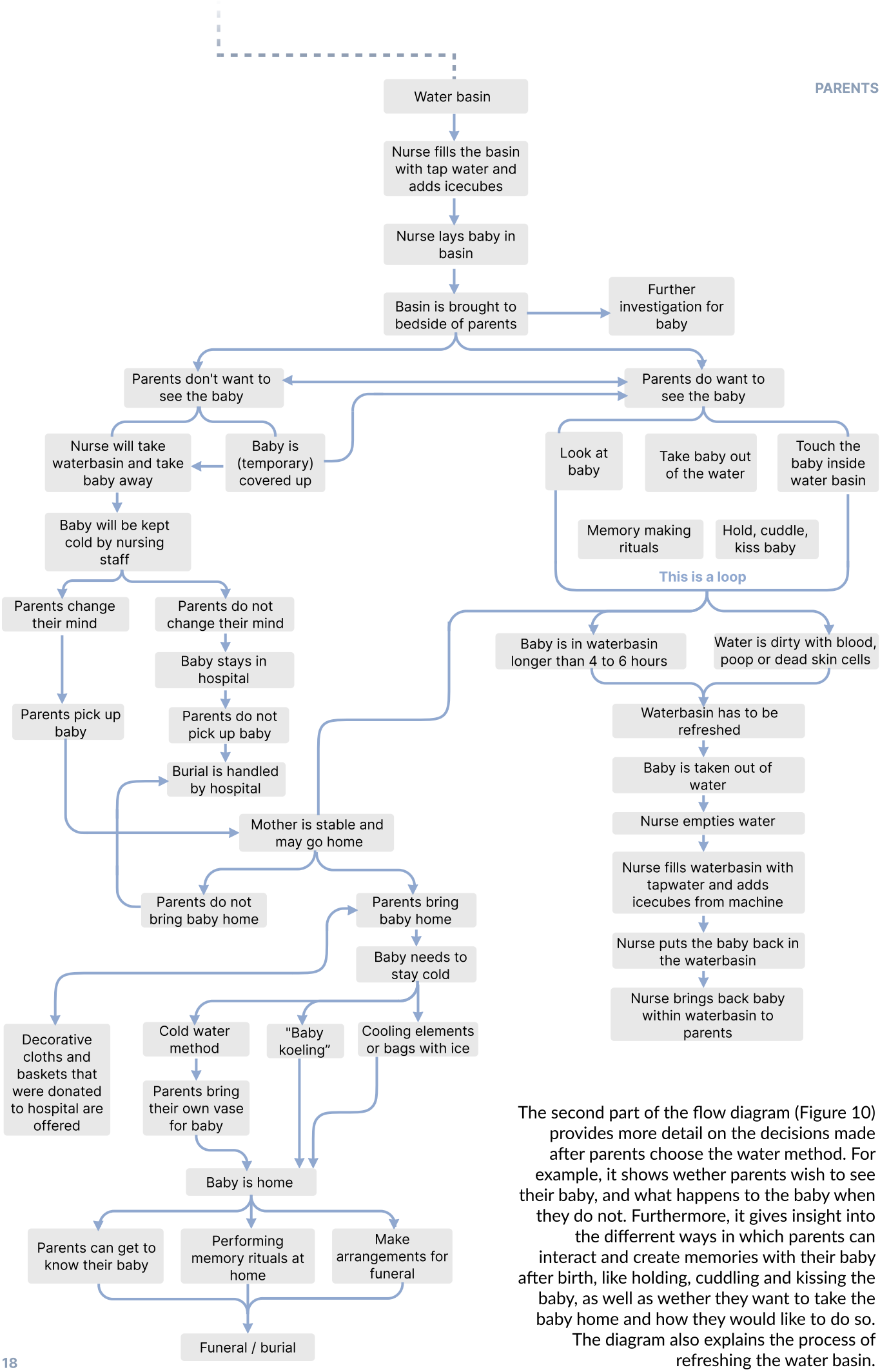
To understand these paths, research based on grey literature and publicly available information guides was done, including online information from hospitals and support organisations that inform parents about stillbirth, childbirth, and what happens afterwards (Nhs, 2025b; Steunpunt Nova, 2025). These sources were complemented with general medical information on stillbirth and birth procedures, including information on causes of stillbirth and pathways such as induced labour or spontaneous labour (Nhs, 2025a; VUMC, 2021). To fill unknown gaps in the overview were discussed during nurse interviews with nurses from the obstetrics department (Personal communication, 2025).

The results of this research is visualized in a flow diagram. The aim of this flow diagram is to gain insight into the various complications, choices, and options that families may encounter.



The first part of the flow diagram (Figure 9) explores complications that may arise in the third trimester, whether these are sudden or not. Furthermore, the flow diagram visualises the decisions that have to be made regarding birth, and whether parents have an induced birth, natural labour or require a caesarean section due to medical reasons. The diagram then explores the process after birth and what happens in the first moments after the baby's birth.

Figure 9, Broad context flow diagram part 1



The second part of the flow diagram (Figure 10) provides more detail on the decisions made after parents choose the water method. For example, it shows wether parents wish to see their baby, and what happens to the baby when they do not. Furthermore, it gives insight into the different ways in which parents can interact and create memories with their baby after birth, like holding, cuddling and kissing the baby, as well as wether they want to take the baby home and how they would like to do so. The diagram also explains the process of refreshing the water basin.

Figure 10, Broad context flow diagram part 2

The flow diagram illustrates that the journey of parents after stillbirth can become complex and differs from family to family. It is important to realise that each family might have experienced different challenges, and that this is taken into account while caring for them after a stillbirth. Furthermore, the diagram visualises the many decisions parents need to make, such as which preservation method they choose, deciding when they want to see the baby or not, which rituals they want to perform, and how to take the baby home. The diagram also gives insight on how some of these decisions could be reconsidered by parents.

2.2.2 Journey of Parents

One journey that a family might follow is explored in greater depth by looking at their activities, emotions, challenges, parties involved, and touchpoints that play a role in the experience of stillbirth and is visualised in Figure 11 to 14. The journey is based on a combination of the previously mentioned medical sources (Nhs, 2025a; Nhs, 2025b; Steunpunt Nova, 2025; VUMC, 2021), information on standard ultrasounds (Verloskundigen Praktijk Nieuw-West en Badhoevedorp, n.d.), and public blog posts of multiple parents about their personal experiences around baby loss. Furthermore, the journey was supported by information received from interviews with nurses from the obstetrics department of Amsterdam AMC (Personal communication, 2025).

The first part of the journey (Figure 11) describes the stages of the pregnancy and challenges that come with the first, second and third trimester. It includes standard ultrasounds, as well as activities such as sharing the news of the pregnancy, having a baby shower, preparing the nursery and deciding on a name. Uncertainty about the pregnancy, and anxiety about miscarriages and many physical symptoms are the main challenges during the first trimester (Mayo Clinic, 2024). During the second trimester, mothers often begin to feel fetal movements, which can strengthen the physical and emotional bond with the baby (Bial Foundation, 2026). During the beginning of the third trimester, when families have not experienced any complications during pregnancy, confidence in the pregnancy grows and preparations are made for the baby's arrival.

The second part of the journey (Figure 12) goes into detail about sudden complications, receiving the news of the passing of the baby, inducing labour, and the stillbirth itself. When the pregnancy has sudden complications, this can come with a lot of anxiety and panic. During the diagnosis, parents may experience an out-of-body feeling and suddenly have to make all sorts of decisions while barely having time to process the loss. One of the biggest challenges during induced labour is that this marks the first step towards the end of the pregnancy, and that the medication used to induce the birth can take a long time to start working. During stillbirth, the physical pain and emotional pain come together, which may be an overwhelming experience for families (Tommy's, n.d.).

After birth (Figure 13), parents experience the first moments together with their baby and begin to get to know them. There can be a lot of emotions involved like sorrow, however some parents may also experience feelings of pride and happiness upon meeting their baby (Personal Communication, 2025). During this time, parents can see the details of their baby, decide whether they want to hold the baby, and perform memory-making rituals (Personal Communication, 2025).

After these first moments, parents are asked whether they wish to use the water method or another preservation method. The main challenge during this phase is the number of decisions that need to be made, deciding on the presence of visitors, and making preparations for the future. In combination with exhaustion and grief, this can be overwhelming (Tommy's, n.d.). Finally, the limited time available at the hospital can be stressful for parents and create pressure, as the mother is usually discharged within 24 hours of giving birth (personal communication, 2025).

When the parents leave the hospital (Figure 13), he baby can be laid out in a basket brought from home or in a container provided by the hospital. This moment involves practical and logistical arrangements to prepare for the release from the hospital. Once at home, parents must make arrangements for the funeral and manage practical tasks, while still taking time to bond with their baby before the funeral. Furthermore, parents have to navigate interactions with society with other baby's, children and other people's pregnancies.

During the funeral (Figure 14), parents may experience pressure to organise a meaningful ceremony, knowing this may be the last time they see their baby. The final phase of the journey is the bereavement period, which can last for a long time. Parents may engage with bereavement rituals, such as lighting a candle, visiting the grave, or starting therapy. Bereavement may involve intense waves of grief (Taladay-Carter & Gunning, 2024), differences in grieving between partners and strain on relationships (Robinson & Robinson, 2022), and parents may be confronted with their loss during birthdays and holidays (Dönmez, 2019).

Patient journey: Mother and partner

Phase	Early pregnancy *week 4 - 6 of pregnancy*	2nd part of 1st trimester *week 7 - 12 of pregnancy*	2nd trimester *week 13 - 26 of pregnancy*	3rd trimester *week 27 - 42 of pregnancy*
Time frame	2 weeks	6 weeks	12 weeks	12 weeks
Activities	▸ Home pregnancy test ▸ Share news with partner ▸ First GP visit to confirm pregnancy Excitement/celebration for pregnancy Information finding	▸ Early ultrasound: confirm pregnancy, heartbeat (w7) ▸ Term ultrasound: Measure baby, confirming due date (w10) ▸ Telling close family, like parents and other children about pregnancy. ▸ Bonding with growing baby General GP visit First pregnancy symptoms like nausea, tired)	▸ Growth Ultrasound: Check development of baby (w12/14) ▸ Gender determination ultrasound (w16) ▸ 20-week ultrasound: Examine organs, skeleton, growth ▸ Telling other family and friends about pregnancy (and gender) ▸ Brainstorm or determine a name for baby ▸ Plan for future of baby (like room, buy clothes) ▸ Baby will start moving ▸ Bonding with growing baby ▸ Feel less anxious about having a miscarriage	▸ Position ultrasound: position of baby, size of baby, check placenta and amniotic fluid (w36) ▸ GP checkups ▸ Baby shower with family and friends ▸ Finish baby room and preparations at home
Emotion				
Challenges	When have experienced miscarriage or childloss before, parents can experience anxiety when hearing they are pregnant again Not knowing when to tell others Uncertainty	Often in the first trimester, mothers experience many pregnancy symptoms, like morning sickness. The early stages of the pregnancy, they might have anxiety about a miscarriages Waiting between ultrasounds How to tell family and siblings?	Usually more energy compared to first trimester, but still some physical discomfort from pregnancy Waiting until 20 week scan can be anxious	The baby starts growing and belly gets heavier to carry. Mother experiences fatigue Making preparations to be ready for birth
Children / Siblings				
(Grand)parents				
Close family				
Friends				
GP				
Sonographer				
Amsterdam UMC				
Nurses				
Doula				
Obstetrician				
Departm neonatologie				
(Hospital) Chaplain				
Funeral undertaker				
Insurers				
Touchpoints	Home pregnancy kit First phone contact GP consultation	Pregnancy test Ultrasound room Ultrasound image	Gender reveal moment Shopping for baby clothes	Position ultrasound baby shower Gifts Preparing hospital bag Birth plan

Figure 11, Journey mother and partners, pregnancy

Parent journey

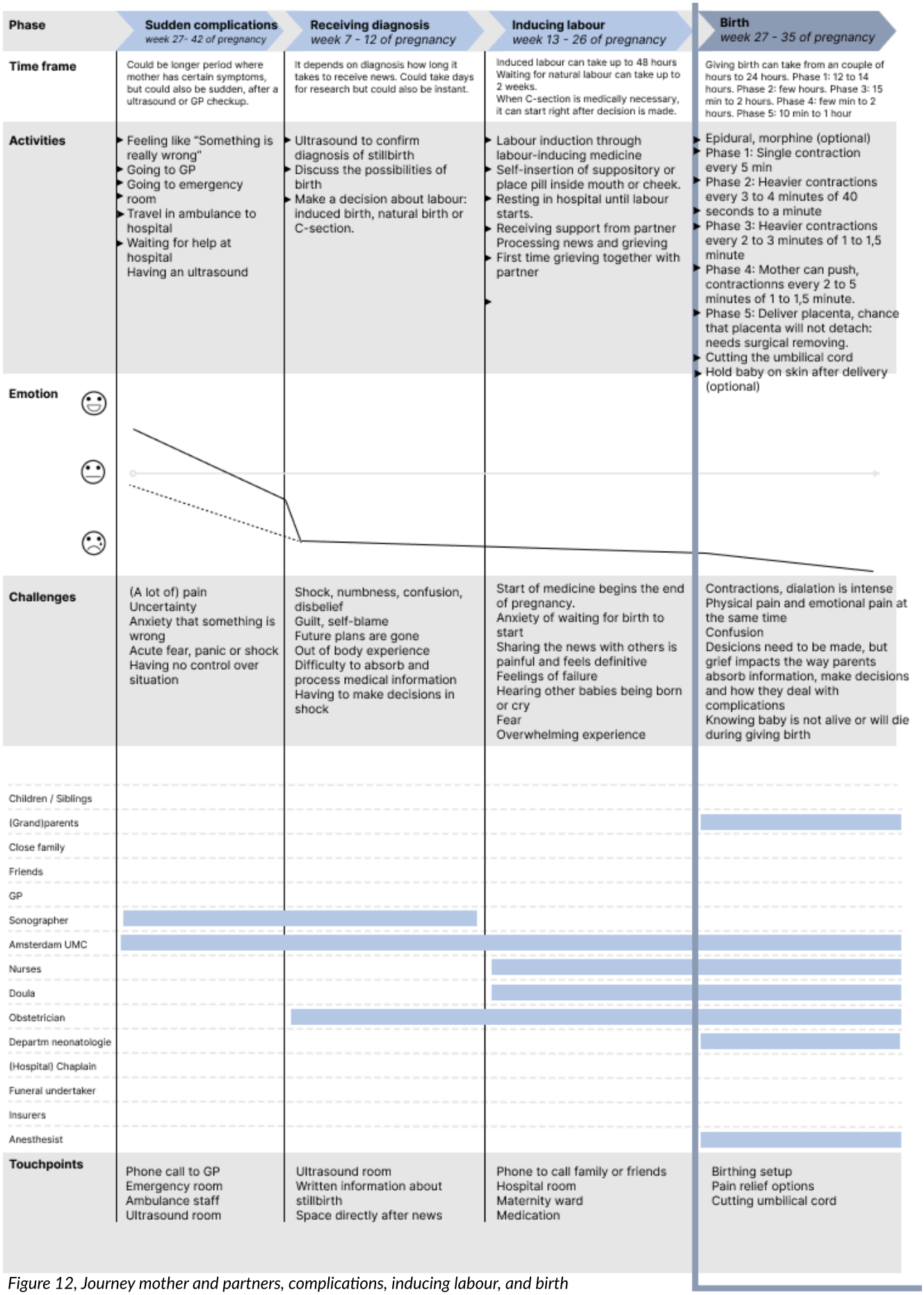


Figure 12, Journey mother and partners, complications, inducing labour, and birth

Parent journey

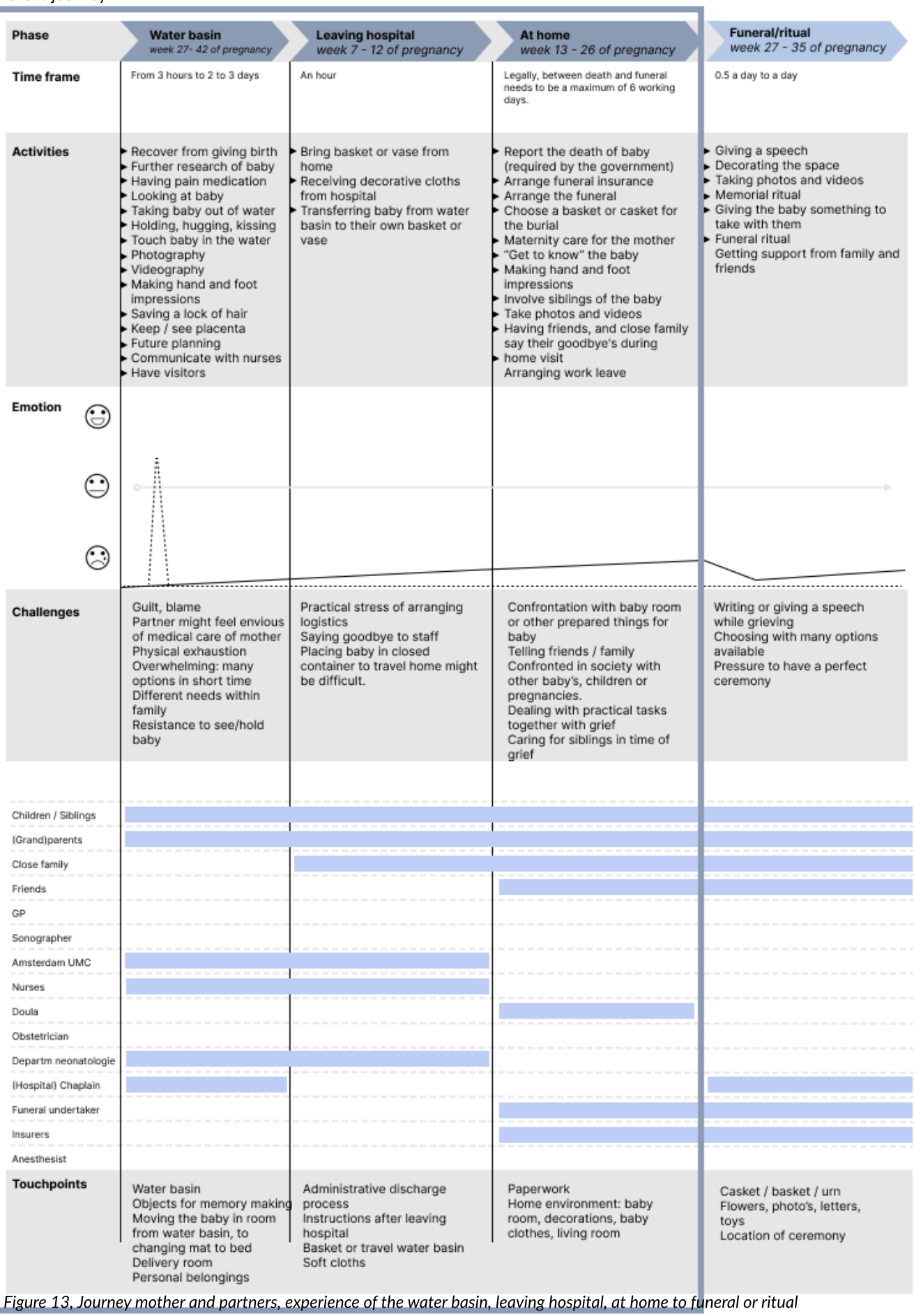


Figure 13, Journey mother and partners, experience of the water basin, leaving hospital, at home to funeral or ritual

Parent journey

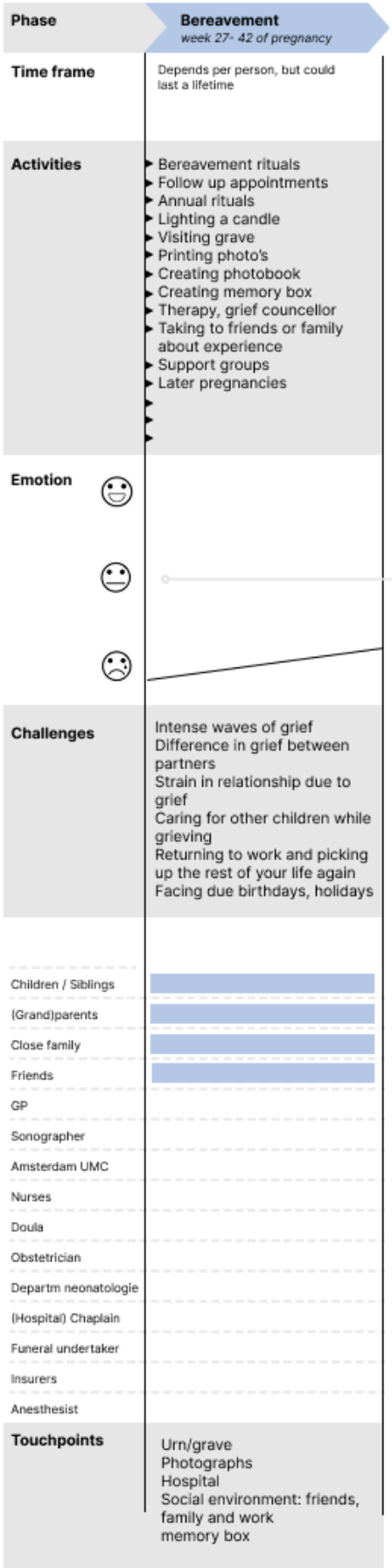


Figure 14, Journey mother and partners, bereavement

2.2.3 A Personal Story

A story, published in the Volkskrant (Van Veen, 2024), in the column Leven na de Dood, tells the experience of Romi, her partner and their daughter of the stillbirth of their son, Max. This story gives an unique perspective on parental grief and challenges faced by one family after stillbirth.

According to Romi, her grieving process already began during pregnancy after learning about her son's heart abnormalities. She described that as a form of self-protection she started distancing herself emotionally, because she was afraid that her pain would only become heavier if she grew more attached. During the interview she reflected about how she not only lost her child, but also her dreams and imagined future. Moments like birthdays or holidays would become painful reminders of her child's absence.

Romi and her partner made different decisions regarding seeing and holding their baby after the stillbirth. Romi initially hesitated to see her baby but decided to do so because she realised it was her only chance, and chose to hold him. Her partner, however, decided not to.

The article also describes the involvement of a sibling in the family's experience after the stillbirth. Romi's daughter, Rosa (5), held her brother with curiosity and calmness. She described him as "so small".

Romi recounts several interactions with others that influenced how she experienced recognition as Max's mother. When she went to pick up Max at the mortuary, the worker asked if she was "the mother of Max." which was a meaningful confirmation of identity for Romi. Later, when picking up photographs taken during the birth, a cashier commented that Max looked beautiful. Romi was grateful for this interaction.

2.2.3.1 Reflection on Personal Story

Romi's experience shows how parental grief can be influenced not only by the birth itself, but also by experiences during pregnancy and the period after giving birth, and how grief can start before the baby has passed away.

Her story also showed the dilemmas, complexity and emotional weight of decision-making after losing a child, and how people within the same family can make different decisions. It is valuable to include the whole family with family-centred care, so that siblings or grandparents have the opportunity to meet the baby as well. Not all children will have the realisation of the situation, but for some it might be valuable and help process the loss. It is important that siblings have the opportunity to be involved.

Recognising parents' identity and using positive descriptions of the baby can support their bereavement process, both from healthcare professionals and in wider social situations.

2.3 Conclusion parents

Parental bereavement after stillbirth is a complex and personal experience that is different for every family. Parents grieve in different ways and are influenced by their physical experiences, emotions, relationships, and the way they are recognised by healthcare professionals and society. Feeling acknowledged as parents, being supported in decision-making, and having space to change decisions during the hospital stay influence how parents experience care before and after stillbirth and have a positive impact on their bereavement process.

Parents have to make many difficult decisions during stillbirth while dealing with shock, grief, physical and emotional pain. These decisions are made under time pressure, and may be influenced by their ability to absorb information before and after stillbirth. At the same time, parents are confronted with the sudden loss of a future they had been planning for their child, including preparations such as baby clothes, toys, or a nursery.

The final design should take the complexity of parental bereavement into account and recognise that each family has followed a different path and has different needs. It should support parental identity, allow space for different grieving styles, and support family involvement with memory-making rituals. Creating space for personal items, such as baby clothes or toys, may help parents connect with their baby and the future they had imagined.

2.3.1 Requirements

Based on the conclusions of this research, these important design requirements and wishes were discovered:

REQUIREMENTS

- The design should support a family-centered approach, including both parents to be involved and support them in their grieving process (Literature, personal story)
- The design should not be a one-fits-all solution, but allow for different grieving styles coping mechanisms, and emotional needs (Literature, flow diagram, personal story)
- The design should encourage parents in seeing, holding and physically being with their baby (Literature, personal story)
- The design should allow parents to change their minds over time, for example about seeing or holding baby without adding pressure. (Literature, flow diagram, personal story)
- The design should not add to cognitive burden, since parents may have limited capacity to absorb information due to shock, grief, emotional and physical pain (Literature, journey)

NICE TO HAVES

- The design should support parental identity, for example by recognizing parents as mother(s) and father/ partner (Literature)
- The design should allow space for personal items, such as baby clothes, toys or blankets (Journey)

03

NURSES



03 NURSES

An obstetrics nurse is a nurse who is specialized in the field of obstetrics. This field of medicine focuses on the care of women prior to conception, during pregnancy and childbirth, and on the care of the baby and family after birth (Montgomery, 2024).

Obstetrics nurses are one of the end-users of the water basin, since they are who will interact most with it. They interact with practical tasks like moving, using, filling, cleaning and storing the water basin (Personal Communication, 2025). To gain insight into the role and journey of obstetrics nurses who support families during a stillbirth, interviews were conducted with nurses from the obstetrics department of Amsterdam UMC. In addition, a context visit (Appendix C) to the department provided practical insights. Medical sources, including hospital websites and relevant literature, were consulted to complement the research.

The first section discusses the role of nurses in the experience of stillbirth. The second section focuses on their impact on parental bereavement. Finally, the journey of nurses is mapped out in Section 3.3.

3.1 Role

Nurses play a major role in supporting parents when a baby is stillborn. They help assist the doctor or obstetrician during and after childbirth and care for mother, child and partner (Montgomery, 2024). They mentally and physically care for them, and help create memories for the family by encouraging cutting the umbilical cord, taking pictures, making hand- and foot impressions and helping with initial physical contact (Personal communication, 2025). Nurses prepare the water basin, when parents have chosen the water method. Nurses inform parents on what steps come next.

While each parent's experience and needs are very personal, nurses may recognize patterns and similarities in the situations they have been part of. Nurses experience situations where a baby is stillborn weekly and support many families through this process, as well as hear stories shared by colleagues (Personal communication, 2025). Because of this, they hold valuable general insights into what parents and the baby need during this time.

3.2 Impact of Healthcare Professionals on Parental Bereavement

Healthcare professionals, like nurses, obstetricians and midwives (Figure 15) have a major impact on the parental bereavement process (Kingdon et al., 2015; Nuzum et al., 2018; Fernández-Férez et al., 2021; Farrales et al., 2020). Clear communication, compassionate and honest care, and the acknowledgement of parents' and the baby's identity affects parents' wellbeing and help reduce grief (Kingdon et al., 2015; Nuzum et al., 2018; Helps et al., 2023; Farrales et al., 2020; L. Smith et al., 2020). Furthermore, caregivers influence parents' decision making, which impacts their long-term regrets (Burden et al., 2016; Kingdon et al., 2015; Nuzum et al., 2018). Without appropriate training, awareness of interventions and adequate skills, healthcare professionals may have a negative effect on the experience of stillbirth and parental bereavement (Fernández-Férez et al., 2021; Bezerra et al., 2024; Robinson & Robinson, 2022). For example, studies have shown that only 20% of caregivers provide memory-making rituals.

Supporting healthcare professionals is important for their own well-being, but also affects the support they can give to grieving parents. Therefore it is important to address of the needs of healthcare professionals. The needs of healthcare professionals are not often discussed in literature. However, some studies mentioned the importance of nurses feeling safe, having peer support available and receiving proper training to care for parents after a stillbirth (Fernández-Férez et al., 2021; Robinson and Robinson, 2022; Bezerra et al., 2024).



Figure 15, Nurse caring for baby

3.3 The Experience of Stillbirth for Nurses

This section explores the experience of stillbirth for nurses, mapping out the activities, emotions, stakeholders and touchpoints in a journey. The information for this nurses' journey was gathered from observations at the obstetrics department and interviews with nurses, with the nurses' emotions supported by direct quotes (Personal communication, 2025).

3.3.1 Journey of Nurses

To map out the experience of a nurse supporting a family going through stillbirth, all activities, emotions, challenges are illustrated in a journey in Figure 16 and 17.

Nurses can experience a range of emotions when supporting a family through stillbirth, particularly at the moment of birth when physical and emotional pain come together, which can be challenging. Moreover, when confronted with circumstances that mirror their own, the intensity of the experience can increase. However, with work experience, nurses can learn to distance themselves professionally, and helping parents can also be rewarding. Peer support is available within the team, so nurses can support each other.

Beside the emotional impact of the situation itself, nurses also reflected on how the material and spatial aspects of care affect their experience. Nurses expressed feelings of shame when offering the water basin to parents, because some believe that it resembles storage boxes that are kept in the attic, and are unfit to use for a stillborn baby.

Additionally, the travel containers, where babies can be placed in when they go home, are not well received because they are too cramped, and do not fit the emotional weight of the situation.

In some cases, nurses take photos for parents after a stillbirth. Some nurses take the photos in the delivery room, while others prefer to take them in the washing-up room. Some nurses have had difficulty operating a professional camera, and others have mentioned feeling that there is limited space in the washing-up room.

Alongside these emotional and practical concerns, nurses also addressed physical challenges that come with preparing, refreshing and cleaning the water basin (Personal Communication, 2025). The water basin is too heavy, and is currently transported on a trolley. Due to the size and weight of the water basin, emptying and transporting is difficult and can cause water to spill over the edge.

Throughout all these moments, it is important for nurses to assess the right moment to share information, as well as to assess when parents have the capacity to make decisions.

> ***"[I am] ashamed to offer something that actually had a different original function, and to put parents' most precious possession in it."***
> ***– Obstetrics nurse, Amsterdam UMC***

Patient journey: Nurse

Phase	Supporting birth *week 27- 42 of pregnancy*	First moments *week 7 - 12 of pregnancy*	Making memories *week 13 - 26 of pregnancy*	Preparing water bassin *week 27 - 35 of pregnancy*
Time frame	Giving birth can take from an couple of hours to 24 hours.	10 min to 2 hours	Memories are made during other phases as well, so dependent how long these take. Hand- and foot impressions & filling in memory card about 10 to 20 minutes.	10 minutes
Activities	▸ Support mother and partner ▸ Care for baby ▸ Offer emotional support to mother and partner ▸ Help with pain management ▸ Help with positioning and breathing of mother ▸ Assist doctor or midwife during birth	▸ Support mother and partner, emotionally and physically ▸ Care for baby, check wether baby needs additional care or needs to be cooled. ▸ Checking of baby's condition ▸ Take pictures of initial moments, first time holding, hugging, kissing the baby.	▸ Take pictures of the baby while the parents are holding the baby. ▸ Take pictures of baby on Celstofmat ▸ Take close up pictures of details of the baby, like the face, hands, feet. ▸ Make hand and feet impressions ▸ Selecting a few pictures and printing them out ▸ Filling out the memory card (herinneringskaartje) with baby's information ▸ Contact stichting Nova	▸ Ask if parents want to use the water method. ▸ Get water bassin from storage ▸ Carry water bassin from storage to coffee room to ice machine ▸ Fill water bassin with ice cubes ▸ Carry water bassin to delivery room. ▸ Fill water bassin with tap water at the sink ▸ Put the water bassin on the trolley ▸ Put baby in water bassin
Emotion	*Wanneer het onverwachts zo eindigt weet je het natuurlijk niet, en die zijn net even wat heftiger dan wanneer je het al weet, ook voor ons.* *het is ook wel een beetje het besef dat dit gebeurt en dat het intens verdrietig is, maar vooral voor ouders en niet voor mij* **Birth of stillborn baby** *"Dan komen meestal de pijn van de bevalling en de emoties heel erg samen. Dat zijn altijd wel hele intense momenten"*	*"Er zijn heel veel mooie momenten ook hoor, ook in zo'n bevalling. Hoe blij mensen ook nog kunnen zijn als die baby geboren wordt."* *"Ik kan echt nog wel wel met tranen in mn ogen staan als mensen dan zo verschrikkelijk verdrietig zijn als de baby is geboren."*	*Wat ik altijd wel fijn vind, is als je een hele mooie foto kan maken. Dat als je echt denkt "Het kindje staat er heel mooi op" dat vind ik altijd wel mooi.* *En ook hoe blij ze kunnen zijn met wat wij voor ze doen, dat geeft heel veel voldoening.* *Ouders worden hoe dan ook ouders, ze zijn ook gewoon heel trots. Ze zien hun kind, ze zien op wie die lijkt, hoe klein de vingertjes zijn, hoe mooi de handjes zijn. Dat maakt die zorg heel mooi*	*Die curverbakken, ja sorry, het ziet er gewoon niet uit* *... beschaamd bent om iets aan te bieden dat eigenlijk een origineel andere functie had om daarbij je allerbaarste in te leggen.* *"Ik vind eigenlijk alles een beetje vervelend aan die bak. Het idee dat je die baby in een ikea bak stopt, weet je zo. Ja, dat gun je dan die mensen niet, die baby ook niet"* **The shame of taking out the water basin**
Challenges	Pain and emotions from mother come together which creates an intense moment Sometimes the baby passes away suddenly, this can be intense for nurses too	A lot of information and decisions need to be told without overwhelming the parents Nurse cares for mother, baby and partner but also needs to take pictures during the first moments.	There is not always enough space to take beautiful pictures There is not always a nice background to take pictures Camera can sometimes be difficult to handle, since it is too complicated Baby's skin can be sticky, so the baby cannot lay on fabric Making hand and foot prints can be stressful and delicate work	Nurses are ashamed of offering the water basin because of its appearance and initial function Water basin needs to be put on a trolley when it's filled with water because it is heavy Water might splash while moving water basin Trolley is not always available, and nurses need to find something else to move water basin with. Smaller water basin (glass bowls) do not fit
Mother	■	■	■	■
Partner	■	■	■	■
Children / Siblings		■	■	
Amsterdam UMC	■	■	■	■
Departm obstetrics	■	■	■	■
(Grand)parents	■	■		
Other nurses	■	■	■	■
Obstetrician	■	■	■	■
Doctor	■			
Anesthesist	■			
Mortuary				
(Hospital) Chaplain				
Touchpoints	**Place**: Delivery room **Tools**: Supplies to support mother, partner and baby during birth, celstofmatje	**Place**: Delivery room **Tools**: Camera, phone, celstofmat, changing mat, supplies to support mother, partner and baby directly after birth	**Place**: Delivery/maternity room, storage room, washing up room **Tools**: Camera, stamp pad, skin friendly ink, celstofmatje, changing mat, memory card, Blanco card, Bleach for stopping skin from flaking, cleaning supplies for the ink, cotton swabs, donated cloths.	**Place**: Delivery/maternity room, storage room, hallway, coffee room, washing up room **Tools**: water basin, (adjustable) sink, trolley, ice machine, ice cubes, tap water

Figure 16, Journey nurses, birth, memory making and preparing the water basin

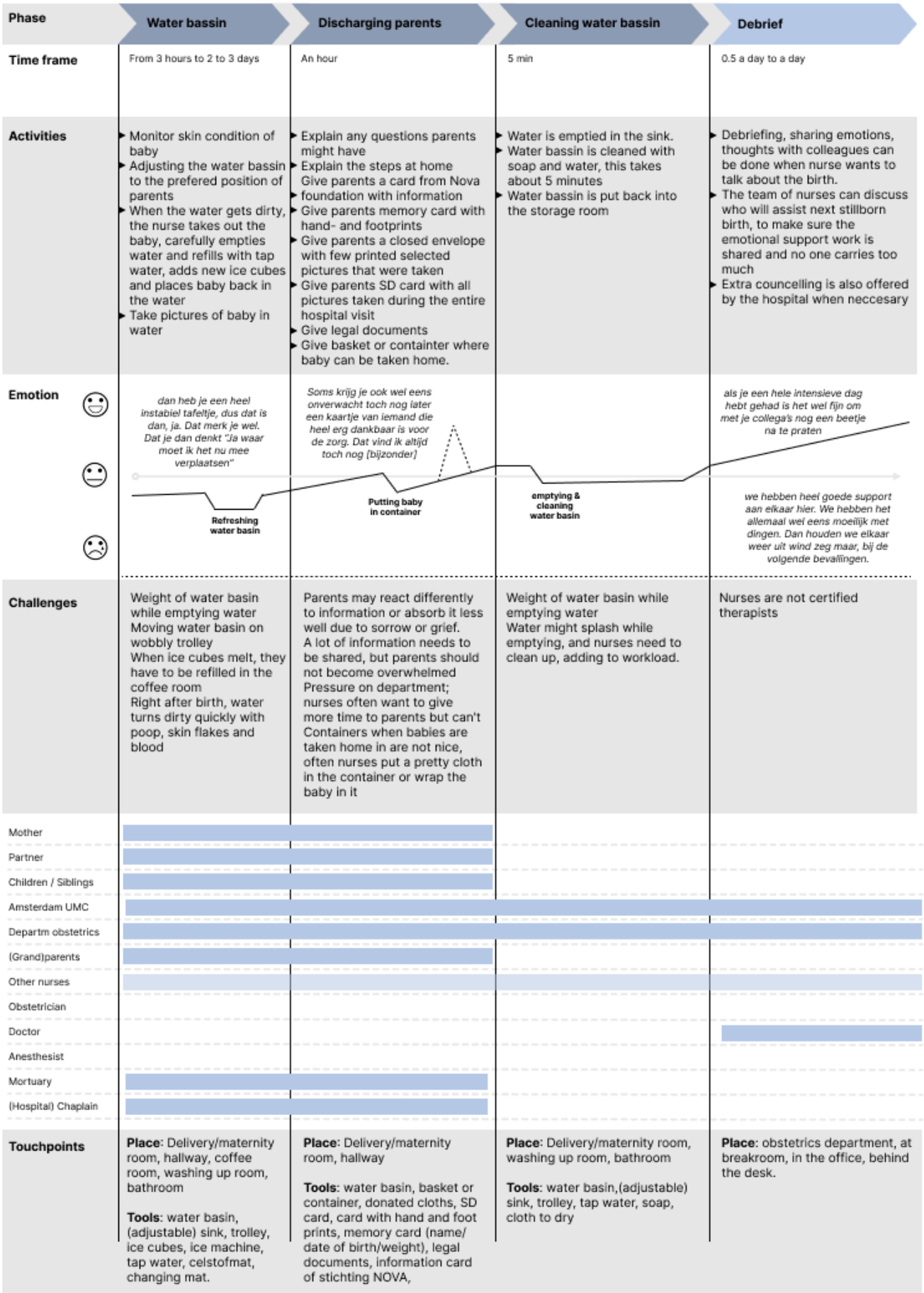


Figure 17, Journey nurses, the experience of the water basin, discharging parents, cleaning the water basin and debrief

3.4 Conclusion nurses

Nurses play a major role in supporting parents after a stillbirth, and have a significant influence on parents' experience and bereavement process. Appropriate training, awareness of interventions, adequate skills and attention to nurses' needs are important. Identifying the right time to share information with parents and assessing wether parents have the capacity to make descisions may be a challenging for nurses.

Nurses can experience stronger emotional responses when a situations mirror their own circumstances. Work experience can help nurses create professional distance. Some nurses reported feels of shame when offering the current waterbasin to parents.

Several practical concerns were raised, such as the weight of the water basin and the difficulty of cleaning, moving and emptying it. Furthermore, multiple issues with taking photographs of the baby were identified, such as problems with available space and the difficulty of camera operation.

3.3.1 Requirements

Based on the conclusions of this research, these important design requirements were discovered:

REQUIREMENTS

- Water in the water basin should stay fresh and should be refreshed when dirty and should be able to be cleaned according to the protocols of the hospital (Journey).
- Emptying and refreshing the water should be possible without physical strain for the nurses (Journey).
- The water basin should fit in the nursing work of healthcare professionals (Literature)
- Healthcare professionals should not feel ashamed when offering the water basin to parents (Journey).

NICE TO HAVES

- The water basin should support bereavement photography (Journey).

04

OTHER STAKEHOLDERS



04 OTHER STAKEHOLDERS

Next to parents and nurses, other stakeholders are involved in the process of stillbirth and the use of the water basin. In Figure 18, these stakeholders are mapped out and structured based on how the water basin affects them into primary stakeholders, secondary stakeholders and tertiary stakeholders. In this chapter, their role in the process of stillbirth and their needs are explored.

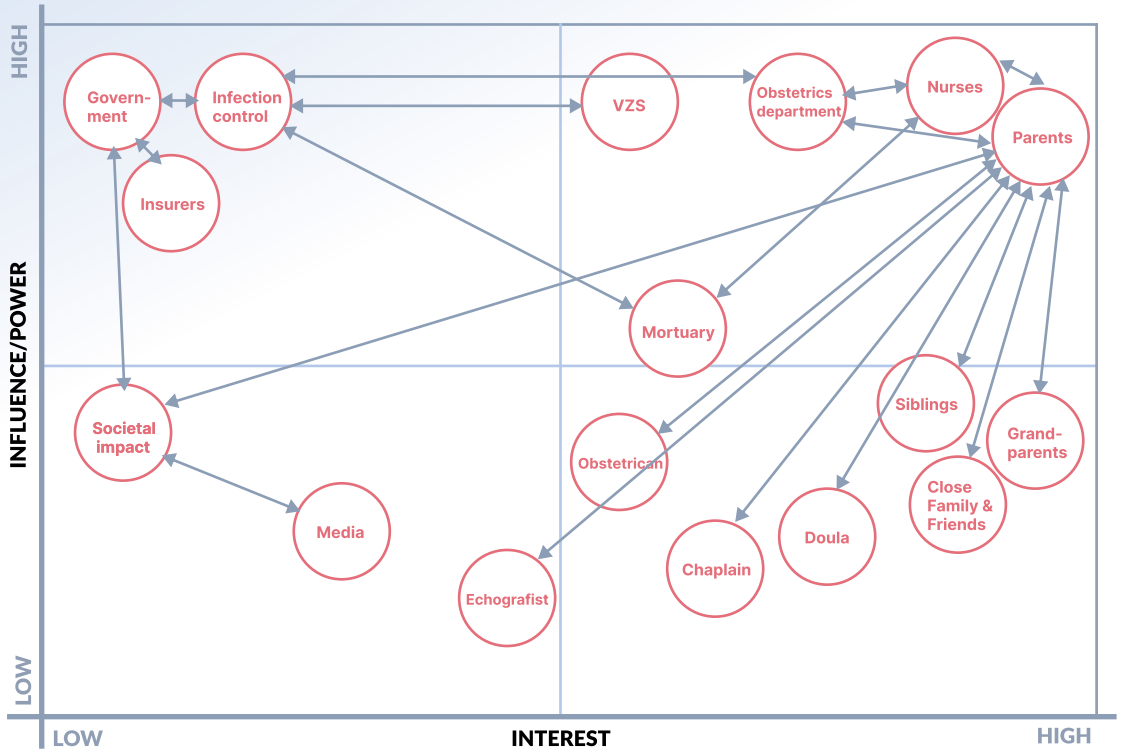


Figure 18, Stakeholders mapped in interest power diagram

4.1 Primary Stakeholders

Primary stakeholders are the people directly involved in the experience after a stillbirth, and will directly have contact with the water basin. The following section will explain the role and needs of siblings, grandparents and close family or friends, and is based partly on existing literature and partly on reflections and insights derived from interviews.

4.1.1 Siblings

Role: Siblings (Figure 19) can influence the bereavement process for parents.

Needs: Research showed that younger children need support from their parents to guide them through their grief (Jennings et al., 2024), and that it is important that they are included in every step of the process and involved in meeting the baby (Steunpunt Nova, 2025). Children might have questions, and it is important to answer these honestly and to not use metaphors and have them understand that the baby has died (Steunpunt Nova, 2025). Research advised to invite and include siblings while taking in account their feelings and prerequisites (Avelin et al., 2012). Depending on their age and understanding of the situation, some siblings might want to see and hold their sibling after birth. It is also important that the children know that the death was nobody's fault, to prevent them from blaming themselves. Some siblings might hide their emotions to protect their parents (Steunpunt Nova, 2025).

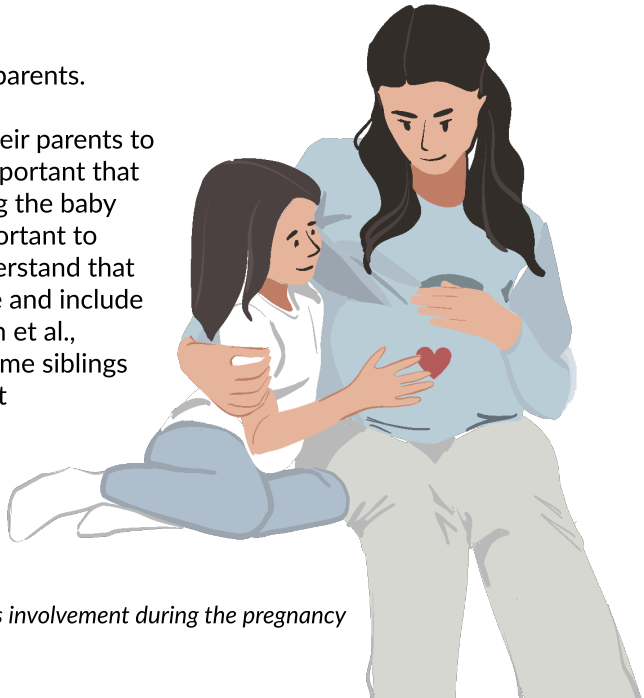


Figure 19, Siblings involvement during the pregnancy

4.1.2 Grandparents

Role: Grandparents (Figure 20) may experience a "double burden" of concern, where they worry for their adult child as well as grief for the grandchild (Murphy, 2014). They are not only mourners, but also emotional supporters for the family. Grandparents have been described as "forgotten grievers", as their loss is often less socially recognised compared to that of parents (Murphy, 2014).

Needs: Involving grandparents in seeing and holding the baby is helpful for their bereavement process (Murphy, 2014). In addition to supporting their children through their bereavement, grandparents may also need space to process their own grief, as feelings of isolation have been reported among bereaved grandparents.



Figure 20, Grieving grandparents

4.1.3 Close Family and Friends of Parents

Role: Other family and friends can support the parents in their grieving process by listening to the experience of parents and being there for them (Red Nose Australia, n.d.), however they might find it difficult to make contact with the parents after the loss.

Needs: This group may need clear instructions from parents regarding visits and support. They may participate in bereavement rituals at the hospital if invited by the parents and may prefer to keep their distance compared to parents and grandparents. This group may experience grief from the loss, or be affected by the parents' emotions. Photography can facilitate support from family members (Oxlad et al., 2023) and help them to connect with the baby, should they not have had the opportunity to meet them yet. Just like some parents, not all family members or friends might want to see the baby or need some time to prepare themselves before seeing the baby. If the baby is in the line of sight when entering the delivery room, this may be intense for some visitors.

4.1.4 The Obstetrics Department

Role: The obstetrics department arranges and manages the location where stillbirth care is done and provide the room, staff, funding and materials necessary to provide quality care (Amsterdam UMC, n.d.; Personal communication, 2025).

Needs: The obstetrics department needs a design that fits in the workflow and (safety) protocols of nurses and the department (Personal communication, 2025). Furthermore, the department needs the design to fit into existing storage rooms, something that is easy and safe to move, and something that can be filled and drained using the existing touchpoints (Personal communication, 2025).

4.2 Secondary Stakeholders

Secondary stakeholders are involved in the experience of the water basin after stillbirth, however they are not directly involved. It should be noted that some of the roles and needs of the secondary stakeholders are based on own interpretations, while others are derived from literature reviews, context visit, interviews, personal communication and online medical sources.

4.2.1 Hospital Amsterdam UMC, Location AMC

Role: Offer quality care to their patients that emotionally and medically cares for them.

Needs: A design that is compliant with hospital standards (Personal communication, 2025), and does not disrupt workflow or increase staff workload and can medically and emotionally support patients.

4.2.2 Verbeterde Zorg Studio

Role: The Verbeterde Zorg Studio is responsible for developing and maintaining the water basin and acts as a contact point with the obstetrics department when repairs or adjustments are needed (Amsterdam UMC, n.d.-b).

Needs: The VZS may need a design that is easy to repair, with replaceable parts rather than arranging a full replacement. They might want a solution that improves the experience for parents and nurses, but is also feasible.

4.2.3 Mortuary (workers)

Role: They care for babies if they are brought to the mortuary. Sometimes they perform examinations to determine the cause of death of the baby (Personal Communication, 2025).

Needs: When the deterioration of the baby is slowed, the quality of the skin makes it easier for mortuary workers to handle the baby. The water method can complicate post-mortem research, since the exposure to water can make the skin softer and makes stitches more difficult (Personal communication, 2025).

4.2.4 Infection Control

Role: Infection control has to maintain the infection and hygiene in hospital Amsterdam AMC. They have protocols and check whether innovations conform to the standards (Personal communication, 2025).

Needs: Infection control wants a design that is easy to clean and avoid any infections spreading in the hospital. This includes materials that withstand 70% alcohol, shallow engravings or logos, no sharp or hard-to-reach corners, and surfaces that can be thoroughly cleaned and dried wherever water can reach (Personal Communication, 2025).

4.2.5 Hospital chaplain or other External Chaplain

Role: Some families will have a need for spiritual or religious care from, for example, a chaplain from the hospital. These caretakers provide emotional and ritual support and can lead or participate in cultural or spiritual rituals (AdventHealth University, 2024).

Needs: These caretakers may have a need for a respectful, peaceful and dignified experience, and a space that supports them in performing these rituals.

4.2.6 Funeral Undertaker

Role: Funeral undertakers manages and oversees of funeral services (NFDA, n.d.) and support parents. They aim to make the ceremony a beautiful moment for the parents and the rest of the family. They can help with logistics of transportation or assist with the paperwork, but also might help prepare the baby in the basket or coffin.

Needs: Funeral undertakers may need communication on how the body of the baby was preserved and how to care for it before and during the ceremony.

4.2.7 General Practitioner and Therapists

Role: General Practicioners and Therapists can play a role in supporting parents and family after loss, offer after care and counselling and check in on parents after the experience.

Need: Since making memories can improve the bereavement process for parents, the water method may influence the bereavement process, which will impact the after care. Furthermore, when the care received was perceived as positive, it may make it easier for the GP and therapist to sensitively talk about the experience.

4.2.8 Volunteers

Role: Volunteers can donate meaningful baskets, blankets or cloths to the hospital that can improve the experience for parents (Personal communciation, 2025).

Need: Volunteers may need guidance on what materials are safe and allowed in the hospital setting, so their donations can support the experience without conflicting with hygiene or safety requirements.

4.2.9 Doula

Role: A doula gives emotional and practical support before, during, and after birth, helping parents through the experience of stillbirth (Doula.nl, n.d.).

Needs: A doula may need clear information on how to care for and support parents using the water method at home, since not every doula has had experience with this method.

4.3 Tertiary stakeholders

Tertiary stakeholders are people or organisations that are not directly involved in using the water basin, but still influence the wider context in which stillbirth care takes place. It should be noted that some of the roles and needs of the secondary stakeholders are based on own interpretations, while others are derived from literature reviews, context visit, interviews, personal communication and online medical sources.

4.3.1 Government and Regulations

Government and registration offices set legal requirements for reporting a stillborn baby, and also shape regulations according to the dutch law. This can have an impact on healthcare regulations, but also the social environment around parents. Insurers can determine whether solutions like a water basin can be reimbursed for parents.

4.3.2 Social Environment

The social environment can have an impact on the parental bereavement process, their responses can validate or devalidate parents' identity or support them (Obst et al, 2021). Stigmas and judgement of the public can also influence this.

4.3.3 Other Healthcare Professionals

Some healthcare professionals, like obstetricians and sonographers do not interact with the water basin, however they provide the care for the parents by helping with the birth and ultrasounds.

4.4 Conclusion other stakeholders

The stakeholder analysis shows that the water method and the water basin affect not only parents and nurses, but a wider group of stakeholders. Primary stakeholders such as parents, family members and siblings have direct contact with the water basin. They need a respectful, calm environment where they can get to know the baby. There should be space for their own grieving process and their preferences on how they want to get to know the baby. Secondary stakeholders like the obstetrics department, infection prevention and Amsterdam UMC influence hygiene regulations, and determine nurses workflows, medical training and protocols. Tertiary stakeholders influence the broader context of grief, regulations and stigma's around stillbirth.

4.4.1 Requirements

Based on the conclusions of this research, these important design requirements were discovered:

REQUIREMENTS

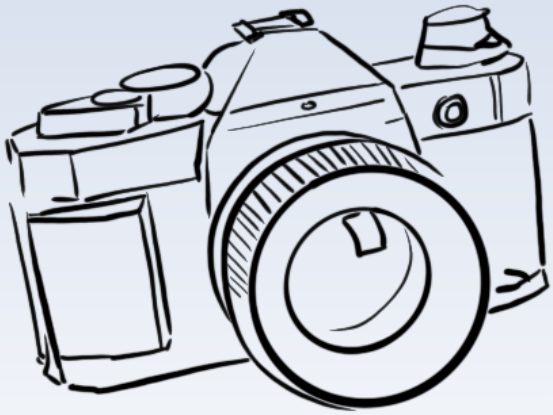
- The design must conform to the infection control protocols of the hospital: All surfaces are smooth (Ra <0,8), Logo's and engravings cannot be too deep (maximum 14x14mm, 0,8mm deep, materials should be resistant to 70% alcohol, all area's must be reachable to clean, no sharp curves (r>0.2), and all spaces where liquids can reach must be able to be wiped down. (Infection prevention)
- The design should fit in the storage room of the obstetrics department (Obstetrics department)
- The new experience should fit in with existing work flows and not increase workload (Amsterdam UMC)

NICE TO HAVES

- The design should be approachable and include all family members or support groups that participate in memory making rituals. (Siblings, grandparents, family and friends)
- Include siblings in the memory making rituals and gently support them to understand that their sibling has died, and that it is no ones fault. (Siblings)
- The design should not intimidate visitors and should allow gentle first encounters. (Family and friends)
- The experience should also consider the transition from hospital care to care at home. Providing information about the water method can help inform caregivers who will take over the care of the baby after the parents leave the hospital. (Doula, funeral undertaker)

05

EXISTING INTERVENTIONS



05 EXISTING INTERVENTIONS

Interventions in hospitals are actions or products that support human health (Gmshah, 2026). In the context of this thesis, interventions are to support parents after experiencing a stillbirth.

A range of existing interventions are currently used in hospitals, including physical interventions such as cold cots, memory-making rituals such as bereavement photography and hand- and footprints, and nonpharmacological interventions such as individual therapy sessions (Figure 21). These interventions have been proven to help relieve parental grief, anxiety, depression and PTSD symptoms (Jansen, 2025).

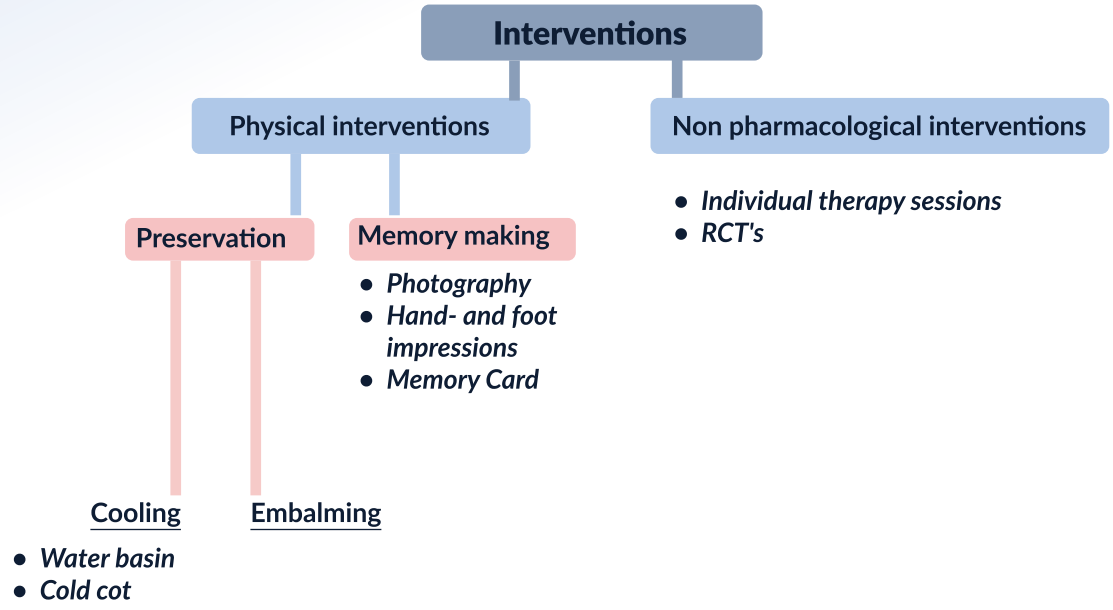


Figure 21, Existing interventions

In this project the focus will be on existing physical interventions for cooling and memory making rituals (Figure 22).

IN SCOPE

Physical interventions
- Preservation: Cooling
  - Water basin
- Memory making rituals
  - Photography
  - Hand- and foot impressions
  - Memory card

OUT SCOPE

Physical interventions
- Preservation: Embalming

Nonpharmacological interventions
- Individual theraphy sessions
- RCTs

Figure 22, Framing of existing interventions

5.1 Existing Physical Interventions

This section discusses existing physical interventions: rituals or physical products offered by nurses in the hospital that support parents after experiencing stillbirth. As each family has their own needs, the use of these interventions are always discussed with the family and never imposed. Section 5.1.1 focuses on memory making interventions, and section 5.1.2 on preservation interventions.

5.1.1 Memory Making Rituals

Memory making rituals are interventions that focus on creating memories, so that parents can remember their baby and strengthen their identity as parents. We discuss photography, making hand- and foot prints and memory cards.

5.1.1.1 Photography

Bereavement photography is done only with permission from the parents, either by the Still Foundation or by nurses from the obstetrics department. The Still Foundation is not always available to take professional photos, because they work on a voluntary basis and are not always available on a short notice, especially in the case of unexpected stillbirths. In addition, parents may also choose not to contact the Still Foundation. Nurses at Amsterdam UMC try to capture photos of the entire birth and what happens afterwards. Both during the birth and the first moment the parents hold the baby, photos of the baby from all angles and detailed photos of, for example, hands, feet, and face.

After taking the photos, nurses print out the best ones and give them to the parents together with an SD card containing all the photos that were taken. These are placed in a sealed envelope together with the hand and footprints and the memorial card, so that parents can look at them when they are ready. Nurses in the obstetrics department said that parents are often proud of their child and that they also find their child very beautiful, regardless of any changes in the skin's appearance.

"I recall taking photos of a baby who didn't look particularly beautiful because their skin was so damaged. In situations like that, you try to make the best of it by finding a good angle. We print the best photos, but we give them everything we take. In the end, the parents used a completely different photo on the birth announcement card. You think your own child is the most beautiful anyway." - Nurse, obstetrics department of AMC

Literature shows that parents are generally positive about bereavement photography. Photography helped validate parents' feelings and identity. Bereavement photography can also help introduce the baby to siblings or other close family members and share information about the child with others. Photography also helped reduce guilt and shame in parents (Oxlad et al., 2023).

Limitations

Unfortunately, not every hospital offers the option of taking photos (Burden et al., 2016). Many parents who did not have the opportunity to take photos during and after the birth wished they had (Oxlad et al., 2023).

Some nurses at Amsterdam UMC indicated that most of the department have difficulty using the complicated camera. They need advice from someone who can explain how to take good photos.

"The camera is fine, but most of us just can't handle it properly. It's some kind of high-tech SLR camera, but I can't get past the automatic setting. I sometimes use the zoom setting when I want a close-up of a hand or foot, but of course there's a lot more you can do with a thing like that. And that's a shame. ... Then someone else messes with the settings because they thought they knew what they were doing, and the next person has to deal with it." - nurse, obstetrics department of AMC

Some nurses indicated that when they take photos of the baby and they are not in the delivery room, but in the scullery, they need more space and a nicer environment to take photos.

"I think the ideal solution would be to have a separate room, because now we do it in the scullery, where there isn't much space. Yes, if you have a really nice corner where you can lay the children down and take beautiful photos, it makes it even nicer." - Nurse, obstetrics department of AMC

5.1.1.2 Hand- and Foot Impressions

Impressions of the hand- and footprints of the baby give parents something tangible to keep. These impressions can be a lasting memory and give parents proof of existence, even after the baby has been buried or cremated.

At Amsterdam UMC, these impressions are made if parents choose to have them done. Nurses use special ink that is suitable for skin, which is applied to the hands and feet with a stamp pad (Figure 23). The prints are then made on a blank card. Some nurses put the card with impressions directly in the envelope together with the printed photos, while others cut out the print and use it to decorate a memory card.

The impressions are usually made before the baby is placed in the water basin, since the ink is easier to remove. According to nurses at Amsterdam UMC, it can be delicate work to make a nice print. Sometimes nurses ask a colleague for help with this step, or they take the baby aside so they don't have to do it in front of the parents.





"Some parents say, 'Take [the baby] away for a moment' to make hand and foot prints, because it can be a bit fiddly at times. It's easier from 28 weeks onwards, but for us [nurses] it's sometimes nicer to do it in a different place, because then you don't have the parents watching you the whole time." - Nurse, obstetrics department of Amsterdam UMC

Figure 23, the inkt and inktpads that are used to make impressions at Amsterdam UMC

5.1.1.3 Memory card

Nurses of Amsterdam UMC fill in memory cards with the information of the baby (Figure 24). This memory card contains the date of birth, time of birth, date of death, duration of pregnancy, weight and length of the baby. This can help parents remember details of their baby.



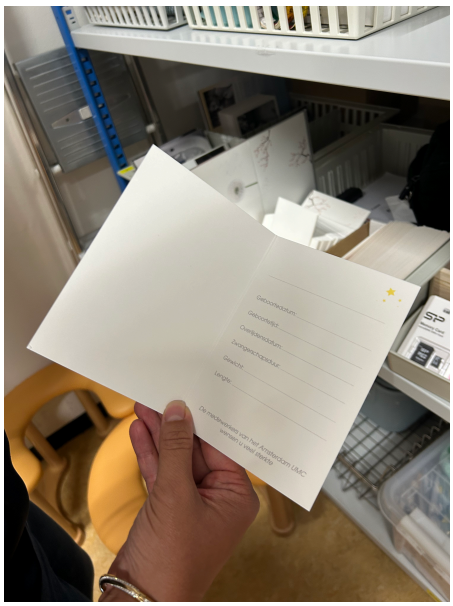


Figure 24, the Memory cards used in Amsterdam UMC

5.2.2 Preservation Techniques

There are various techniques that help preserve the baby's skin. The preservation method cooling is further explored, and the water method and cold cots are discussed the following sections.

5.2.2.1 Cooling

Cooling the skin and body slows down the process of physical body changes and deterioration. The purpose of cooling is to slow down discoloration, odor formation, and other visible changes as much as possible, regardless of the temperature or conditions in the room. This helps to keep the baby in a dignified and recognizable state for longer, which gives parents time to be with their baby, take photos, or perform memory-making rituals without the body changing rapidly (P. Smith et al., 2020). Especially stillborn babies who have passed in the womb, the skin is often delicate and sensitive to environmental changes (Personal communication, 2025).

Despite the advantages, cooling the body also has a disadvantage. Research shows that parents naturally expect a baby to be warm, while a cold body is strongly associated with death (P. Smith et al., 2020). When the baby feels cold, it could accentuate the reality of death. In addition, the lower temperature can make the baby stiffer, which can further emphasize this feeling. It is therefore important that nurses handle this carefully and prepare parents for this experience.

5.2.2.2 The Water Method

When using the water method, the baby is placed in a water basin. The baby's entire body is submerged in cold water and completely surrounds the baby (Figure 25). This ensures that the entire body remains evenly cooled.

An important advantage of this method is that the baby's skin does not shrivel because it absorbs the water. The skin also regains a more natural colour, and imperfections such as bruises become less visible. The baby's limbs remain more flexible in the water, making the baby easier to position. Laying the baby in water gives an opportunity for bereavement photography. It can capture gentler photo's, and gives opportunities to take pictures that would otherwise have been avoided (Duffey, 2014). Nurses at Amsterdam UMC indicate that beautiful photos can be taken using the water method, since the baby usually takes on a natural, relaxed position in the water, as if it were in the womb. According to the nurses, photographers from the Still Foundation also seem to like taking pictures when the baby is laid out in water, because it often results in beautiful photos (Personal Communication, 2025).

However, this technique also has disadvantages. When the baby is taken out of the water, the skin must be kept moist. The water can also soften the skin, making it even more vulnerable. When parents want to hold the baby, they can also get wet, which can be an unpleasant feeling. Furthermore, the fact that the baby is lying in a water basin can make it more difficult to make physical contact, compared to a baby lying in a basket or on a blanket next to the bed.

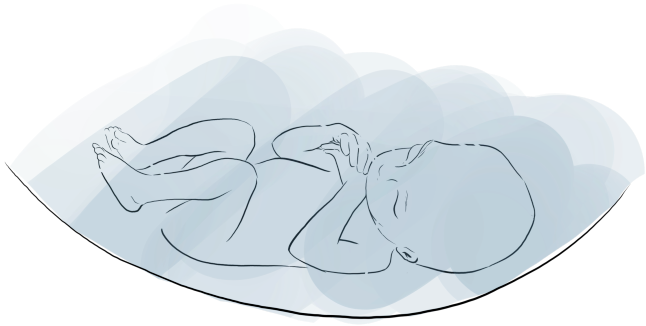


Figure 25, the water method

5.2.2.3 Cold cots

Cold cots are a technique for keeping a baby cool by placing cooling elements around them. These can be ice packs or seperate cooling devices, such as the CuddleCot or Caring Cradle, which have a separate cooling unit. Similar to the water method, cooling the baby helps to delay deterioration. One advantage of this technique is that the baby remains cool without getting wet. Ice packs are also relatively inexpensive and easy to use.

However, this technique also has disadvantages. Cold cots do not cool the entire body evenly because the cooling elements do not fully surround the baby. Discolouration of skin that is not in contact with the cooling elements can still occur, as well as that the skin still shrivels. Furthermore, ice packs are often covered with cloths, which can leave fibres on the baby's fragile and sensitive skin. Some cooling systems, such as the CuddleCot and Caring Cradle, produce noise due to their cooling mechanisms (e.g. Peltier elements), which may be disruptive to the experience.

5.2.2.4 State of the Art Cooling Methods

Different physical interventions that are used in hospitals of the water method and the cold cots are compared in Table 1.

Table 1, comparing the water method and cold cots

Type of cooling	**Water basin**	**Water basin**	**Water basin**	**Cold cots**	**Cold cots**	**Cold cots**
Name	"Curverbak"	Small water basins	Water basin designed by Stef Bone	Cloths in icepacks	CuddleBlanket	Caring Cradle
Visualisation						
Description	Water basin for bigger babies at Amsterdam AMC	Water basin for smaller babies at Amsterdam AMC	Water basin for larger babies at Maxima MC	Ice packs wrapped in cloth that are layed in basket to keep skin cold	Cold pad, that is temperature controlled by a seperate cooling element	Portable cooling unit
Suited for babies of:	28-42 weeks	12-28 weeks	28-42 weeks	28-42 weeks	28-42 weeks	28-42 weeks
Where is it used?	Amsterdam UMC	Amsterdam UMC	Maxima MC	Amsterdam UMC	Worldwide	USA
Size	52×42×28 cm	20/29×20/29 ×20/29	60 × 40 cm	+- 15 × 22 cm	40 × 55 cm	105.5×47.5×108 cm
Cooling technology	Ice water	Ice water	Ice water	Ice pack	Peltier cooling element (TEC)	Peltier cooling element (TEC)
Temperature of cooling	4-10 °C	4-10 °C	4-10 °C	Icepacks: -18 °C On skin: 4 - 6 °C	8 °C	5 - 10 °C
Costs	€15	€10-15	unknown	€10	€124,78	€6060
Pro's	• Consistent cooling of baby skin • Skin does not shrivel • improve colouration of the skin	• Consistent cooling of baby skin • Skin does not shrivel • Able to be carried • Transparant • Supports natural fetal postion of baby • improve colouration of the skin	• Consistent cooling of baby skin • Skin does not shrivel • Non clinical look • No sharp edges • Space for personal belongings • Portable with wheels • Transparant • Supports natural fetal postion of baby	• Portable • Low tech • Easy to handle • Discreet • Low cost	• Parents can hold baby in their arms • Company offers free training for nurses • Easy to clean, transport and store • Non medical look • Smaller size available	• Portable on wheels • R134a environmental friendly coolant • Easy to clean • Space for storage • No training required • No connected tubes • Smaller size available
Cons	• Leaves imprints • Too large and heavy • Not aesthetically pleasing • Negative associations with shape • Not transparant • Baby will be wet when cuddling	• Water basin will be heavy to empty • Large, takes up much space • Baby will be wet when cuddling	• Water basin will be heavy to empty • Large, takes up much space in delivery room • Baby will be wet when cuddling	• Inconsistent cooling • Risk of freezing skin • unreliable results • Only some patches are cooled • Skin will shrivel eventually	• The face is not cooled • Makes noise • Uses chemical to clean water inside system • Requires training • Connected tubes can be annoying • Part of body cannot be seen • Consistent temperature	• Expensive • Clincal feel • Not transparant, cannot be seen from the side • Consistent temperature

This state of the art analysis between three water basins and three cold cot solutions shows that both preservation techniques achieve a similar temperature range, but the water method provides more consistent cooling of the whole body. Cold cots do not cool babies evenly, and they can be noisy and technically complex. However, cold cot systems with external coolers, such as a peltier cooler, can maintain a more consistent temperature than icepacks or ice in water basins. Some water basins and certain cold cot systems, such as the CuddleBlanket and the Caring Cradle, are designed for hospital use and come with a stand. Some designs aim for a less clinical appearance to create a calmer experience.

5.2 Physical Interventions Conclusion

This chapter aimed to explore existing physical interventions, as well as memory-making rituals and preservation techniques. Memory-making rituals include photography, in which photos, hand-and foot prints, and memory cards are created and given to parents as mementos. Cooling techniques were explored as a way to preserve the baby. While cooling helps maintain the baby's skin in a dignified condition, the cold sensation can also emphasise the reality of death.

The water method can consistently cool the entire body of the baby to delay deterioration and prevent shrivelling of the skin. Cold cot techniques that use external Peltier cooling systems, can keep the baby cool without water and maintain a more stable temperature. However, cold cots systems do not cool the entire body evenly, can be expensive, and nurses may need additional training to operate theses systems.

5.2.1 Requirements

Based on the conclusions of this research, these important design requirements were discovered:

REQUIREMENTS

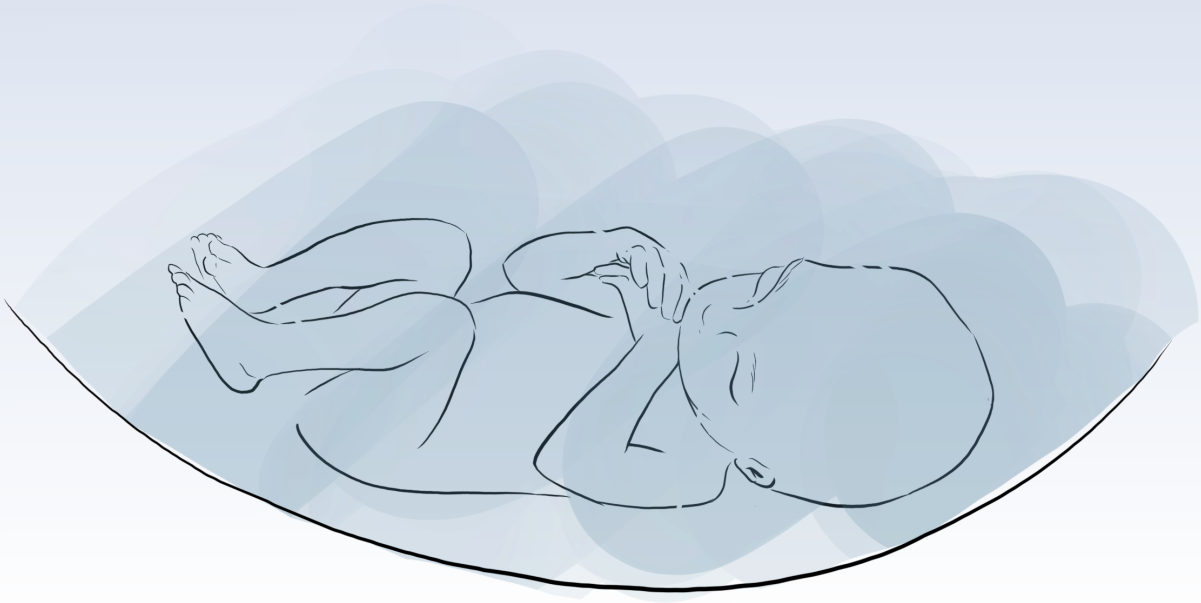
- The water basin should maintain a water temperature between 4-10 degrees (State of the art, bereavement specialists).
- The water basin should be able to consistent and even cooling of the baby's entire body. (Cooling)
- The baby's body should be able to fully submerge in water inside the water basin. (Cooling)
- The water basin should support the baby and prevent damage to fragile skin. (Cooling)
- The design should accommodate all supplies required by nurses throughout the entire process. (Memory-making rituals)
- The water basin should support memory-making rituals, such as photography, by giving a undistorted and calm view of the baby. (Memory-making rituals)
- The interaction should be intuitive and require minimal training for nurses. (State of the art)

NICE TO HAVES

- The water basin should be large enough to accomodate for the baby, while remaining as compact as possible for storage. (State of the art)
- The water basin should minimise disturbing elements such as noise and visual clutter. (State of the art)

06

THE EXPERIENCE OF THE WATER METHOD AT AMSTERDAM UMC



06 THE EXPERIENCE OF THE WATER METHOD AT AMSTERDAM UMC

To get a better understanding of the experience of the use of the water method at the obstetrics department in Amsterdam UMC, qualitative research was conducted with nurses. From their perspective, insights were gathered about their needs, and needs of parents. In section 6.1, an interview was conducted and analysed to identify design guidelines. In section 6.2, a co-creation was done to open discussions about designing an improved and dignified experience, and Section 6.3 concludes with requirements found in research. This chapter aims to find design guidelines for the *Define* phase of this thesis.

6.1 Initial Interview with Nurses

For this qualitative interview research, two research questions were formulated:

What are the experiences, needs, and challenges of obstetric nurses regarding the use of the current water method for stillborn babies at Amsterdam UMC?

What are the experiences, needs and challenges for parents that use the water method for their stillborn baby from a nurse perspective?

6.1.1 Initial Interview with Nurses Method

Participants

Four obstetric nurses from Amsterdam UMC who have experience with stillbirth care and the use of the water method and water basin participated with this study (Table 2). Participants were recruited at the obstetrics department on a voluntary basis. Participants were informed about the sensitive topic of stillborn babies and the water method before agreeing to participate in the interview.

Table 2, participants of user study 1

Participant number #	Role
1	Specialized nurse in obstetrics or maternity ward and admission coordinator
2	Specialized nurse in obstetrics
3	Specialized nurse in obstetrics
4	Specialized nurse in obstetrics

Procedure and Materials

All data was anonymised and stored in a secure OneDrive folder. Participation was voluntary and participants could take breaks and stop the interview at any time. The interview was carried out in a private room in the obstetrics department. Due to the emotionally charged nature of the subject, participants were given the opportunity to skip questions. The consent form and ethical checklist are included in Appendix B and the full interview guide can be found in Appendix D.1.

Analysis

The interviews were first transcribed and anonymised. The transcripts were then read several times to become familiar with the content. During this process, initial impressions and notable statements were identified. Subsequently, statements were intuitively grouped into preliminary clusters. These were then regrouped into final clusters that formed the themes. Some design guidelines were further divided into sub-themes to further structure the data. Finally, these design guidelines were assigned names and completed with representative quotes. The analysis was executed manually by printing out the interviews, cutting out relevant quotes and manually grouping these quotes. These detailed themes aim to develop design guidelines for the concept development phase and lay the foundation for the concept development phase.

6.1.2 Initial Interview with Nurses Results

Thematic analysis

The thematic analysis of the four interviews resulted in 11 themes and 11 sub-themes:

- Parents need an overview of the possibilities after a stillbirth, but this information must not overwhelm them.
- Nurses adjust their care to the different needs of parents.
- There is a need for a same standard of care, so that every family can be offered the same possibilities after a stillbirth.
- Nurses recognise the added value of the water method.
- The natural position of the baby is comforting for both nurses and parents.
- A gentle, loving and warm experience is desired for both nurses and parents.
- Nurses are dissatisfied with the current water basin.
  - The current water basin evokes associations with household products and usage, which are inappropriate for its current purpose.
  - Nurses find offering the current water basin objectionable and embarrassing.
- Practical usability and ergonomics of the water basin
  - The water basin should be easy to move and handle
  - Stability and a stand increase safety and enhance the appearance of the water basin
  - Emptying and cleaning the basin is impractical and difficult
- Helping parents and nursing work can bring satisfaction to nurses.
  - Nurses derive satisfaction from providing good care to parents.
  - Nurses derive satisfaction from the gratitude of parents
- Dealing with grief amongst nurses
  - Nurses are able to maintain professional and emotional distance.
  - Nurses may be emotionally affected during childbirth, depending on the situation
- Nurses receive a great deal of support from the obstetrics team
  - Nurses can talk to one another about challenges and experiences after supporting a stillbirth
  - The nursing team supports one another by taking turns with supporting stillbirths

Theme 1

Parents need an overview of the possibilities after a stillbirth, but this information must not overwhelm them.

Grieving parents need clear information, both before, after and during the birth. In the event of an unexpected death, parents must first be given space to process the shock, but afterwards they need information so that they do not feel they are missing out on anything. According to the nurses, parents can become more anxious and experience greater stress when they lack information and do not know what to expect.

> *"At first they experience the initial shock, but afterwards they really start looking for information, asking 'what can I do', 'what must I do'. They want to make sure everything is sorted properly. The unknown is frightening. If you have no idea what lies ahead, it is very frightening and stressful [...]" - Interview 1*

> *"I think people respond particularly well to clear explanations and a lot of attention." – Interview 3*

> *"If they've experienced a sudden stillbirth, they don't know much about it, and they're suddenly faced with a lot of information, so we tend to take it step by step, as and when there's room. Whether before the birth or sometimes after the birth, and actually, there's no rush at all." – Interview 2*

Theme 2

Nurses adjust their care to the different needs of parents.

Nurses have observed that parents vary greatly in terms of what they need when facing the loss of their child. These differences are influenced by factors such as cultural background, financial circumstances and personal values. As a result, the experience of loss can vary greatly, and nurses believe it is important to take this into account in the way they support parents.

> *"We naturally have a very diverse range of patient categories here. We have the lawyer from Amsterdam Zuid, but we also have the mother on income support from the Bijlmer, who has a completely different cultural background as well. [...] The experience of Amsterdam Zuid and the Bijlmer is very different. You have to take that into account." - Interview 3*
>
> *"Of course, we're also well aware that things are very different. Just the financial aspect alone. People from Amsterdam Zuid can often organise and pay for a big farewell. But the mother on social security in the Bijlmer has very few financial resources. So we sometimes bring in social workers, but you have to take into account what the possibilities are for those people. So it's really about empathising with your patient, that's what it all comes down to." - Interview 3*

Nurses indicate that tailoring their approach to parents begins with having an open conversation. They ask about expectations, wishes and boundaries, and try to sense what parents need at that moment.
Although parents often know exactly what they want, the loss can still take them by shock. Nurses therefore try to listen, assess what they need and make it easier for them to talk about it.

> *"People are quite capable of making their own decisions and often know what they want. But when something happens suddenly, their whole world is turned upside down. Then you really have to be flexible and assess what these people need. And also make it a topic of discussion, because sometimes I suggest something and they look at me as if to say: how did you come up with that?" - Interview 3*

The way in which nurses deal with these differences shows that they do not view their care as a single fixed approach, but as something that must be constantly adapted to the parents standing before them. By listening, empathising and being flexible, they try to provide care that suits every family.

Theme 3

There is a need for a same standard of care, so that every family can be offered the same possibilities after a stillbirth.

Nurses want to be able to provide all families with the same standard of care. This means offering each family the same options. For example, parents with a larger stillborn baby should still be able to choose the water method. It also means that the entire obstetrics team offers the same options to each family. This prevents parents from feeling that they have missed out on something that another family received, which could lead them to develop a negative view of the whole experience.

Nurses noted that the internet is a source of information for parents, but that it can also be overwhelming. Not all the options available online are available at Amsterdam UMC. Parents can use the internet to compare other options with those offered to them at the AMC. They may feel they have missed out on something if it wasn't offered at the hospital.

> *Sometimes people feel they've missed out on things or something like that; there are so many opportunities to create memories and you can only do it all once, because ultimately the baby is cremated or buried. And yes, if you look online, there are lots of possibilities, but it also costs a lot of money. And sometimes we don't know everything either and I don't think we offer everything, and that's a shame when people feel they've missed out on something afterwards. Sometimes you hear that it's our fault, but well, you've got to be able to blame someone - Interview 2*

Theme 4

Nurses recognise the added value of the water method.

Nurses are positive about the water method and regard it as a valuable way of performing post-mortem care. They praise the method for its positive effects on the skin: the baby remains in good condition for longer, discolouration is reduced and the skin looks smoother.

> *"I'm very positive about it, simply because the skin stays much nicer, and the babies really remain in better condition than if you don't do it." – Interview 1*
>
> *"What we often see is that babies placed in water look a bit nicer... if you place them in water with ice, they turn a much pinker colour and stay beautiful for longer." – Interview 2*
>
> *"We used to have cooling packs as well, but then you'd notice at some point that the top started to discolour. Now the baby stays cool in the water, assumes that beautiful foetal position again; I think that's particularly lovely for parents to see." – Interview 4*

In addition to these practical benefits, nurses believe the water method also has emotional value. Parents can keep their baby close to them for longer, creating more time and space to look at, hold and make memories. Unlike other methods, where the baby is wrapped in cloths or cooled with ice packs, in water the child remains fully visible.

> *"I think it's lovely for parents to be able to keep their child close to them for as long as possible" – Interview 4*
>
> *"The fact that you can see right through it, [...] you want parents to be able to get a good look at the child from all angles." – Interview 1*
>
> *"No, I just think it's a lovely method. Otherwise, they're just wrapped in cloths and laid down somewhere, whereas now they're simply laid out beautifully." - Interview 3*
>
> *"The water method is the most beautiful. You can also embalm them or something, but that's really quite different, so the water method is the most beautiful." – Interview 2*

Theme 5

The natural position of the baby is comforting for both nurses and parents.

When a stillborn baby is placed in a water basin, the baby naturally assumes the foetal position. The baby's back is slightly curved, the head slightly bent, and the arms and legs drawn in. Nurses describe this position as beautiful and natural, and they feel it is the most beautiful position for the baby. Nurses say that parents may also find this a beautiful position.

> *"When you place the baby in that round basin, the baby really does settle back into a position much like how it was in the womb. For those people [parents], it's truly beautiful, and you can take some really beautiful photos." – Interview 3*
>
> *"So I think that when something is completely round, that's when the babies look their best in it. And it's perfectly fine if the little back is a bit curved, because the babies are actually already lying in a bit of a foetal position." – Interview 2*
>
> *"Now a baby like that stays cool in the water, goes into that lovely foetal position again. I think that's particularly lovely for parents to see." – Interview 4*

This natural position somewhat recreates how the baby looked during pregnancy, as it was positioned in the same way in the womb. This makes it easier for parents to recognise their baby, and the body does not look strange or unnatural. This may encourage parents to view the baby, creates a sense of familiarity and may make viewing the baby less intimidating.

Theme 6

A gentle, loving and warm experience is desired for both nurses and parents.

Nurses believe it is important that the experience of laying out a child feels gentle and warm. The whole setting must look friendly and loving, so that parents can get to know their child in a calm and dignified manner.

> *"You want parents to be able to look at a nice little spot and not, you know, when someone is laid out in a casket, you make an effort with that too. Just because it's functional doesn't mean it's beautiful." – Interview 3*
>
> *"I think [the smaller containers] look a bit friendlier, a bit nicer, a bit more professional, than one of those Curver containers." – Interview 4*

Nurses observe that parents prefer round and soft shapes. This is apparent from the fact that when parents take their child home, they often do so in soft baskets lined with cloths rather than a wooden box. The nurses believe it is important to make an effort to ensure the experience feels welcoming, as this is important to parents. This can be achieved, for example, by adding a small butterfly or a soft cloth. Whilst this does depend on the family's personal taste and what they need, it can certainly make the experience feel warmer and more welcoming.

> *"There's a reason why, for all those babies [...] those people [parents] all carry little baskets. Nobody turns up with a wooden box. Often rounded shapes, and just soft. A soft look." – Interview 3*
>
> *"I think it could be a lot more welcoming. If you have something round, and perhaps with, I don't know, a little butterfly or something on it to make it just a bit nicer, a bit more welcoming, so that it looks completely different from one of those curver containers on a trolley." – Interview 4*
>
> *There's always a difference of taste in that too. One person might prefer a classic wooden coffin, whilst another might prefer wrapping the baby in cloths. That's always going to be the case. But if you have a base that's attractive, and you can add personal touches to it, then, uh, [that would be lovely]. – Interview 3*

Theme 7

Nurses are dissatisfied with the current water basin.

Nurses have made it clear that they are dissatisfied with the current solution for laying larger babies out in the water basin. They feel that the appearance of the basin is not in line with the care they wish to provide to parents. The current basin, which is square and made of milky-white plastic, is perceived as unprofessional and inappropriate.

Subtheme

The current water basin evokes associations with household products and usage, which are inappropriate for its current purpose.

The shape and appearance of the current water basin evoke associations with household products and purpose. Nurses feel that this appearance is not in line with the current function of the water basin: the presentation of a stillborn baby. The basin looks as though it is intended for storing items or tucking away under the bed, not for laying a child in. This feels inappropriate and detracts from the significance of the ritual.

> *Because it really is just like you've gone to Blokker and bought one of those things. That's not a bad thing in itself, but that's exactly what it looks like, - Interview 4*
>
> *Well, I actually find everything about that box a bit annoying. The idea of putting that baby in an IKEA box, you know. It's also a bit very cheap. Yeah, you don't really wish that on those people, or on the baby either. – Int 3*
>
> *The biggest pitfall is that you feel embarrassed to offer something that originally had a completely different purpose, and to use it to lay your most precious loved one in. What we're using now is a container in which you keep rubbish to store in the attic for things you no longer use, and yet you now want to lay parents' most precious possession in it. The result is that we're less likely to offer it. The threshold for offering it is higher. You're quicker to think, "Ah it would be possible, but let's wrap the baby in a cloth," but for the quality and condition of the baby's skin, that really doesn't work as well. - Interview 1*

> *I actually don't like much about it. I actually find everything a bit miserable. – Interview 3*
>
> *Well, I don't really like the Curver box that much... haha, well, it looks like a Curver box. We've got a slightly rounder one for the little ones, which looks a bit friendlier than the sort of box I've got under my bed at home. - Interview 4*
>
> *The function of the original box doesn't match its current function. - Interview 1*

Subtheme

Nurses find offering the current water basin objectionable and embarrassing.

Nurses sometimes feel uncomfortable and uneasy when offering the current water basin to parents. They feel that the shape, appearance and quality of the water basin do not match the experience. Some are even embarrassed to use the basin, as it detracts from the intention of the nursing care. A number of nurses therefore choose not to use the water basin. Others use it only when there is absolutely no alternative, and try to place the child in one of the smaller glass bowls, which are considered beautiful.

> *You can make just about anything these days. We're visiting the moon, so why are we stuck with such a stupid tub? – Interview 1*
>
> *It's more that it's sometimes awkward to turn up with such a silly looking container. – Interview 1*
>
> *Well, I've never put a child in one of those, no, no - Interview 2*
>
> *The Curver container, well, sorry, they just look awful. - Interview 4*
>
> *But I really do think that tub is a very sad thing. - Interview 3*

Theme 8

Practical usability and ergonomics of the water basin

Nurses feel that the current water basin does not meet the practical requirements of their work. The basins are heavy, difficult to move and empty. In addition, they are not always stable when placed in the delivery room. Nurses feel it is important to reduce the physical strain and make the water basin safer to use.

Subtheme

The water basin should be easy to move and handle

Nurses report that the larger basins in particular are heavy and difficult to move. This makes the work physically demanding and increases the risk of accidents. They emphasise that the water basin needs to be lighter and fitted with sturdy handles or rims so that it can be gripped securely.

> *"The basin is heavy, of course; you can't move it easily." – Interview 1*
>
> *"We often have, look, those small ones you can still lift, but a big one like that, I think you'd have to put it on a trolley." – Interview 2*
>
> *"But then it becomes a very heavy basin. So it's nice if the basin itself isn't so heavy, but also that it has good handles." – Interview 3*
>
> *"Then you're walking around with a thing like that, and it's nice to have a sort of rim you can use to lift it. If it's like that, the outside gets slippery. It's a bit of a nightmare if you drop it, whether it's with or without a child." – Interview 4*
>
> *"Should be easy to handle when picking it up. So not slippery, but actually with a rim that makes it easy to grip." – Interview 4*

Subtheme

Stability and a stand increase safety and improve the appearance of the water basin

As well as ease of lifting, nurses consider stability to be important. The basin must stand firmly and not be able to slide or tip over. A stable stand or base is seen as a solution that would offer both safety and a neat, professional appearance.

> *"You do have to make sure it's stable, of course. If you place a basin like that on a small table, you have to make sure it can't slide." – Interview 3*
>
> *"It would be nice if a stand came with the basin, so that it looks stable and neat as a whole." – Interview 2*
>
> *"And stability, because, well, you have to put that basin down somewhere. I'd like something you can just keep on a stand, something like what baby baths have." – Interview 3*

Subtheme

Emptying and cleaning the basin is impractical and difficult

Nurses find emptying the basin one of the most challenging parts of the whole process. The basin becomes heavy due to the volume of water and can spill over the edge. This makes it difficult to empty the basin.

> *"Whether you're emptying a small bowl into the sink or emptying a container like this, it's quite a lot of water. It then splashes over the edge. If you pour too quickly, you end up having to mop the floor again." – Interview 1*
>
> *"I think it's mainly emptying it. Filling it is fine, but it's really the emptying part." – Interview 4*

Theme 9

Helping parents and nursing work can bring satisfaction to nurses

Supporting parents who have lost a baby to stillbirth can sometimes be difficult, but nurses find their work meaningful. They find satisfaction in providing dignified, compassionate care and in the gratitude expressed by parents. They feel that their efforts can make a difference to parents going through a difficult time, which gives their work a sense of value.

Subtheme

Nurses derive satisfaction from providing good care to parents.

Nurses at Amsterdam UMC find their work rewarding when they can help families and provide good care. They believe it is important to make a difference to how parents experience this period. Nurses are pleased when they can create lovely memories for families. For example, by taking a beautiful photo of the baby and giving parents a memento they can take home with them.

> *"Because you know so much, those people [parents] can really appreciate it when you tell them about other experiences or guide them on what to expect from the birth." – interview 2*
>
> *What I always enjoy is when you can take a really lovely photo. When you genuinely think, "The baby looks so beautiful in this," I always find that wonderful. – interview 2*
>
> *It's very rewarding, because those people are in a very difficult situation and very often those around them find it uncomfortable. So, you can do a lot for those people, so I find it very rewarding work, yes. – Interview 3*
>
> *Yes, this isn't easy, no. But, because you know you can do so much for them, it's also rewarding. - Interview 3*
>
> *It's also nice that you can do something for these people; I always go home feeling satisfied when I've been able to do this. - Interview 4*

In order to provide good care and experience this emotional fulfillment, nurses believe it is important that materials and equipment help them to provide parents with compassionate care. It is important that the quality of medical equipment is in line with the quality of care they themselves wish to provide and consider important.

> *"[...] it's a bit of a funny thing that we always say, 'Well, we'd like a department as nice as the neonatal unit has', you know. But that doesn't actually matter at all. Because, of course, it's all about the care you provide and your patient. But something like what you're aiming for now, that is something that, well, it makes me happy, let's put it that way. It makes me happy because then I can offer something to those people that is more humane than a cold container for your stillborn baby – interview 3*

Subtheme

Nurses derive satisfaction from the gratitude of parents

Nurses also find fulfillment when parents express their gratitude for the care they received. This can take the form of a card, for example, or a simple thank-you after the care is provided. Despite their grief, parents appreciate the nurses' dedication. Moments like these make nurses feel proud of themselves and of the department.

A thank-you from parents of a stillborn baby can sometimes be even more meaningful to a nurse than one from parents of a healthy newborn.

> *"Being thanked after a birth like that. Sometimes you'll unexpectedly receive a card later from someone who's very grateful for the care. I always find that [special]". - Interview 2*
>
> *"I notice a lot of gratitude. Often, after the baby is born, there's sadness, but also a lot of gratitude for the support provided. I always find that very touching. That despite being incredibly sad, these people are always happy with the care they receive." - Interview 2*
>
> *"... when people say, 'This was terrible, but you turned it into a good experience.' That's very rewarding." - interview 3*
>
> *"I've sometimes received an email afterward from someone [...] saying how nice it had been and how much they'd benefited from you. That's definitely part of why you do it. It makes me feel proud, proud of what we all do here in the department." - Interview 4*

Theme 10

Dealing with emotions amongst nurses

Supporting a stillbirth can be emotionally demanding for nurses. How nurses experience and process their emotions depends on the circumstances and their personal involvement. They may find certain moments and situations more difficult to manage, but they are also able to emotionally distance themselves from these sad experiences, partly due to their work experience and the support of their colleagues.

Subtheme

Nurses are able to maintain professional and emotional distance.

Nurses can experience difficult moments when supporting a stillbirth, but they are usually able to maintain emotional distance. Work experience in the obstetrics department can help with this, along with support from colleagues through discussing difficult moments together.

> *You do quite a lot of this, so because I've done it quite often, you know a bit about what to say to people and you also know a bit about how to deal with their grief, but they're always quite intense days, because of course there's an awful lot of grief involved, which makes it, well, yes. You can put it aside a bit, but it always gets to you in the end. – Interview 2*

> *It's intense care, but I can separate it in that sense; it doesn't keep me awake at night. Of course, some situations affect you more than others, but it's also a bit of a realisation that this happens and that it's intensely sad, but mainly for the parents and not for me. - interview 1*
>
> *Sometimes you just have to be practical, because someone's on the bathroom or something and the baby's coming out. So then your own emotions [aren't important], your practical side comes to the fore. - interview 3*

Subtheme

Nurses may be emotionally affected during childbirth, depending on the situation.

Nurses say that they themselves sometimes experience difficult moments when supporting the birth of a stillborn baby. Their emotional response is very personal and varies from situation to situation. They often find it more intense when:

- The baby dies unexpectedly
- When parents react very strongly or show a lot of emotion
- When they have a good connection with the parents
- When the baby is full-term
- When the situation closely mirrors personal experiences

> *Then, of course, you have this absolutely beautiful, healthy baby, a big baby, you know. I find that more intense than a baby with a massive heart defect where the pregnancy is terminated at 18 weeks. - interview 1*
>
> *It really depends on how the birth goes, so to speak, and how the parents react. Sometimes you really connect with people, and then you feel more emotional yourself. I can still find myself with tears in my eyes when people are so terribly sad after the baby is born. But that's not always the case; it also depends a bit on the circumstances. - interview 3*
>
> *"The moment the baby is born. That's usually when the pain of labour and the emotions really come together. And those are always very intense moments, especially because you're also dealing with the partner, who hasn't been able to do much all day, just being there a bit. They usually break down at a moment like that, and so does the mother, so that's always the hardest part – interview 2*
>
> *"It really depends on the parents and how they deal with it; if someone bursts into tears, I can too." – interview 4*
>
> *"There are also people who show a lot of emotion, and that often moves me too." – interview 4*
>
> *"Especially if someone has been pregnant several times and then it doesn't work out again; I find that very sad." – interview 4*
>
> *"Yes, the sadness really does get to you sometimes, so that you feel a bit sad yourself about the situation." – interview 2*

Theme 11

Nurses receive a great deal of support from the obstetrics team

Nurses find the obstetrics team supportive. The work can be emotionally demanding, but within the team there is space to share experiences and help one another. This makes them feel supported and helps them to endure the work for longer.

Subtheme

Nurses can talk to one another about challenges and experiences after supporting a stillbirth

When nurses have been through a difficult delivery, there is an opportunity within the obstetrics team to talk about it. This peer support and encouragement from colleagues helps them process the experience, often during the same shift or shortly afterwards.

> *If you've had a really intense day, it's nice to have a debrief with your colleagues. So it's often during the same shift or the next one that you have a quick chat about it.- interview 2*
>
> *We have a peer support team, which also includes fellow nurses, doctors and midwives. It's a really large team. They always call in response to serious incidents, often in the event of unexpected deaths, or if you indicate that you're not feeling quite yourself. You can contact them yourself too. - interview 1*
>
> *There are always colleagues available to talk to if needed. It's a really lovely team. - interview 4*

Subtheme

The nursing team supports one another by taking turns with supporting stillbirths

The nursing team works together to ensure that the emotional burden is shared among them. Colleagues take turns dealing with stillbirths or other difficult situations. That way, no single nurse has to bear the heaviest moments all the time.

> *You take turns a bit, especially my colleagues who work full-time; if they have to deal with a stillborn baby every day, you won't last long in this job. So then, you try to take turns a bit, asking 'who wants to go there?' or 'who would like to assist with a pleasant delivery? – int 1*
>
> *So yes, we do it, but you can't do it every day. Often, when there are a lot of cases like this, you try to spread it out a bit among your colleagues. - int 2*
>
> *But we have really good support for one another here. Because we all go through it sometimes. We all struggle with things from time to time. Then we look out for one another, so to speak, during the next births. - int 3*

6.1.3 Initial Interview with Nurses Discussion

This analysis shows that there is no resistance from nurses to the water method itself, but mainly to the current water basin. Nurses are enthusiastic about the positive effects of cooling and submerging the baby's skin in cold water, the natural fetal position in which the baby lies, and the opportunity for parents to spend more time with their child. This means that, even though there is currently no dignified solution for larger babies, the water method could become one if the water basin meets the gentle, soft, and warm experience that both parents and nurses need.

The current water basin clashes with the professional image of the nurses. They expressed embarrassment about offering it to parents, while also sharing how proud they are of their work and how much they value providing quality care. The idea of placing a child in a 'storage box' or 'a plastic bin from the store' contradicts with the quality and dedication they work for. This can undermine the fulfillment they get from their work. A water basin that does suit the aesthetic and symbolic importance of this moment can therefore not only improve the parental experience, but also contribute to the nurses' sense of integrity and pride.

Nurses want to be able to offer every family uniform care, regardless of the size of the baby or which nurses are supporting the process. In practice this consistency is still lacking, because some nurses avoid using the water basin out of embarrassment or use smaller alternatives. As a result parents might have different experiences. Furthermore, parents can compare their experience to other experiences that are shared on the internet. This could lead to parents feeling like they have missed out on experiences, regret or negatively look back on the experience.

Nurses emphasize that every family has different values, needs and financial possibilities and it is important to start a conversation to ask families what they need. This seems to conflict with the fact that nurses want to offer parents

uniform care. However, both of these needs can be met, by offering parents uniform care that still allows families to individually adapt the experience to different cultures, styles or situations. The uniformity will make parents less likely to compare their experience unfavourably to that of other families. Personalisation will allow families to personalise the experience to their own needs. Together, uniformity and personalisation will improve the quality of care, which will not only support parents better in their bereavement process, but also make nurses feel more fulfilled from their work.

6.1.4 Initial Interview with Nurses Conclusion

This study aimed to gain a better understanding of the experience of the use of the watermethod at the obstetrics department in Amsterdam AMC,

What are the experiences, needs, and challenges of obstetric nurses regarding the use of the current water method for stillborn babies at Amsterdam UMC?

Nurses appreciate the water method because it makes the baby look more beautiful and natural, which comforts parents. At the same time, they are dissatisfied with the current water basin: it looks like a household tub, feels unprofessional and is heavy, unstable and difficult to empty without spilling. They want uniform care and materials that match the dignity of the moment. Despite the emotional weight, they find their work meaningful.

What are the experiences, needs and challenges for parents that use the water method for their stillborn baby from a nurse perspective?

Parents first need space to process the shock, then clear but calm information so that they don't miss any options. The water method helps parents because the baby is lying in a recognisable and natural position. Furthermore, they need something that is completely transparent, so they can see every part of their baby and get to know them. Needs vary depending on culture, financial situation and values, so nurses adapt their care to each family. A soft, warm and dignified atmosphere is an essential part of the experience.

6.2. Co-creation Session with Nurses

This section discusses the two co-creation sessions held with nurses and designers to explore the idea and solution space for a new experience for the water method.

6.2.1 Co-creation Session Method

6.2.1.1 Participants

The co-creation sessions included obstetrics nurses of the Amsterdam UMC, designers and engineers from Prototyping and Development. By combining these two target groups, they can learn from each other and combine different perspectives and backgrounds.

First session: 10 nurses and 8 designers
Second session: 10 nurses and 9 designers

Due to scheduling conflicts, not all participants were the same across sessions. The sessions were independent and did not require prior participation. At least 2 designers had to be in each group, so they could

6.2.1.2 Procedure

Two co-creation sessions were each 45 minutes long and were done during nurses clinical hours. Both sessions followed the principles of a Road Map for Creative Problem Solving Techniques (Heijne & van Der Meer, 2019). The aim was to complete two design diamonds:

Session 1: idea finding diamond (45 minutes)
Session 2: solution finding diamond (45 minutes)

The structure of these sessions were organised in three steps: Diverging, reverging and converging.

Session 1
Participants brainstormed together with a group of 6 on the Problem as Given “Hoe kunnen we een water basin ontwerpen voor stilgeboren babies (ouder dan 28 weken) die ouders ondersteunt en werkbaar is voor verpleegkundigen ”. First, participants generated as many ideas as possible, which were then intuitively clustered and evaluated using dot voting (red/blue stickers) to find innovative, interesting and out-of-the-box ideas. During the brainstorming sessions, participants were encouraged to build off each other's ideas and think out loud when placing sticky notes on the board. Groups were allowed to walk to boards of other groups to gather inspiration. A detailed session plan can be found in Appendix E.1. After the session, observations, thoughts and questions were documented and a reflection was done to improve the approach for Session 2. The setup of session one can be seen in Figure 26 amd 27.



Figure 26, set up of co-creation session 1

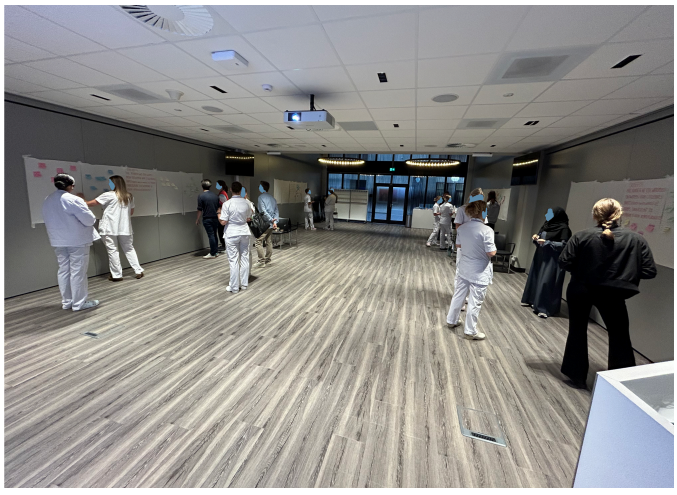


Figure 27, all groups brainstorming together during the co-creation session

Session 2
The second co-creation session was used for solution finding, and subproblems were based on the insights from the first session. The main research question for this session was:

" Hoe kunnen we ouders ondersteunen in een goed afscheid van hun stilgeboren kindje? In dit project focussen we op de rol van de watermethode, waarbij de methode ook werkbaar is voor ouders en verpleegkundigen."

First, all participants brainstormed together to define what an undignified experience was to get accustomed to the sbuject. They were encouraged to build of each other ideas. After this warming up exercise, the group was split into three teams, with a minimum of 6 participants, with different backgrounds distributed over the teams. Each team had a note-taker and a timekeeper. Each team brainstormed on one of the following subproblems:

Group 1: In what different ways can you make saying goodbye to a baby feel dignified and personal?
Group 2: How can parents have contact with their baby and interact with them in the delivery room?
Group 3: What kind of appearance should the water basin have, to create a comforting feeling for parents?

This time, groups were not allowed to interact with other groups, but to find a solution for their subquestion with their group. They were tasked to create a poster or low-fidelity prototype of their solution. At the end of the session, each group pitched their solution, and a discussion was opened to include opinions of the other groups on each solution. The full session plan can be found in Appendix E.1 and the setup of this session can be seen in Figure 28 and 29.



Figure 28, set up of co-creation session 2



Figure 29, set up of co-creation session 2

6.2.1.3 Materials

Materials necessary for the first co-creation session:

- Flipchart sheet (x24)
  - 3 for the mindset of the different steps that are listed consecutively on a flipchart sheet
  - 5 per team as a background for ideas (20)
  - 4 of which have the Problem as Given written on them.
- Agenda with some fun drawings
- Round stickers in 2 different colours, red and bue
- Sticky notes
- Pens
- Biscuits
- Printed consent forms
- Adapted for co-creation session
- Printed session plan
- Pens for the consent forms.

Materials neccesary for the second co-creation session:

- Lo-fi prototyping materials (coloured paper, cardboard, clay, tape, glue, scissors)
- Sticky notes
- Coloured pens
- A4 sheets
- Phone for audio recording and photo's

6.2.1.4 Ethics

All data and photos were anonymised and stored in a secure OneDrive folder. Participation was voluntary and participants could take breaks and stop the interview at any time. The consent form and ethical checklist are included in Appendix B.

6.2.1.5 Analysis

After session 1, observations, thoughts and questions were written down, then a reflection was done on the session to iterate on the second session.

The discussion in the second session was recorded and transcribed. These transcripts, together with notes from each team" note-taker and personal reflections, were analysed to find themes. These themes were used to draw conclusions and influence the design drivers.

6.2.2 Co-creation session Results

Results of co-creation session 1 can be found in Figure 30 and Appendix E.2 and results of co-creation session 2 can be found in Figure 31 and Appendix E.3.



Figure 30, results co-creation session 1

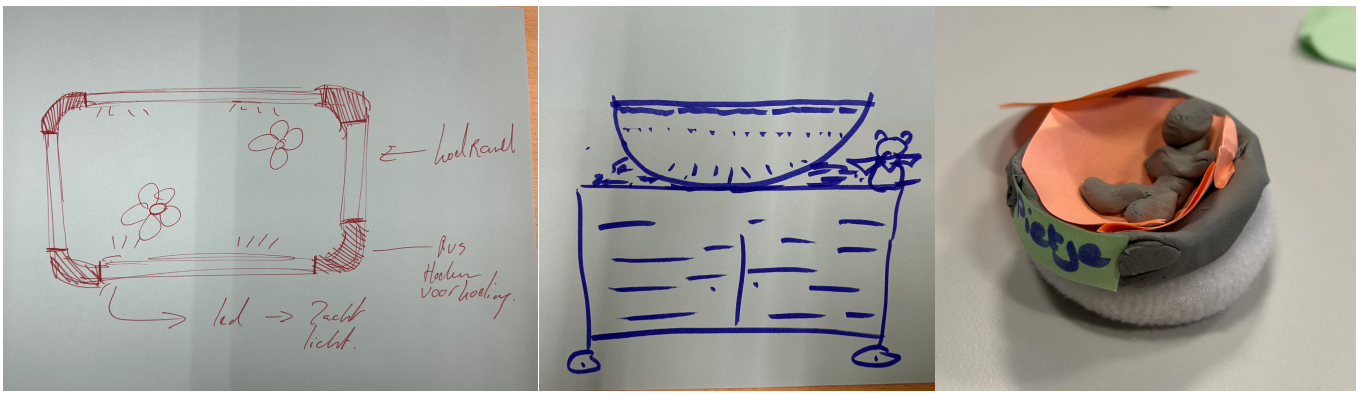


Figure 31, results co-creation session 2

6.2.2 Co-creation Session Discussion

Understanding dignity and worthiness
Nurses believe that dignified design goes hand in hand with aesthetics, but do note that cultural backgrounds influence parents' perceptions of what is worthy and that these beliefs about a dignified experience can vary between families. The decisions made by parents after giving birth to a stillborn baby to mourn and say goodbye to the baby are very personal.

Nurses mentioned that the worthiness of the experience is not only important for parents, but also for themselves. When parents did not want to see the baby, nurses could not leave the baby in a closed tupperware container. They would put effort in wrapping it in a pretty blanket or making sure the baby was not put aside in a corner somewhere in the room.

What feels undignified?
Some elements were found undignified or unworthy for the baby by the resource group. These included laying baby on the ground, fishbowl-like shapes, waterbassin sizes that were too small or too big, using too much RVS in the design, the baby laying in dirty water, a waterbassin with sharp edges, poor visibility of the baby, textured material that would leave marks on the baby's skin, unsuitable colours and distorted image of baby.

What feels dignified?
Some nurses said that by adding personal touches to and around the water bassin, for example with stuffed animals, decorating the space with personal belongings, namecards, lights, music, choosing different colours and patterns for the waterbassin and perhaps involving siblings of the stilborn baby could be seen as a worthy experience.

Furthermore, some nurses mentioned how a warm appearance would be preferred, with warm / neutral colours so that it would be suitable for all babies. As per shape, nurses found round shapes generally more dignified. A half egg-like shape, or a shape that resembles a womb. Covering the baby during transport in the hospital or transport home was also considered part of the worthiness of the experience.

Considerations for nurses and the obstetrics department
Nurses value personalising the water bassin to parents' needs. They think it is important to adjust the water bassin to different preferences from parents. However, they did not want to add additional cost to the obstetrics department or increase their own workload. A design that would invite parents to personalise it, without impacting the work process of the nurses, would be ideal.

Too many variables and added steps would increase the workload. Examples include making parents choose between options like colour or pattern, or overcomplicating the water basin by adding extra steps to the process of cleaning and refreshing water.

Care from beginning to end
The nurses found it beautiful when the experience would be thought of from the beginning all the way to when parents take home the baby and even when parents would have the baby at home. However, some nurses were worried about money. When (part of) the water basin would go home to the parents, the department would not have the funds to fund all this, and asking the parents for money would feel insensitive.

Personalisation without pressure
Some nurses found it important that the design of the water bassin should not force parents to do something they don't want to do. One of the nurses commented on the idea of having name cards on the water bassin, that some families do not name their baby, and that a space to place the card into it would be forcing them to look at a blank space or force them to write something down and feel like it would be expected from them to fill in a name.

6.2.2 Co-creation Session Conclusion

The aim of the chapter was to explore the idea and solution space for a new experience for the water method together with nurses and designers. The first session focussed more on exploring the problem space and ideating on the main research question: 'Hoe kunnen we een water basin ontwerpen voor stilgeboren babies (ouder dan 28 weken) die ouders ondersteunt en werkbaar is voor verpleegkundigen'. The second session explored subquestions of the solution space and focussed more on the interaction between stakeholders and the water basin. Furthermore, during session two, the definition of dignity and worthiness was discussed. Dignity is influenced by easthetics, but cultural influences on what is perceived as worthy. Nurses value personalisation, but find it important that this personalisation does not overwhelm parents or increase workload or costs for the obstetrics department.

6.3 Conclusion Interview and Co-creation Sessions

The chapter aimed to understand the experience of the water method at Amsterdam UMC through interviews and co-creation sessions, and to develop design guidelines for the *Define* phase of the thesis. The interviews resulted in 11 themes and 11 sub-themes, while discussions during the co-creation sessions provided additional insights into the needs of nurses and parents, how dignity is viewed, considerations for the obstetrics department, and personalisation, complementing the interview findings.

6.3.1 Requirements

Based on the conclusions of this research, these important design requirements and wishes were discovered:

REQUIREMENTS

- Emptying and refreshing the water should be possible without physical strain for the nurses. (Interview, Co-creation session 1)
- The base of the design should feel whole, although it should invite personalisation (e.g. space for cloths, small objects, decoration), without forcing it. No element should pressure parents into choices they do not want (e.g. mandatory name display). (Co-creation session 2)
- The new experience should feel warm, calm and dignified. (Co-creation session 2)
- The new design should not significantly increase workload for the obstetrics department and should fit into existing workflows of nurses (Interview, Co-creation 2)
- The new design should not significantly increase costs for the obstetrics department for the obstetrics department. (Co-creation 2)
- The water basin should support nurses' sense of dignity, and should fit the professional quality of the care they offer. (Interview)

NICE TO HAVES

- Designing the full experience, from before the birth until the moment parents take the baby home should be as dignified as possible. (Co-creation 2)

07

DESIGN VISION



07 DESIGN VISION

This chapter presents the design vision and design drivers that form the foundation for further concept development. Section 7.3 states the design requirements.

7.1 Problem Statement

The objective of this thesis was to design a new, dignified experience for the water method for stillborn babies between 28 and 42 weeks that supports parents in their grieving process and fits with care professionals in their nursing work.

The needs of nurses and parents were researched through literature and medical sources, as well as interviews with nurses from Amsterdam UMC. Parents who have experienced stillbirth often face intense emotions and must make decisions while in shock. Recognition of their parental identity and memory-making rituals, such as seeing and holding the baby, can influence the bereavement process.

The water method helps to preserve the baby's appearance, slow deterioration and gives parents more time together. However, nurses experience feelings of shame when offering the current water basin for the water method for larger babies born between 28 and 42 weeks. They also raise practical and ergonomic concerns when emptying and moving the water basin.

7.2 Design Drivers

All the preliminary research has been translated into four design drivers that serve as the foundation for concept development, whereby theoretical insights have been converted into design principles that directly influence the design.

7.2.1 Personalisation without Pressure

Each family has other needs, values and a way of coping with grief. The water basin should therefore allow for adaptation or personalisation, so that parents can make the moment of meeting the baby truly theirs. For example, by decorating the water basin with a name card, or adding flowers or stuffed animals to the basin.

At the same time, personalisation should be possible, but never expected. The design should not create pressure for parents and make them feel like they have to decorate or do memory making rituals if they do not want to. The "default" base of the water basin should already feel complete. Furthermore, this personalisation should not add pressure to nurses workload by adding more steps to the whole process. Instead, it should support them.

7.2.2 Create Memories and Connections

The water basin should support parents in getting to know their baby and creating memories after birth. It is important that the parents can explore details like hands, feet and facial features. The baby should be to lie as visible as possible inside the water basin if parents want to, allowing the baby to be seen from any angle without an obstructed view

The design should include the whole family; mother, partner, siblings and close family to have the opportunity to meet the baby and create memories together if they wish to do so. However, it is important that the experience still feels complete, also when parents do not want to partipate in any memory-making rituals or do not have other younger children, a partner or any supporting family members.

The design should invite interaction, so that parents, siblings and family members feel invited to come closer, touch the water or, if they wish, touch the baby or take the baby out of the water to cuddle with them. The design should support memory making rituals, such as photography and hand- and feet impressions, by creating a calm and even background and positioning the baby in a natural position.

7.2.3 Dignified Experience

The experience of the water basin should feel warm, calm, friendly and soft. The design should avoid associations that feel inappropriate for this context, such as household storage or fish bowls. Instead the experience should feel natural and protective like the womb. The basin should not leave marks on the baby's skin, and should prevent damage or awkward positions.

The design should consider the entire experience of parents after a stillbirth: not only when the baby is in the water, but also when the water basin is moved, when parents walk across the room, when family comes to visit or when the baby is taken home. During this entire process, the baby should be treated with dignity.

7.2.4 Support Nurses in their Work

The new water basin should make handling the water basin nurses easier and safer for nurses. The design should take ergonomic standards into account during moving, emptying and filling the water basin and should not be physically demanding. The basin should fit into existing workflows and not add extra steps that increase workload.

The design should align with the quality care that nurses offer parents. They should feel comfortable and proud when offering the water method, rather than embarrassed by the appearance or associations of the basin. A design that reflects their standards can increase their satisfaction of work instead of taking away from it. This could bring nurses fulfillment, and make it more likely to offer the water method consistently to all families.

7.3 List of Requirements

The design requirements for the water basin are summarised in Table 3. These requirements are based on all preliminary research and structured according to the Delft Design Guide method (Boeijen et al., 2014).

Table 3, requirements structured in categories

#	Category	Requirements	Based on
1	Performance	The water basin should maintain a water temperature between 4-10 degrees	State of the art, Bereavement specialists
2	Performance	The water basin should be able to consistent and even cooling of the baby's entire body.	Cooling
3	Performance	The baby's body should be able to fully submerge in water inside the water basin.	Cooling
4	Maintanance	Water in the water basin should stay fresh and should be refreshed when dirty and should be able to be cleaned according to the protocols of the hospital.	Nurse Journey
5	Target Product Costs	The new design should not significantly increase costs for the obstetrics department for the obstetrics department.	Co-creation session 2
6	Size and weight, storage	The design should fit in the storage room of the obstetrics department.	Stakeholder analysis: obstetrics department
7	Aesthetics, appearance and finish	The design should not be a one-fits-all solution, but allow for different grieving styles coping mechanisms, and emotional needs	Literature, Flow Diagram, Personal Story

#	Category	Requirements	Based on
8	Aesthetics, appearance and finish	The base of the design should feel whole, although it should invite personalisation (e.g. space for cloths, small objects, decoration), without forcing it. No element should pressure parents into choices they do not want (e.g. mandatory name display).	Co-creation session 2
9	Aesthetics, appearance and finish	The water basin should support memory-making rituals, such as photography, by giving a undistorted and calm view of the baby. (Memory-making rituals)	Memory-making rituals
10	Aesthetics, appearance and finish	The new experience should feel warm, calm and dignified. (Co-creation session 2)	Co-creation session 2
11	Ergonomics	The design should support a family-centered approach, including both parents to be involved and support them in their grieving process	Literature, Personal Story
12	Ergonomics	The design should encourage parents in seeing, holding and physically being with their baby.	Literature, Personal Story
13	Ergonomics	The design should allow parents to change their minds over time, for example about seeing or holding baby without adding pressure.	Literature, Flow Diagram, Personal Story
14	Ergonomics	The design should not add to cognitive burden, since parents may have limited capacity to absorb information due to shock, grief, emotional and physical pain.	Literature, Parent Journey
15	Ergonomics	Emptying and refreshing the water should be possible without physical strain for the nurses.	Nurse Journey
16	Ergonomics	The interaction should be intuitive and require minimal training for nurses.	State of the art: cooling
17	Safety	The design must conform to the infection control protocols of the hospital: All surfaces are smooth (Ra <0,8), Logo's and engravings cannot be too deep (maximum 14x14mm, 0,8mm deep, materials should be resistant to 70% alcohol, all area's must be reachable to clean, no sharp curves (r>0.2), and all spaces where liquids can reach must be able to be wiped down. (Infection prevention)	Stakeholder analysis: infection control
18	Safety	The water basin should support the baby and prevent damage to fragile skin.	Preservation methods: Cooling
19	Societal and political implications	Healthcare professionals should not feel ashamed when offering the water basin to parents.	Nurse Journey
20	Societal and political implications	The water basin should support nurses' sense of dignity, and should fit the professional quality of the care they offer.	Initial interviews with nurses
21	Installation and initiation of use	The new design should not significantly increase workload for the obstetrics department and should fit into existing workflows of nurses.	Initial interviews, Co-creation Session 2, Literature
22	Installation and initiation of use	The design should accommodate all supplies required by nurses throughout the entire process.	Physical interventions: memory-making rituals

The 'nice to haves' for the water basin are summarised in Table 4. These are based on all preliminary research and structured according to the Delft Design Guide method (Boeijen et al., 2014).

Table 4, nice to haves structured in categories

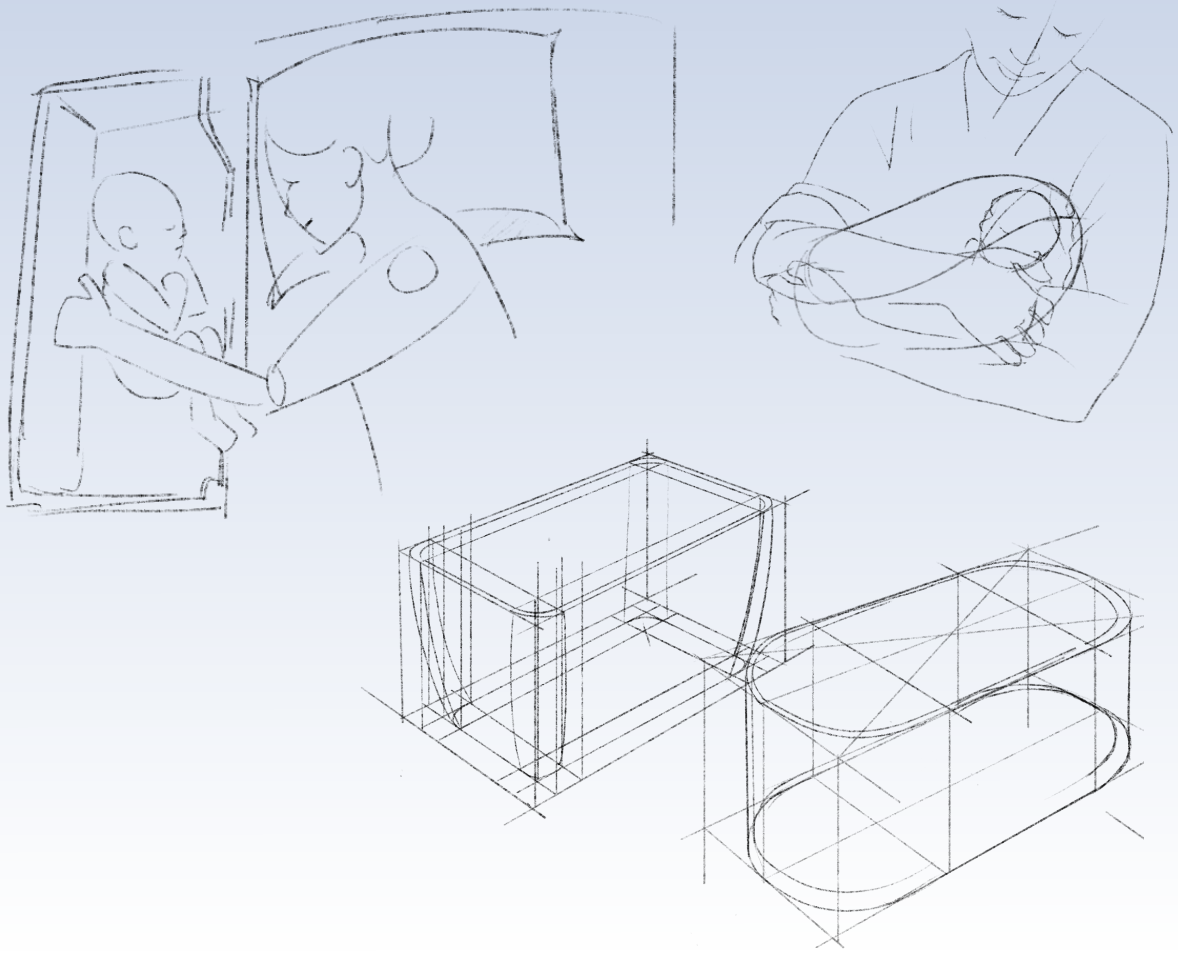
#	Category	Nice to haves	Based on
1	Size and weight	The water basin should be large enough to accomodate for the baby, while remaining as compact as possible for storage.	State of the art: cooling
2	Aesthetics, appearance and finish	The water basin should minimise disturbing elements such as noise and visual clutter.	State of the art: cooling
3	Aesthetics, appearance and finish	The water basin should support bereavement photography as well as possible.	Nurse Journey
4	Aesthetics, appearance and finish	Designing the full experience, from before the birth until the moment parents take the baby home should be as dignified as possible.	Co-creation session 2
5	Aesthetics, appearance and finish	The design should not intimidate visitors and should allow gentle first encounters.	Stakeholder analysis: Family and friends
6	Ergonomics	The design should support parental identity, for example by recognizing parents as mother(s) and father/partner.	Literature
7	Ergonomics	The design should allow space for personal items, such as baby clothes, toys or blankets.	Parent Journey
8	Ergonomics	The design should be approachable and include all family members or support groups that participate in memory making rituals.	Stakeholder analysis: Siblings, grandparents, family and friends
9	Ergonomics	Include siblings in the memory making rituals and gently support them to understand that their sibling has died, and that it is no ones fault.	Stakeholder analysis: Siblings
10	Societal and political implications	The experience should also consider the transition from hospital care to care at home. Providing information about the water method can help inform caregivers who will take over the care of the baby after the parents leave the hospital.	Stakeholder analaysis: Doula, Funeral undertaker

7.4 Envisioned process

The envisioned process should feel **warm** and **invite parents to interact** and get to know their baby. The design should evoke a feeling that is **natural** and **protective**, almost like the protection of a **mother's womb**.

08

IDEATION AND CONCEPTS



08 IDEATION AND CONCEPTS

This chapter presents the ideation process for the design drivers. The result of this ideation process are four concepts: Halo, Tree of Life, Flow and Memora, and are presented in section 8.2. Section 8.3, evaluates these four concepts with nurses of the obstetrics department and bereavement specialists.

8.1 Ideation on Subproblems of Design Drivers

To begin exploring the problem space, subproblems were derived from the design drivers (Figure 31). All sketches on these subproblems and the design drivers can be found in Appendix F.

Personalisation without Pressure

- How to personalise the water basin?
- How to personalise the water basin without pressure for nurses?
- How to personalise the water basin without pressure

Support Nurses in their Work

- How to ergonomically move a heavy object?
- How to empty a big volume of water?
- How to keep volume of water cold?
- How to make nurses satisfied and feel fulfillment?

Create Memories and Connections

- How to involve parents and help them have contact with their baby?
- How to support parents in their bereavement?
- How to support memory making rituals?
- How to include family and siblings meeting the baby?

Dignified Experience

- How to stabilize a baby laying in a water basin?
- How to give a water basin a warm appearance?
- How to cover the baby in water basin?
- How to incorporate symbolic elements to the context of laying a baby in water?
- How to let baby lay in natural position?
- How to make taking home the baby a more dignified experience?

Figure 31, subproblems of design drivers

Ideas were selected and grouped together after brainstorming the subproblems and combined into initial concepts. Four concepts were then further developed for evaluation. Combining a wide variety of ideas was important in order to create a broad range of concepts, so that the evaluation would provide meaningful insights. Also, exisiting products like baby baths were analysed as inspiration (Appendix G)

Several low-fidelity prototypes were created and experiments were done to explore some of the ideas that emerged during the ideation phase (see Figure 32).



Figure 32, experiment and prototypes during ideation on design drivers

8.2 Concepts

This section presents the four concepts, Halo, Tree of Life, Flow and Memora, after ideation. Detailed illustrations were created for each concept to communicate the design features. 1:10 scale prototypes were made to understand the spatial proportions of each concept. All concepts are accompanied by a mood board to demonstrate their intended atmosphere.

8.2.1 Concept 1: Halo

The Halo concept (Figure 33 to 35) is inspired by the halo effect, which occurs when sunlight or moonlight shines through a cloud of ice crystals (Morsing, n.d.). The water basin of the Halo stands on top of a ring-shaped base. This base has space for personal belongings of the baby that parents have brought with them. The sides of the base are magnetic, and siblings or other visitors can be included by decorating and personalising the sides of the base with magnets. The Halo's stand is designed so that the water basin can be placed above or next to the bed, resembling a co-sleeping bed. This way parents can be close to the baby, even when the mother is less mobile.

A cover is attached to the base to hide the medical stand, and can be adjusted based on parents' needs. It is also possible to cover the water basin when the water basin is transported in the hallways of the hospital.

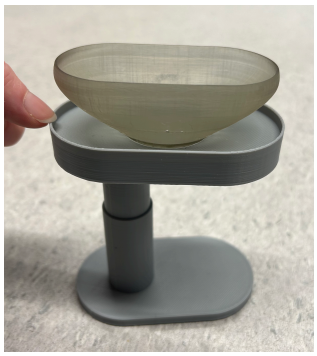


Figure 33, Prototype of concept Halo



Figure 34, Moodboard of concept Halo

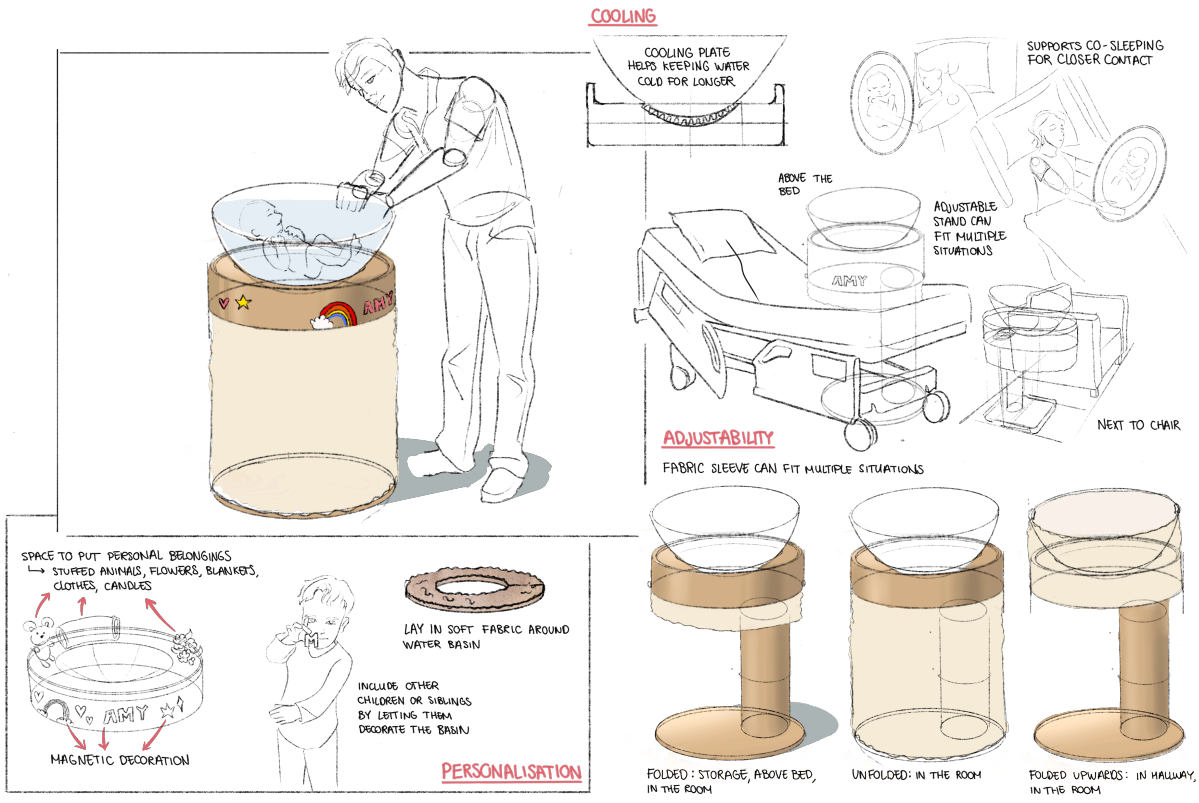


Figure 35, Illustration of concept Halo

8.2.2 Concept 2: Tree of Life

The Tree of Life concept (Figure 36 to 38) is inspired by forests and the natural shapes and structure of trees. The stand is shaped as a tree, transforming it from a 'device' to a symbolic resting place. The child lies as if nestled in a canopy of leaves. Parents, siblings or other visitors can decorate the edge of the water basin with flower clips, as if the tree is blooming. The natural cavities in the stand will provide space for stuffed animals or other belongings, but will not force parents, as cavities in trees are natural when left empty. The branches extending onto the water basin are the connecting points that allow the basin to rotate for easy emptying of the water.

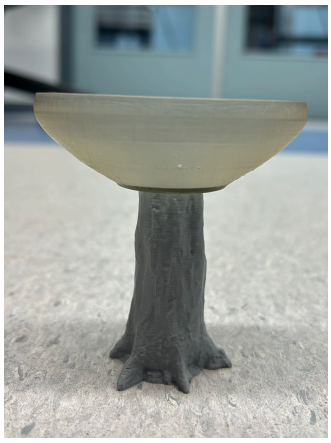


Figure 36, Prototype of concept Tree of Life



Figure 37, Moodboard of concept Tree of Life

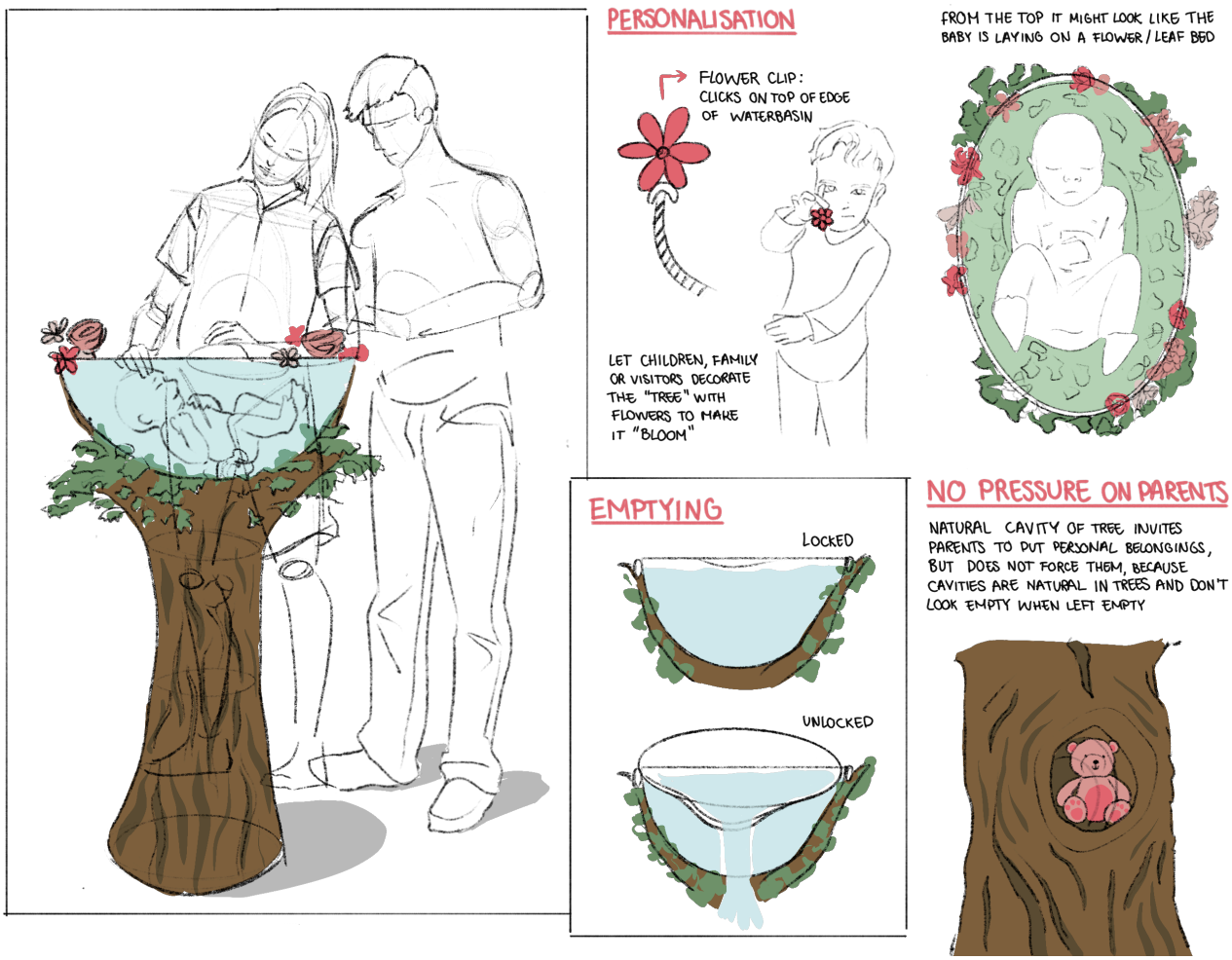


Figure 38, Illustration of concept Tree of Life

8.2.3 Concept 3: Flow

The concept Flow (Figure 39 to 41) is inspired by the natural flow of water. The shape of the base is inspired by a waterfall and is magnetic, so that magnets can be used to personalise the experience. Parents, but also siblings or other visitors can contribute to the personalisation. The water in the basin is kept in motion and the gentle sound of water flowing can create the impression of a river flowing through the delivery room. Light falls into the water, which projects moving patterns on the delivery room's floor and ceiling.

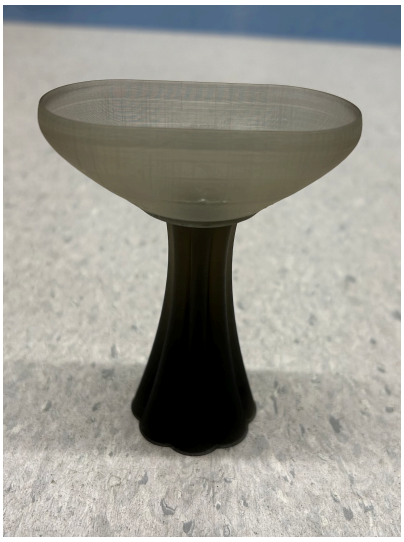


Figure 39, Prototype of concept Flow



Figure 40, Moodboard of concept Tree of Life

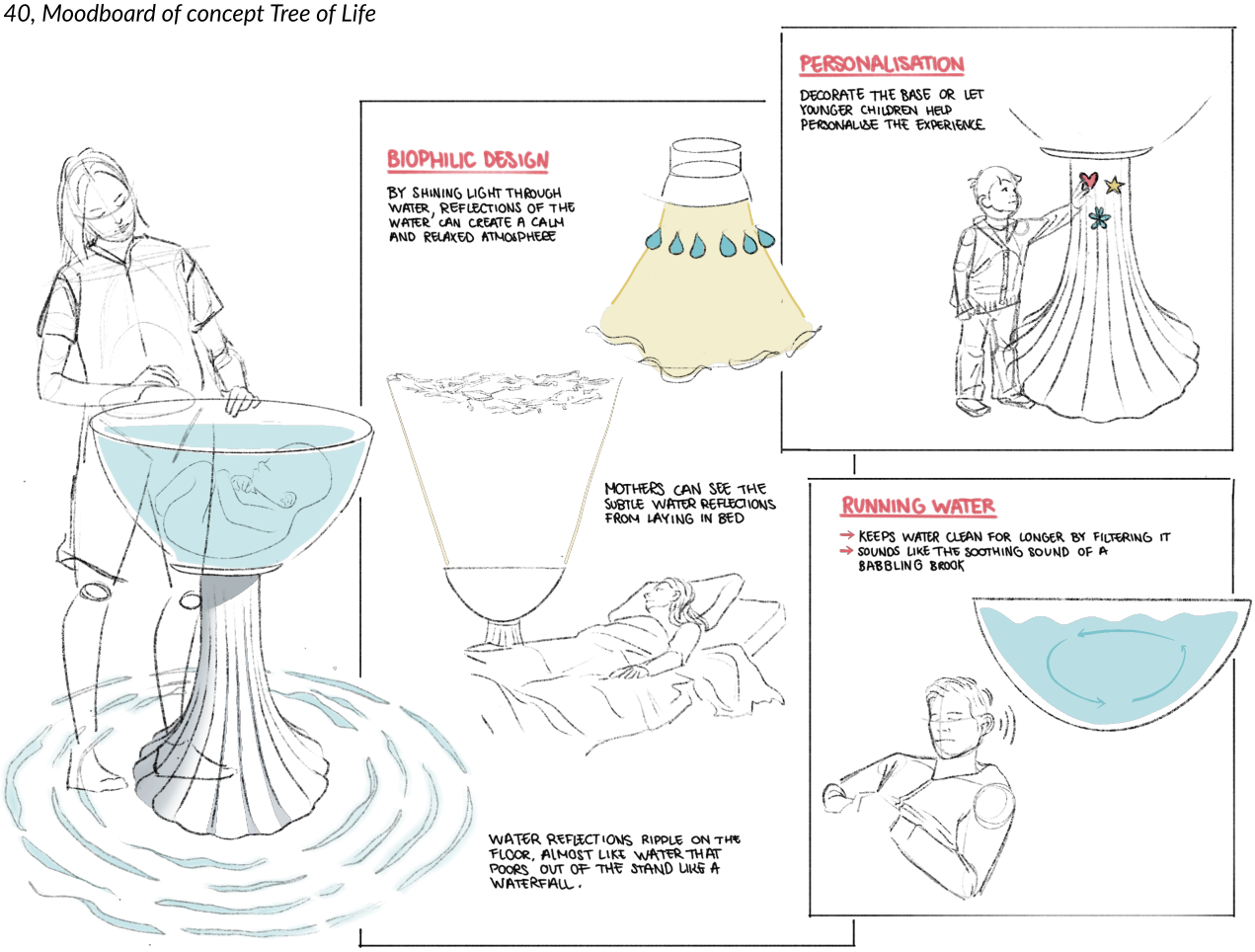


Figure 41, Illustration of concept Flow

8.2.4 Concept 4: Memora

The Memora concept (Figure 42 and 43) is inspired by the practicality of a changing table in a nursery. The Memora consists of a water basin on a wheeled cabinet can easily be transported around the department. The filter is hidden away inside the cabinet, and keeps the water clean for longer. There is also a hidden drain that makes emptying the water basin easier.

All the supplies that nuses need to create memories for the baby are close together to the water basin. For example, the ink pads, celstof cloths, memory cards and a photocamera. The storage space within the cabinet is divided into two sections. Nurses can access the cabinet from the back, while parents can place personal items in the front section. Furthermore, parents can find items such as scented oils or baby oil to suit their needs. A soft blanket cloth can be draped on top of the cabinet to give it a more soft appearance. Personal belongings of the baby can be placed on top of the cabinet to create a more personal experience.



Figure 42, Illustration of concept Memora

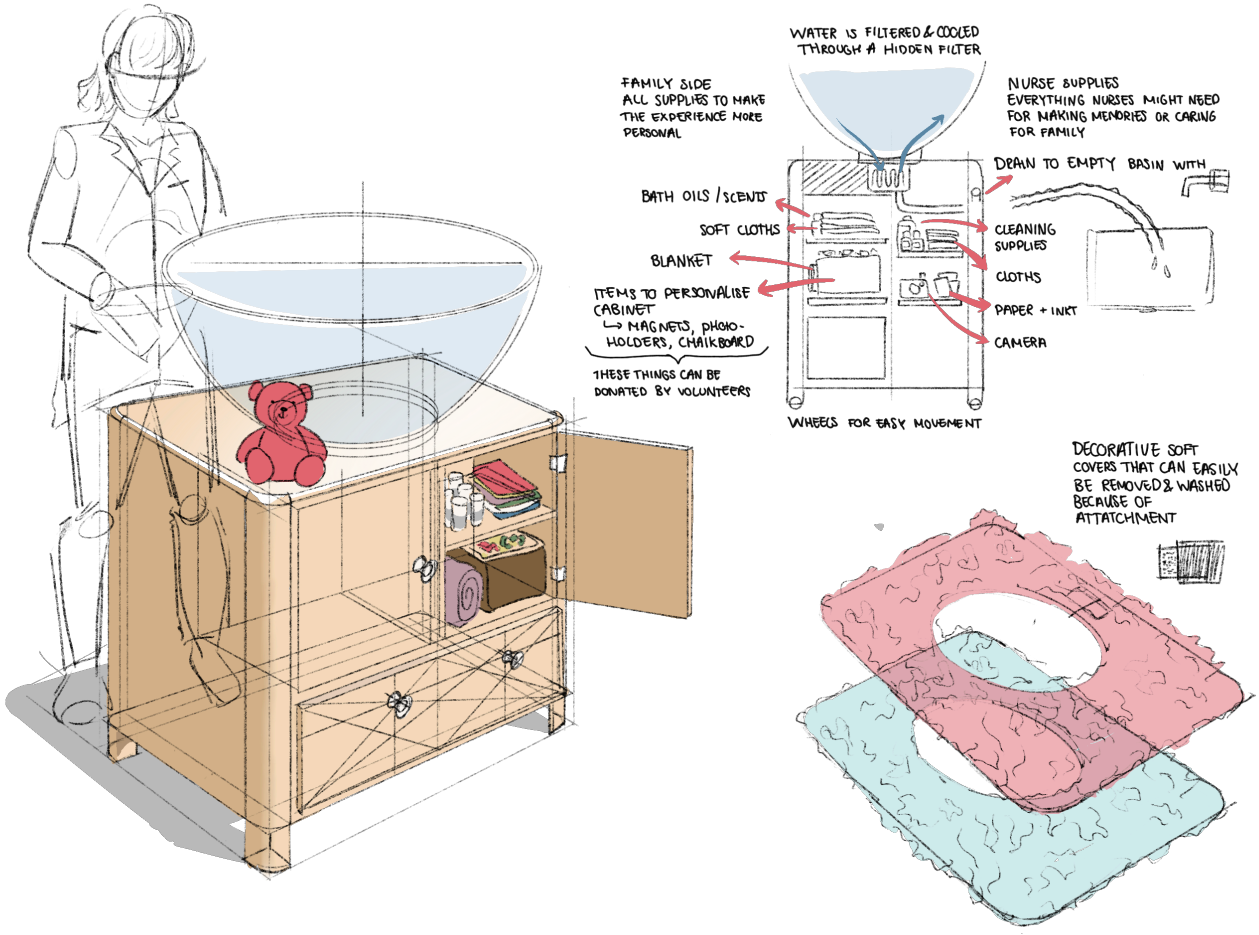


Figure 43, Illustration of concept Memora

8.3 Evaluation of the Four Concepts

To evaluate the four concepts, two studies were carried out. The aim of this evaluation study was to evaluate the four concepts, as well as the elements within them that were valued and suited to the clinical context. These insights serve as a basis for further design choices in the development process. The following research questions were formulated:

How do healthcare professionals and bereavement specialists assess the four conceptual designs for a new water basin in terms of clinical workability, perceived suitability for hospital use, and expected parental experience

Which elements of the four concepts are preferred for further development?

8.3.1 Evaluation of Four Concepts Method

8.3.1.1 Participants

For the first study, nurses of the obstetrics department of Amsterdam UMC were included in the evaluation of the final design, as they are the primary users of the water basin and responsible for moving, emptying and cleaning it. Nurses' feedback is essential to validate the usability and design features in the clinical context. All participants had experience in supporting parents through stillbirth and had experience with using the water method. Participants were retrieved by going to the department and interviewing those who were available. In total four healthcare professionals participated.

In the second study, two bereavement specialists on caring for bereaved parents participated. They are part of steunpunt NOVA and Ima afscheidszorg. an organisation that shares knowledge and offers guidance on the experience of stillbirth. Since 2014 Ima Afscheidszorg has supported families that have lost their baby. Since 2017, Ima Afscheidszorg has offered the water method in a home setting. Given their work caring for bereaved parents, they were invited to share their perspective of how parents might experience the four concepts.

8.3.1.2 Procedure

Each concept was presented to participants separately using drawings and a verbal explanation. In addition, mood boards were shown for each concept to clarify the atmosphere and design intention. After the explanation, participants were first asked for their initial thoughts and then to intuitively assess the concepts using the different coloured markers. Participants then assessed the overall concept and the sub-elements using the three colour codes. For each assessment, they were asked to explain the reason behind their score in order to gain insight into their underlying motivations. All statements were recorded on a telephone and transcribed afterwards.

8.3.1.2 Procedure

The following materials were used during the first study:

- Four printed concept visualisations
- A mood board to clarify the atmosphere and design intention
- Legend with meaning of the coloured markers (Figure 44)
- Three markers in different colours (green = +2 "super interesting, I love it"; blue = +1 "nice, i like it "; orange = −1 "doesn't work for this context")
- Consent forms
- Paper and pen
- Phone for audio recordings

For the second study the following materials were used.

- Four printed concept visualisations
- A mood board to clarify the atmosphere and design intention
- Consent forms
- Paper and pen
- Phone for audio recordings

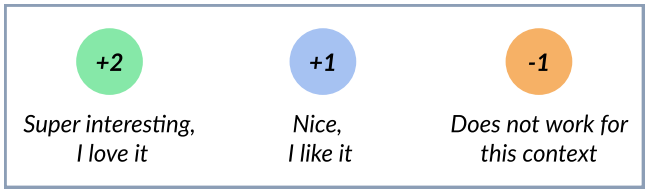


Figure 44, Legend of the coloured markers

8.3.1.4 Ethics

Informed consent was obtained prior to participation. The data was processed confidentially and anonymised. Participants were allowed to stop or leave the room at any time. The interviews took place in a private room in the hospital, at the obstetrics department. If something urgent came up, nurses were close to quickly assist their collegues.

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8.3.1.5 Analysis

The audio of the evaluation was recorded and transcribed into a transcript. The reflections on the four concepts design were analysed and categorised, and supported with quotes from their statement.

8.3.2 Evaluation of Four Concepts Results

This section discusses the results of the first evaluation study with nurses. First, the quantitative results of the scoring system are described, followed by a qualitative overview of the general assessment of the concepts.

8.3.2.1 Evaluation results with Nurses

a. Quantitative Results of Scoring System

The quantitative results of the first evaluation study with nurses are presented in Table 5.

Table 5, quantitative results of evaluation study with nurses

	Participant 1	Participant 2	Participant 3	Participant 4
Concept 1	6	5	4	5
Concept 2	1	0	1	-1
Concept 3	2	4	4	2
Concept 4	8	7	7	6

b. Four Concepts Evaluation nurses

Concept 1: Halo

Halo was generally positively received by nurses, mostly due to the personalisation ring and the moveable stand that is able to be placed over the bed of the mother.

Possibility to be placed over the bed

The stand makes it possible for the water basin to be placed over the bed, even when the mother is less mobile. However, one nurse did argue that not all mothers are immobile and are still able to move slightly after giving birth. One participant was reminded of the beds they use for living baby's, that can be placed over the bed. Several participants mentioned that HALO concept is a clear improvement on the current practice of placing it on a bedside table or medical table:

> *'So I think this is really good [the standard], I agree with that.' - nurse*
>
> *It's not often that they can't get out of bed. But it's nice that it can just be placed close to the bed.' - nurse*
>
> *'It's a bit like what we do with living children, that they can pull it over the bed. That makes it easier to reach. And now we put them on a little medical table, yeah very nice and cosy [sarcasm]... Well, if you're not very mobile, it's not very easy to reach. I really like the idea.' - nurse*

Stability of standard
At the same time, there are concerns about the stability of the standard. Both the weight of the water and the baby must be carried safely, and according to some participants, this requires a wider base:

> *'Then there's a chance that if you make this base a bit bigger, it will be more stable.' - nurse*
>
> *'I think this will be too unstable... but if you improve the base, it should be fine.' - nurse*

Personalisation ring
The personalisation ring has received varied responses. Although the majority nurses find the idea valuable, it has also been noted that parents have little time for this immediately after the birth. Furthermore, one nurse mentioned that smaller magnets can pose a risk in the presence of young brothers or sisters:

> *'Then I don't think they're interested in this, I'm pretty sure of that.' - nurse*
>
> *'It wouldn't be the first time a child put something in their mouth that they shouldn't have.' - nurse*

However, the idea of giving parents space to place personal belongings was appreciated by the participants:

> *'Yes, and I like this [personalisation ring] too, but I don't think it will be used very much. But I think an edge where you can put a stuffed animal is a really nice idea. Because people often have a stuffed animal or a blanket.' - nurse*

Covering the waterbassin
In addition, nurses expressed a need to cover the basin, both for transporting the basin in the corridor and in the delivery room. In the concept HALO, some nurses liked the idea of a cover that is built into the basin to cover it. Current methods of covering the basin, such as placing a towel over it, are impractical because towels sink into the water when placed over a large basin:

> *"You cover it with a cloth, but then it falls into the water... and gets wet." - nurse*

Cleanability
Finally, the concept is positively received by one of the nurses because of its cleanability; the design appears to be easy to clean hygienically:

> *"Just a simple design that's not too complicated.. then you can run a disinfectant wipe over it and it's clean again."*

Concept 2: Tree of Life

The bereavement specialists like the Tree of Life concept, but feel that the concept is more suitable for home use and does not fit well in a hospital context.

Personalisation
Several participants perceive the idea of personalisation with flowers as aesthetic, appealing, and warm, but at the same time as unrealistic and excessive in a hospital setting. Participants anticipate that parents will have limited space and time to actively decorate the water basin with flowers shortly after the birth, making this form of personalisation unsuitable for their situation:

> *'Too much fuss, I think. I'm more concerned about the decorations. That's what I think. Are people going to do that in the short time they're here? It's just too much. I think. Although the idea is nice. But I don't see those people doing it. If you've just given birth and you have a dead child, I don't see them picking flowers.' - nurse*
>
> *"I like the idea of the flowers, but I think it's a bit too much for here in the maternity ward." - nurse*
>
> *"It's lovely to do at home, but not here." - nurse*

Symbolic form and aesthetics
In addition, the symbolism and aesthetics of the concept, such as the tree shape, are considered too strong for use in the AMC. Participants feel that it does not fit in with the clinical atmosphere of the hospital. Nurses emphasise that the design is not neutral enough to offer to all parents and is more suited to a funeral home than a hospital environment:

> *"This is really... you need people who like this sort of thing." - nurse*
>
> *"Great for home, but we're too business-like here." - nurse*
>
> *"Concept 1 is neutral... this isn't." - nurse*

Workability
In terms of workability, the concept is evaluated critically. The materials and finish are considered difficult to keep clean and therefore unsuitable for hospital practice:

> *'This one looks rather rough... difficult to keep clean.' - nurse*
>
> *'I'm not sure if it's practical for here.' - nurse*

Concept 3: Flow

Flow is generally seen as an aesthetically pleasing and simple design, but nurses feel that several elements are less suited to the hospital context.

Simplicity
The simplicity of the standard is viewed positively, and the concept appears feasible in principle.

> *'It's quite simple really... just a stand with a basin on top.' - nurse*

Light effect
Clear doubts were expressed about the light effect and the reflection of the water on the ceiling or floor. The current lighting in the delivery room does not create a sufficient atmosphere and is often switched off. Instead, the room is lit by a lamp behind the bed, which means that the intended reflection effect is unlikely to be visible.

> *'I don't think the ceiling light works... fluorescent light.' - nurse*
>
> *In addition, the idea of projections or shadows of the baby on the floor or ceiling is perceived as potentially uncomfortable or even eerie:*
>
> *'I don't know how people will feel about the baby's shadow.' - nurse*
>
> *'I think that's a bit eerie... or that there's a ghost or something.' - nurse*
>
> *One of the participants was positive about added light. This would add to the overall atmosphere of the room.*
>
> *"I think that's a nice idea. If you could incorporate that and dim the room a little, and this light comes on... and that in that dark room or uninviting room, it would give some light." - nurse*

Not neutral enough
Some nurses find the concept too pronounced in terms of atmosphere or effect, and emphasise that a more neutral look is more appropriate in a hospital setting:

> *'Lighting can certainly be very beautiful, but I think this is a bit too much, because it is so specific and people either like it or they don't.' - nurse*

> *'To use it here, keep it neutral.' - nurse*

Running water
The idea of running water is questioned by one of the participants because of potential practical issues for the mother, such as the urge to urinate when mobility is limited:

> *'Running water can sometimes really affect the bladder... great idea, but not for the first 24 hours.' - nurse*

Stability
Finally, there are concerns about the stability of the design, especially since the basin sticks out slightly and water can move during transport:

'Perhaps the base should be a little wider, given the shape of the basin.' - nurse
'I wonder how stable it is... especially if the water starts to move around a bit.' - nurse

> *'Perhaps the base should be a little wider, given the shape of the basin.' - nurse*
>
> *'I wonder how stable it is... especially if the water starts to move around a bit.' - nurse*

Concept 4: Memora

Memora receives the most positive reviews by nurses. According to them the design fits well with the practical and logistical needs within the hospital and the obstetrics department.

Space for materials
Nurses particularly appreciate that the concept provides space for their own materials because it saves them time and energy searching and walking around.

> *"This looks really nice, yes. So this is also for us... more workable here in the department... And this has also been designed with us in mind, in the sense that we can also store our camera, our ink, our prints, our cards. So I think it's really nice that this has also been incorporated. This is really for the hospital. So this is super nice, yes." - nurse*
>
> *'Then you have everything together... very handy.' - nurse*

Space to put personal belongings
The possibility of storing parents' personal belongings is also seen as a positive:

> *'Many people have blankets or stuffed animals, so they can store those somewhere.' - nurse*

Mobility and stability
The mobile cabinet is considered very practical and makes it easy to position the water basin next to the bed. The stability of the design is appreciated:

> *"And sturdy... it stands on four legs, and the thing is bigger than the tray. - nurse*
>
> *'This is sturdy, it can't tip over in any way.' - nurse*
>
> *'At least with this one, you can be sure it won't tip over.' - nurse*

Storage
The participants did question where Memora can be stored within the limited space of the maternity ward:

> *'Where do we put this cabinet? ... there's not much space.'*

In addition, the items that nurses also need for smaller babies would have to be stored in two places.

> *'Under 24 weeks, but you can just take the items from here. You don't necessarily need this cabinet for that, because this is a very large basin for a baby under 24 weeks, so you would have it in two places. Personally, I don't mind that.' - nurse*

Filtering
Nurses are enthusiastic about the filter and changing system, especially because it saves time and solves practical issues. One of these practical issues is that the water basin is heavy and therefore difficult to empty. With a filter, nurses would have to change the water less often.

> *'That's really nice... a big plus.' - nurse*

Laundry logistics
The soft blankets are well received, but the laundry logistics form a practical obstacle:

> *'You just lose them in the laundry bag.' - nurse*

c. Preference for Concept for Nurses

The results show that Memora is clearly preferred by the nurses. They particularly appreciate its workability, stability and storage space, which meet the practical needs of the hospital and their department. However, an important point of attention is the space that the concept takes up, both in the delivery room and in storage.

Halo was also well received, mainly because of its neutrality, simplicity and that it could be placed over the bed of the mother. At the same time, doubts were raised about the stability and the usefulness of the personalisation ring, because some nurses questioned whether parents would use this in the hospital setting.

Tree of Life was considered the least suitable for the hospital environment. Its appearance was perceived as too specific and not neutral enough, and participants noted that the concept would be more difficult to clean because of the rough surface. Although some participants appreciated the design aesthetically, they felt it was more suitable for home use or a funeral home.

Flow was appreciated by some participants for its simplicity and the aesthetic element of light reflection. However, it was considered less suitable in a hospital context due to concerns about stability, unsuitable lighting in hospital rooms and possible undesirable effects of light reflections. This concept was also considered more suitable for home use than for clinical use.

8.3.2.2 Evaluation results with Bereavement Specialists

a. Four Concepts Evaluation Bereavement Specialists

The quantitative results of the first evaluation study with nurses are presented in Table X.

Concept 1: Halo

The concept Halo was positively received. The bereavement specialists appreciated the soft appearance and the way how the mother was able to stay close to the baby by moving the Halo over the bed.

> *'I really like the fact that it can be moved close to the mother.' (Bereavement Specialist)*

Personalisation

The bereavement specialists recognised the value of personalisation, but emphasised that it should not be forced upon parents. They said that small elements such as names or symbols could be meaningful and give parents a sense of regaining control, but only if parents felt ready for it.

> *The fact that you regain a little bit of control somewhere, even if it is something small like choosing a cloth or putting a name on the base, lets parents feel once again: 'I decided this myself.' - Bereavement Specialist*

Lacking in supporting emptying

However, the bereavement specialists mentioned that the Halo concept still lacked practical solutions to certain issues. In particular, it has no simple emptying or drainage system or any cooling.

Concept 2: Tree of Life

The concept Tree of Life was appreciated for its symbolic elements and aesthetic appearance. The bereavement specialists found the concept "wonderful".

Natural place to store personal items

The bereavement specialists appreciated the natural cavities in which parents could store personal items. They felt like it was less forced than explicit compartments.

> *"This is just the hollow of a tree. In a forest, you also don't think: why isn't there a stuffed animal in here?" - Bereavement Specialist*

Less neutral

At the same time, bereavement specialists found the concept to be less neutral. They said that some parents might find the tree too pronounced or overdone, particularly those who are already struggling with the idea of the water method itself.

> *"I can imagine that there are people who think: this is really exaggerated." - Bereavement Specialist*

Less suitable for clinical context

Furthermore, the bereavement specialists raised concerns about practical issues. For example, this concept would be difficult to clean and maintain, and found it less suitable for the hospital context.

Concept 3: Flow

Biophilic elements

The biophilic elements, such as the movement of water and light, were found interesting by the bereavement specialists, but also raised the most doubts. They appreciated the calming effect of light and reflection and linked this to symbolism of hope and gentleness. However, they questioned whether the noise of the water moving and light reflections might become restless for some parents.

> *"The whole idea of light is calming. You see this with candles at funerals; it represents hope that things will get brighter again." - Bereavement Specialist*

Water filtration
The idea of using a filter was appealing because it would reduce the need to change the water frequently. However, bereavement specialists expressed reservations about the technical and ethical uncertainties surrounding the effect the filters would have on body decomposition.

> *"Which baby do you test that on? You can't just say, 'We don't know what this does, but we'll try it.'" - Bereavement Specialist*

Concept 4: Memora

Supportive for in the hospital context
The bereavement specialists particularly appreciated the practical features such as storage facilitation, emptying, filtering, and the support this offers to nurses.

> *'When I see this for a hospital, I immediately think: this is the one.' - Bereavement Specialist*

This concept was seen as reliable and appropriate for the reality of the hospital. They believed Memora is a concept that parents would accept when it would be brought in, especially for short in the hospital.

> *'Then parents also think: this is it. Just like that cooling crib that is simply wheeled in.' - Bereavement Specialist*

b. Four Concepts preference bereavement specialists

The bereavement specialists found the Memora concept best suited to the hospital. They thought the Tree of Life concept was very beautiful, but not practical. They appreciated all the personalisation options and said these could be applied to all concepts. However, they did miss elements that considered keeping the water cold for longer.

8.3.3 Evaluation of Four Concepts Discussion

Both nurses and bereavement specialists emphasised the importance of neutrality for products in a hospital context. Concepts that were too pronounced, symbolic or aesthetically charged were deemed unsuitable for use in the delivery room. Both healthcare professionals and bereavement specialists said that the product must be suitable for many parents and appear to have been designed specifically for this purpose without imposing any meaning. Both nurses and bereavement specialists preferred the Memora concept due to its practicality and suitability for a hospital environment. However, they both appreciated the neutrality of the Halo concept and its added value in being able to be placed over the bed. At the same time, nurses pointed out that in most cases, mothers are mobile enough to get up. This raises the question of how necessary a design that can be placed over the bed is, or whether a basin next to the bed is sufficient.

Parents are often in a state of shock after the death of their baby and usually stay in the hospital for a short time. In this context, some of the nurses believe that there is not always a need for personalisation. Parents may be more focused on saying goodbye and making practical arrangements. The bereavement specialists did not mention the same, and believed that it could be a valuable first step if the nurses could place the magnetic letters to the base.

Nurses appreciated having the supplies close to the water basin, but at the same time it became clear that materials for making memories are also needed in other places in the department. In theory, having all supplies in the same place to make memories would be ideal; however, in practice, additional complications may arise.

Retrieving materials from the unit at the time the baby is in the water basin may diminish the dignity of the moment. In addition, it was indicated that certain items, such as a camera, will not be purchased multiple times due to cost considerations. As a result, these items cannot be stored close to the water basin as part of the standard setup, but will have to be stored somewhere accessible for the whole department. Other materials, such as ink and memorial cards, are available in larger quantities and could be placed in multiple places, which some nurses did not find to be a problem.

In addition, the question was raised as to whether drawers would remain accessible when the water basin is positioned directly against the bed. In that case, drawers would only be accessible by moving the unit, which might not be desirable and should therefore be taken into consideration in the design.

Reflect on method

The same evaluation method was not used for the nurses and the bereavement specialists. The sticker scoring system was only used for the nurses. Although these scores provide insight into which elements of the concepts were appreciated, the total score per concept does not provide a completely reliable picture of preference or quality. This is because the distribution of points was not proportional, as some concepts had more separate components or certain elements received more attention during the presentation. As a result, the total score may give a distorted picture of the actual appreciation.

8.3.4 Evaluation of Four Concepts Conclusion

The aim of this evaluation study was to evaluate the four concepts, as well as the elements within them that were valued and suited to the clinical context.

How do healthcare professionals and bereavement specialists assess the four conceptual designs for a new water basin in terms of clinical workability, perceived suitability for hospital use, and expected parental experience

Both nurses and bereavement specialists primarily assessed the four concepts based on clinical workability, stability, cleanability, and practical support within a hospital context. Neutrality was deemed the most important factor, with the Memora and Halo concepts being perceived as the most neutral. The Memora concept was considered stable and functional. Designs with stronger symbolism or more pronounced aesthetics (such as the Tree of Life and Flow concepts) were more often deemed less suitable for a hospital setting or less practical. Additionally, bereavement specialists emphasised that personalisation should not put pressure on parents.

Which elements of the four concepts are preferred for further development?

Figure 45 shows the elements of the concepts that were appreciated by nurses and bereavement specialists.

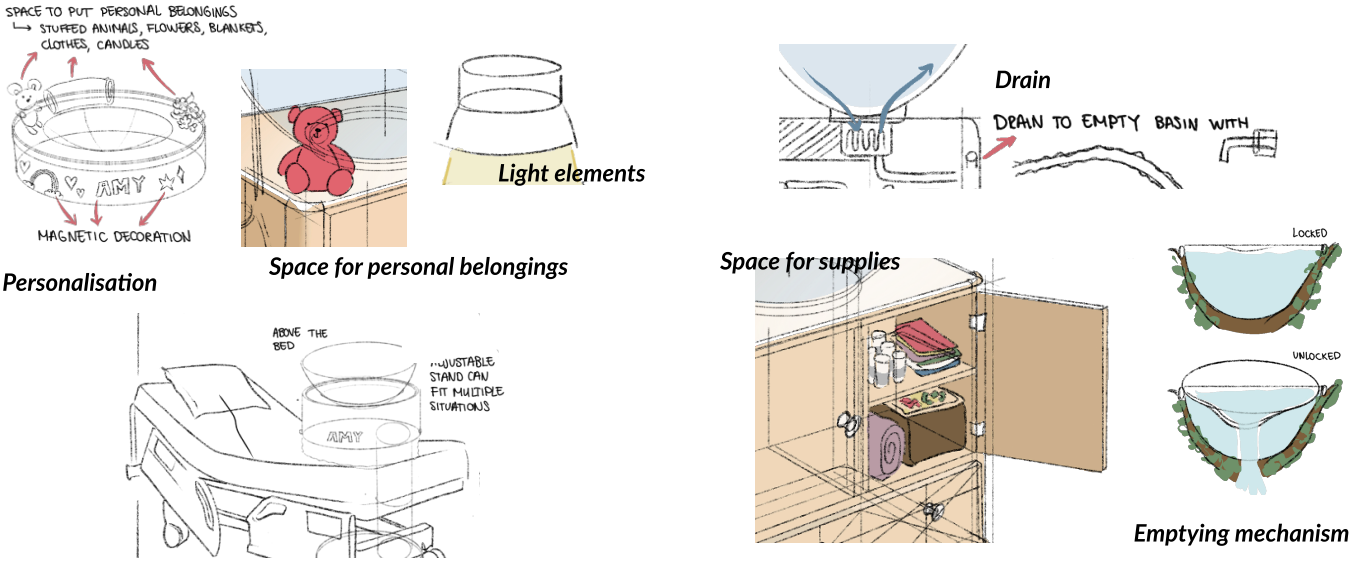
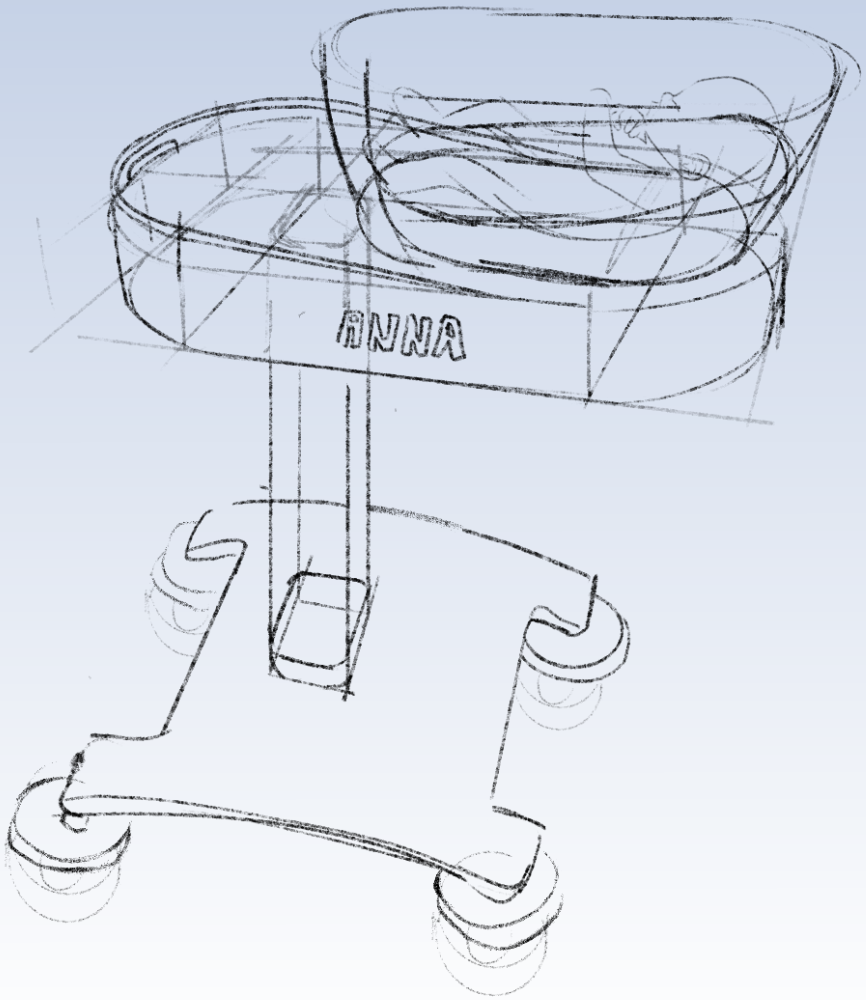


Figure 45, elements that were valued from the concepts

09

CONCEPT DETAILING



09 CONCEPT DETAILING

This chapter presents the design directions that emerged from the concept development and evaluation process. It provides a final reflection and redirection before the final design is presented. Section 9.1 discusses these design directions and makes a selection which direction aligns with the envisioned process. Section 9.2 contains a summary of the development to the final design.

9.1 Design direction

Following the development and evaluation of the four concepts, recurring approaches were discovered and structured into three overarching design directions: a symbolic design direction, a practical design direction, and a design direction focused on creating a special place for parents and their baby.

The symbolic approach has a strong focus on expression and meaning, and explores how form, material and symbolic elements can support parents and their baby in their final moments together. Although concepts that align with this design direction were perceived as aesthetically pleasing and meaningful, it may be less suitable for use in a clinical setting and more appropriate for non-medical contexts, such as a funeral home.

The practical design direction focuses on supporting nurses and incorporating functional elements, such as the ability to easily empty the water basin and store necessary equipment near it during the care process. However, this design direction could result in the design becoming more closely connected to the furnishings of the delivery room. This could potentially lead to the design being perceived more as equipment, instead of making it feel like a place where the parents and baby can bond and create meaningful memories.

The last design direction focuses on creating a special place that supports intimacy between parents and their baby in their first moments together. It offers space for parents' personal belongings, rituals and memory-making. This design direction emphasises the connection between parents and child. Within this approach, the special place is clearly distinguishable from the standard care environment of the delivery room, while remaining appropriate in the clinical context.

The envisioned process of the experience should feel warm and invite parents to interact and get to know their baby. The design should evoke a feeling that is natural and protective, almost like the protection of a mother's womb. The envisioned process aligns most with the design direction focused on creating a special place. A special place that is intimate and protective can encourage interaction between parents and their baby, which can help contribute to a meaningful experience.

At the same time, it is recognised that the design must also function within healthcare practice. That is why certain elements from the practical design direction have been integrated, such as facilitating the emptying of the water bath and providing storage for essential items for nurses. These functional aspects should support use for nurses without compromising the parents' experience or their ability to connect with their baby. This way, the design brings together the needs of both parents and nurses, with the parents' experience as the starting point.

The chosen design direction and its core principles together with its main functionalities is visualised in Figure 46.

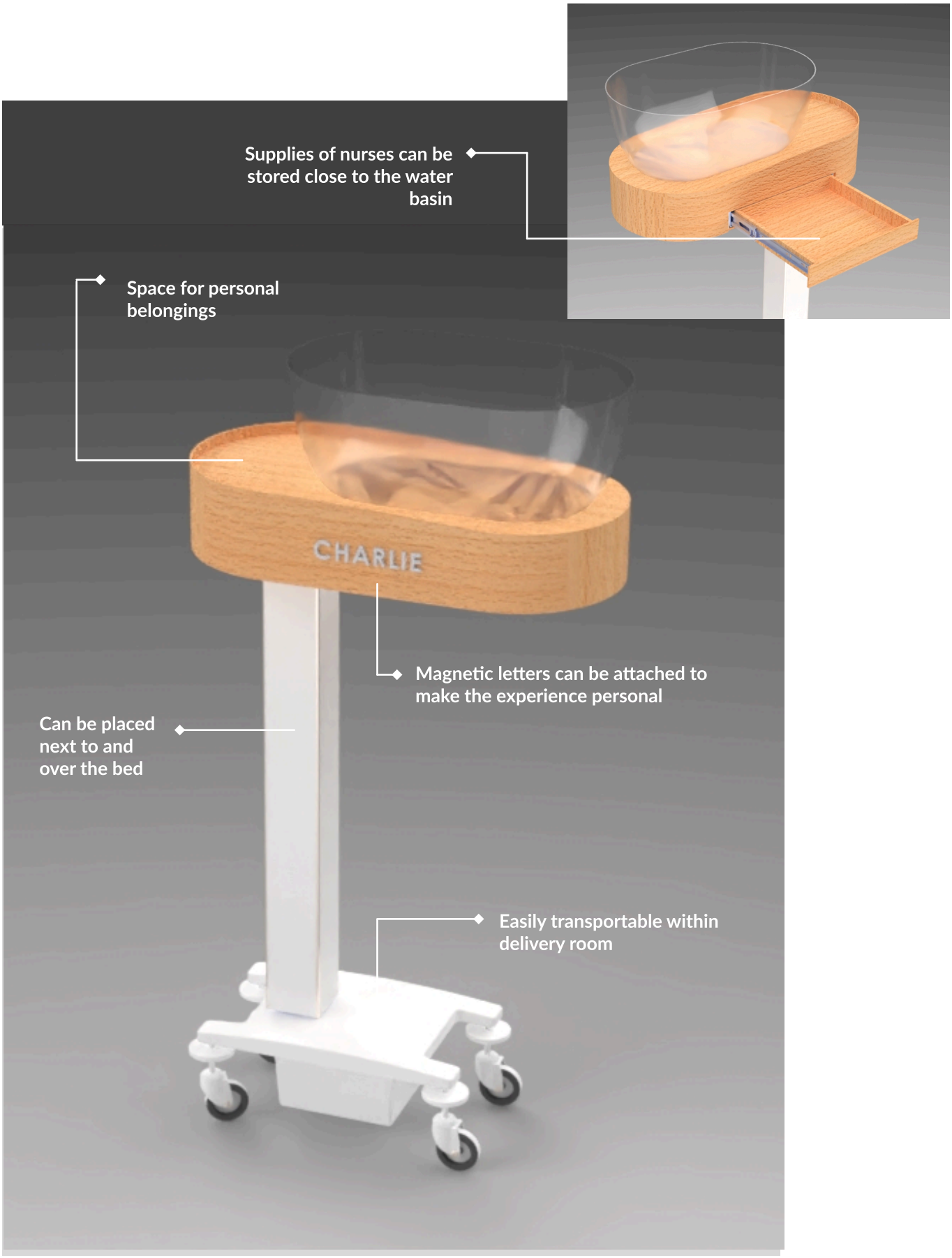


Figure 46, Chosen design direction and its main functionalities

9.2 The Road to the Final Design

The selected design direction and solution space were explored through sketching, prototyping and brainstorming sessions. Figure 47 provides an overview of the development process and the steps taken towards the final design.

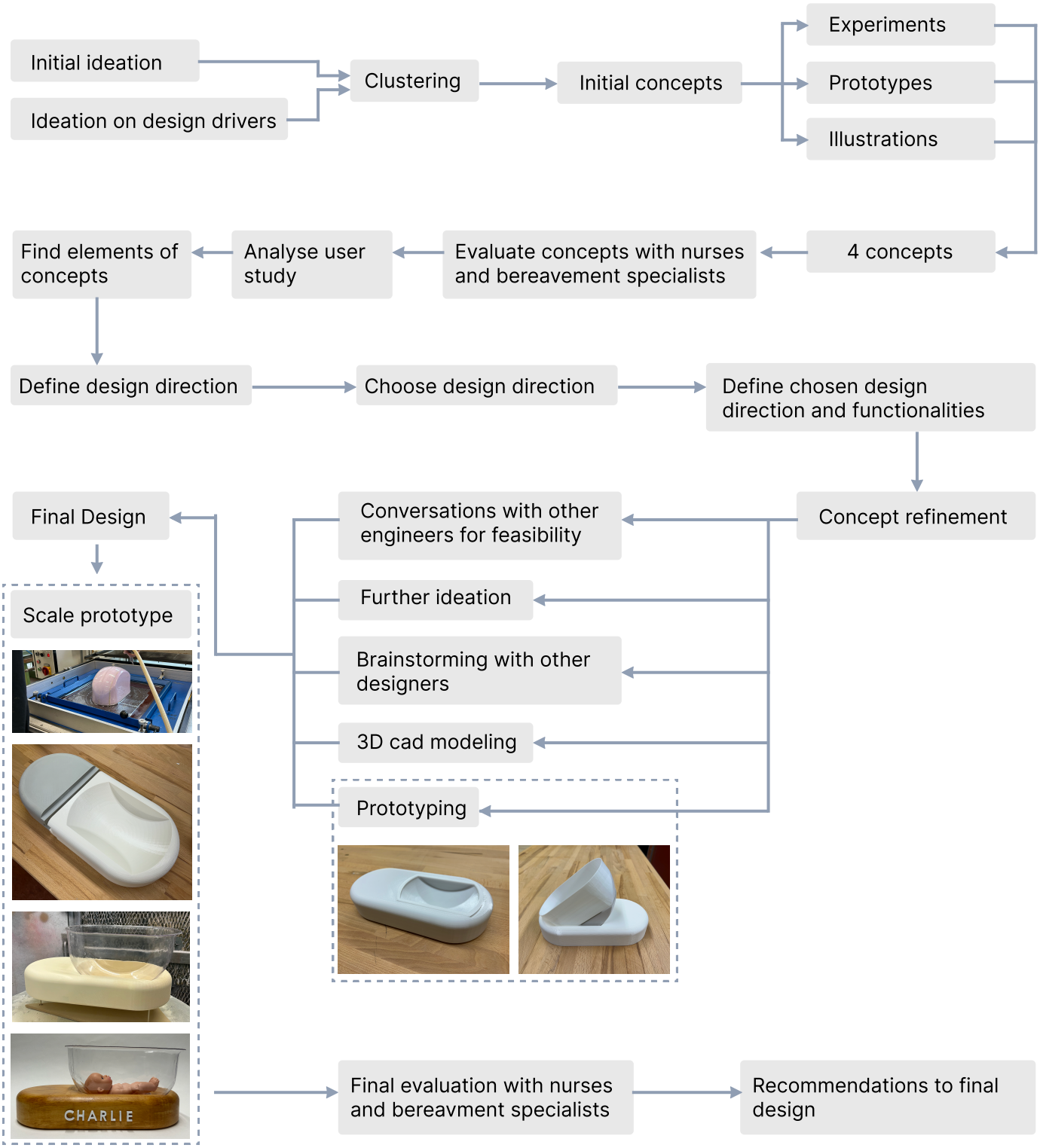


Figure 47, design route from idation to final design

Figure 48 illustrates the design considerations that emerged during the development of the final design.

The Base

Emptying Mechanism

- Ball joints
- Rollers
- No joints or rollers
- Rails
- Gas spring

Locking mechanism

- Suction cup
- Bonding
- Clamping
- Pin
- Clicking and unscrewing
- Retractable ball joints
- Worm gear drive

Personalisation space

- Around the basin with a rim
- Place water basin of centre and create extra space for personal belonings
- Drawer
- plateau connected to the stand

Nurse supplies

- A drawer
- A plateau for extra supplies
- Small cabinet attached to the stand

The Water Basin

Emtpying mechanism

- Seperate component that guides water out basin
- Rotate along radius
- Bonding to plateau with handle

Position on the base

- Middle
- Off-centre
- Recessed
- On top of base

The rim

- Straight rim for finishing water basin
- Curved rim for easier handling
- Rim formed into spout for easier emptying

Cooling element

- Lay-in covers cooling element
- Blocks of ice in certain shapes, like hearts and stars
- Have a second layer within the water basin to store ice pack or cooling element

Figure 48, different design decisions that were explored

10

FINAL DESIGN



10 FINAL DESIGN

This chapter presents the final result of this thesis and describes the final design, interaction, and physical implementation. The first section shows renders of the final design, followed by the dimensions of the design. The next section discusses the interaction, where a storyboard describes all interactions, and describes the intended look and feel. Then, the three main parts of the final design, the water basin, the base and the stand, are discussed. To conclude, all components and a cost estimation of the final design are discussed in the last section.

The final design, Memora (Figure 49), consists of a transparent water basin that is partially recessed into a base that has a natural-wood like appearance. If the family has a need for this, the base can be personalised with magnetic letters that spell the baby's name. This can transform Memora from a product to the child's personal resting place. Due to the magnetic sides of the base, additional magnets can be added for further customisation. This personalisation process can also involve other family members such as siblings, relatives, or friends. Next to the water basin, there is space on the base for parents to put personal belongings such as baby clothes, toys or blankets they brought for the baby, or other items that help with their bereavement. The basin and base are mounted on a mobile stand. This allows parents to move the water basin next to or over the bed, keeping their baby close even when the mother is less mobile after giving birth.



Figure 49, Final design

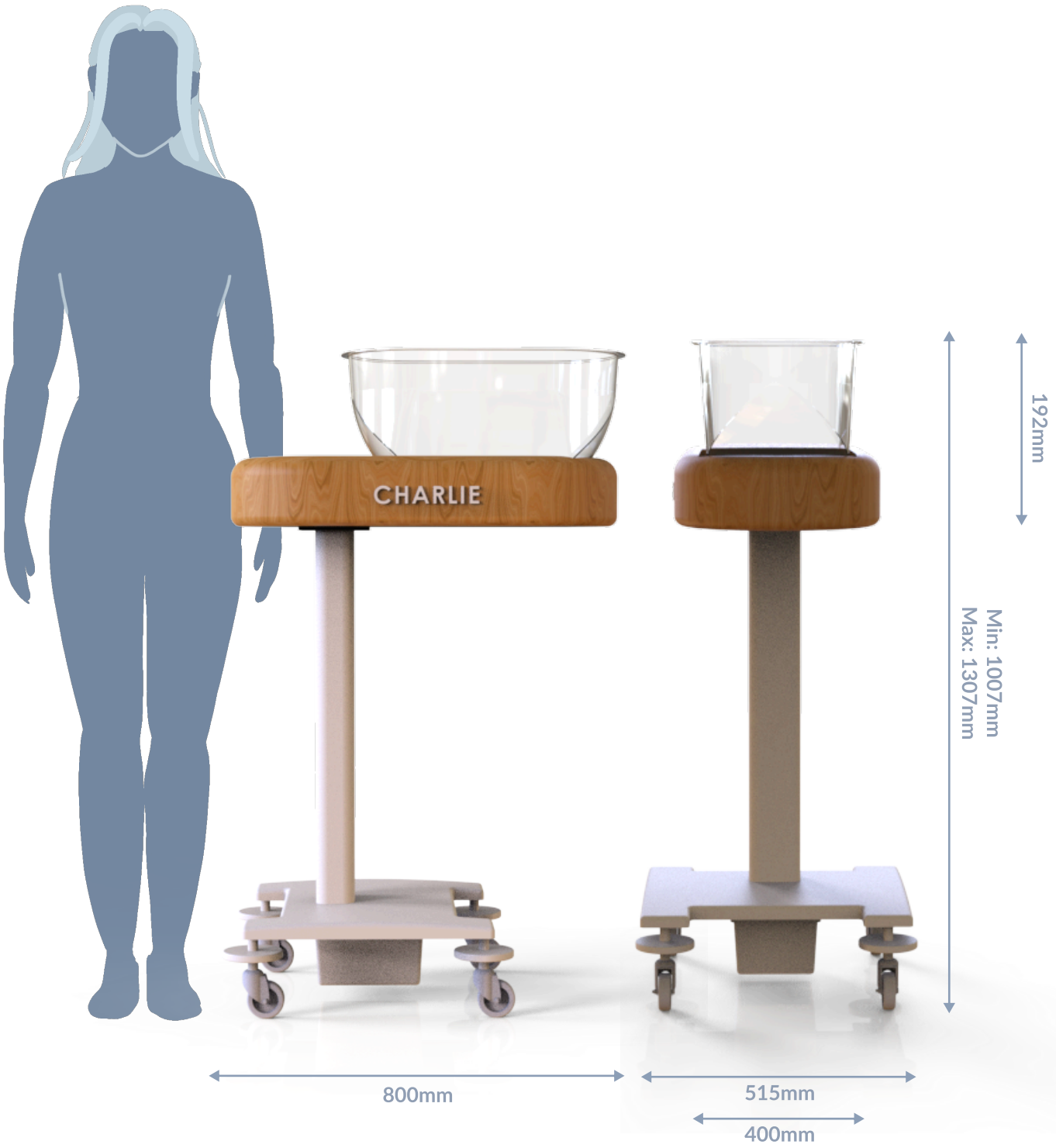


Figure 50, measurements of the Memora

10.1 Interaction

This section presents the interaction of the final design. Section 10.1.1 illustrates the user scenario in hospital context in a storyboard. Section 10.1.2 describes the look and feel of the Memora together with the underlying theoretical considerations, such as biophilic design, the golden ratio and Gestalt principles.

10.1.1 User Scenario

In Figure 51 and 52, the envisioned interaction of the Memora is visualised in a storyboard.



Figure 51, first part of the interaction scenario



Figure 52, Second part of the interaction scenario

10.1.2 Look and Feel

The appearance of the final design contributes to the experience of parents. Both form and choice of materials play an important role in this. The design has round and soft shapes, because research shows that these are perceived as more peaceful than angular shapes, which were associated with anger (Sievers et al., 2019). In addition, the design is in line with the principles of Gestalt theory that states that people prefer simple, symmetrical, and orderly shapes because they are easier to process cognitively.

The design also takes into account proportions and visual balance, using the golden ratio and the golden spiral (see Figure 53). The golden ratio is a mathmatical principle often used in aesthetically pleasing design (Gordon, 2022). It describes a ratio between two quantities, a and b (where a is larger than b), in which the ratio of the total (a + b) to the larger part (a) is equal to the ratio of the larger part (a) to the smaller part (b). When this ratio is used in design, it can create an organic, balanced and aesthetically pleasing composition. For the Memora, the proportions between the height of the base and the water basin are based on this principle, and the middle of the water basin is positioned within this golden ratio.

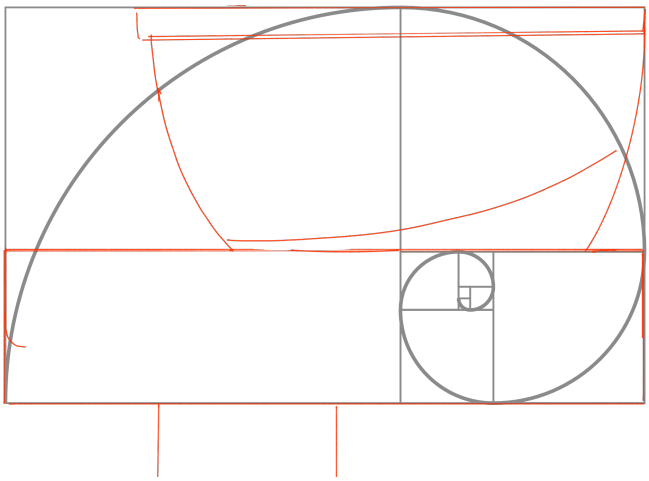


Figure 53, the Memora and golden ratio

Biophilic design is a theory that states that because humans have evolved in natural environments, they have an affinity towards nature and other living entities. Biophilic design brings the experience of nature to the built environment. Research investigated that the use of wood material is preferred in patient rooms (Nyrud et al., 2013). The wooden look of the base helps to give the Memora a warm, non-clinical appearance, see Figure 54 and 55).



Figure 54, 3D close up of the Memora



Figure 55, Wooden appearance of the base

The recessed position of the water basin (Figure 56) in the base gives a feeling of stability and safety. The basin appears more stable than if it were placed on top of the base, which is important for parents' confidence when laying their child in the basin.



Figure 56, The water basin lies slightly recessed in the base

Finally, it is important that the form and appearance of the final design are suitable for a hospital setting and have a neutral appearance (Personal communication, 2025). The product should be appreciated by many families, so shapes that are too outspoken, symbolic elements and bright colours are not suitable within the hospital context.

However it is important the final design remains visually distinct from medical equipment, in order to avoid being perceived as a piece of equipment, but rather as a dedicated space for parents and their baby.

10.2 The Water Basin

The water basin (Figure 57) is the part of the Memora where the baby's body is laid in cold water (Figure 58). Its design balances functionality and appearance. The water basin should let parents clearly see their baby, present the baby in a dignified and comfortable way while avoiding a distorted view of the baby.



Figure 57, The final design of the water basin



Figure 58, Baby lies in final design of the water basin

10.2.1 The Shape of the Water Basin

It is important that parents and visitors see the baby lying calm and comfortable in the water basin. If the baby is wedged against the edge, appears to have too little space or is in an unnatural position, this can have a negative impact on the parents' experience.

The natural posture of a stillborn baby is with the back arched , the legs and arms bent and tucked in slightly, and the head tilted inwards slightly, in line with the spine (De Watermethode, 2025) (Figure 59). Analysis of photographs of babies born between 28 and 42 weeks gestation laid out in water shows that they are often placed in basins with a flat bottom, since few round glass bowls or containers are large enough. When a baby lies on its back in such a basin, the entire length of its back and the back of its head lie flat on the bottom. This causes the natural curvature of the spine to disappear. However, when the baby lies on its side, this curvature remains visible. Nevertheless, this position does not remain stable when the baby is laid back on its back. A rounded bottom of the water basin would support the natural curvature of the back and head.

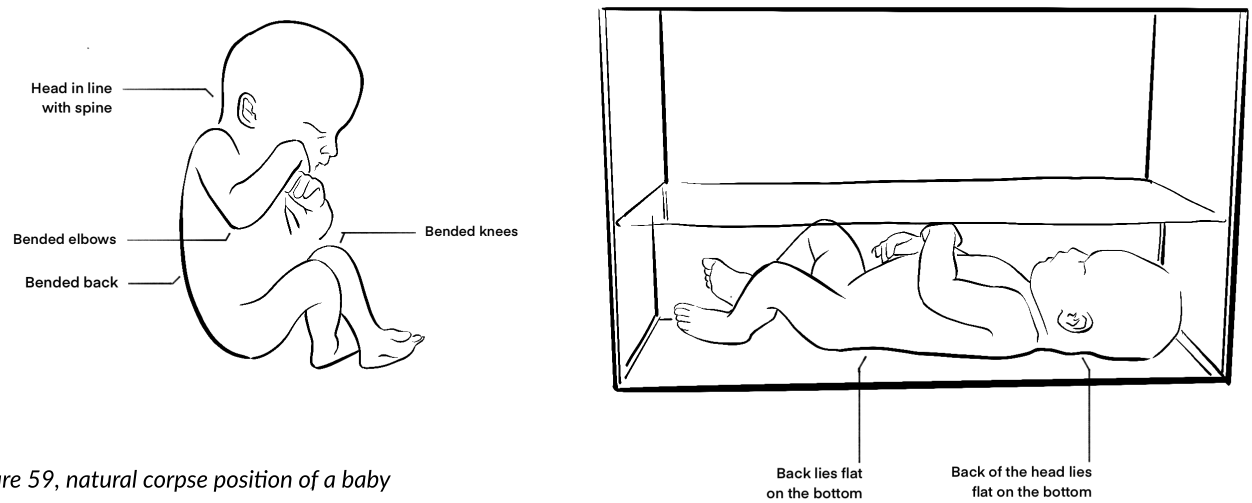


Figure 59, natural corpse position of a baby

Supporting the baby's back and head in their natural position provides parents with a more familiar image of their child. This position is similar to how the baby was positioned in the womb, which parents often recognise from ultrasounds. This can contribute to a feeling of familiarity and recognition. It is also important that the baby does not have any distorted view through the glass. Sharp corners might create distorted views of the baby.

The final shape of the water basin (see Figure 60) features a continuous radius along the bottom and side walls. The rounded base supports the natural curvature of the baby's spine and eliminates sharp corners to reduce optical distortion and reflections. The top of the basin has a symmetrical oval contour to give it a soft, calm appearance. The geometry was also designed with manufacturability in mind and has a sufficient draft angle for thermoforming, however, the draft angle was kept to a minimum to reduce the likelihood to spill water out of the basin. A larger draft angle would have increased the overall volume of the basin, which would in turn increase the weight of a fully filled water basin.



Figure 60, A baby doll lying in the final design of the water basin

10.2.2 The Lay-in

With the rounded bottom of the water basin, the baby natural curvature is supported. However, since the water basin lies slightly recessed in the base, part of the baby's body may be visually obscured from certain angles (Figure 61). While some parents may prefer this more recessed position, others may want a better view of the baby (Figure 62). To address this, a removable lay-in insert was introduced. The lay-in elevates the baby slightly within the basin and prevents their body from resting against the bottom.



Figure 61, baby in water basin without Lay-in



Figure 62, baby in water basin with Lay-in

The lay-in (Figure 63) functions much like a cot, supporting the baby's natural position when lying down. The bottom is curved like the bottom of the water basin, and a small raised edge helps to keep from sliding down in the basin. Two channels prevent skin flakes and other debris from collecting. Finally, as the lay-in is made of sheet material and is hollow, there is space between it and the bottom of the water basin. Any cooling elements or ice cubes can be placed here to cool the water without affecting the visual appearance. This lay-in also conceals the rollers on which the water basin rests.

If parents do not wish to hold their baby while the nurses change the water in the basin, the nurses can remove the baby and the lay-in from the water together. The baby can then rest on the lay-in until they are ready to go back in. This means that nurses have to touch the baby's fragile skin less often and do not have to transfer them to a celstof cloth.

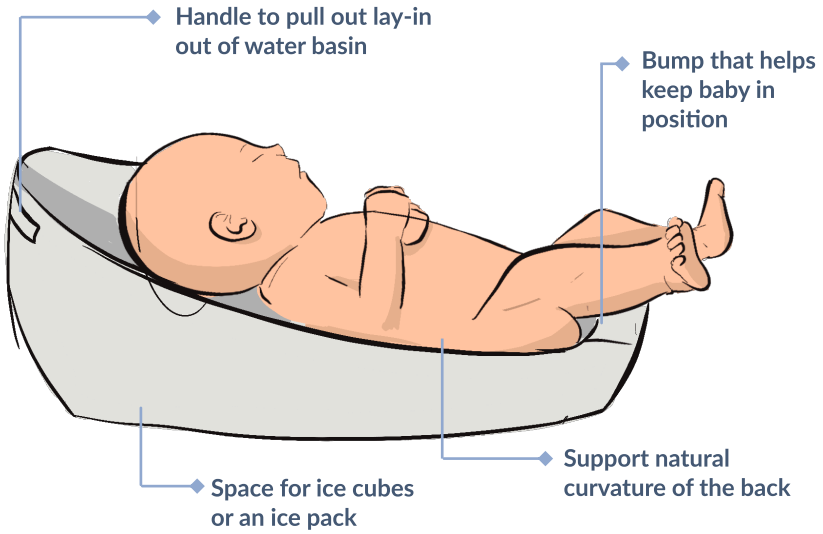


Figure 63, baby lying on the lay-in

10.2.3 Emptying Mechanism

The water bath must be emptied and refilled with clean water from the sink every 4 hours if the tub is dirty with blood, faeces or skin debris (personal communication, 2025). As babies are often covered in blood immediately after birth, the water basin must be emptied more frequently in the first hours to maintain hygiene and a clean appearance.

As the water basin needs to be large enough to support babies weighing up to 3500 grams and measuring up to 52 cm in length (Miles, 2025), it holds approximately 30 to 35 litres of water. According to lifting regulations, nurses should lift no more than 23 kg. In less ideal situations, this limit is even lower (NIOSH, 2024). From an ergonomic perspective, manually lifting and emptying the water basin is not ideal unless nurses ask their colleagues for assistance.

To make emptying and cleaning the water basin easier and ergonomically safer for nurses, the final design incorporates a tilting mechanism that allows the water basin to rotate around a continuous radius (Figure 64).



Figure 64, the tilting mechanism

Instead of the water basin being tipped forward in a conventional way (Figure 65), the water basin rotates along its round bottom surface. Because the water basin rotates around its own centre, the centre of gravity is not shifted forward during emptying (Figure 66). That improves the stability and safety for nurses during emptying.



Figure 65, conventional tipping

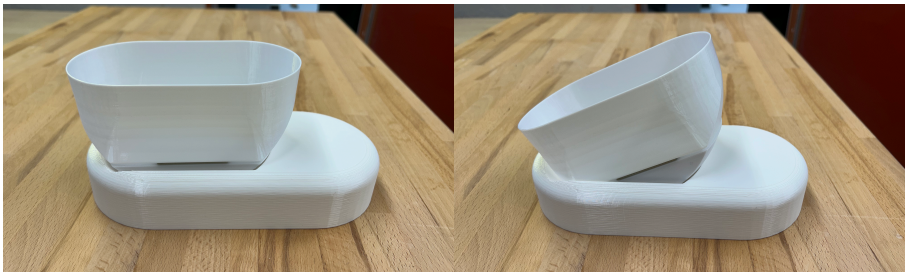


Figure 66, rotational tipping

The recessed base supports the rotational movement by guiding the basin along its radius. The integrated rollers reduce friction and create a smooth movement during emptying. The recessed base and rollers are further discussed in Section 3.10.5.

However, the water basin cannot be completely emptied with this rotating mechanism (Figure 67). After fully rotating the water basin in the base, up 22 liters of water can be drained, leaving around 8-10 L water still in the water basin. Since the water basin is not attached to the base, but instead sits on top of it, it can be lifted up and the remaining water emptied manually into the sink. The weight of the remainder of the water is below the ergonomic standard of 23 kg, making it a safe way for nurses to lift the water basin and empty the remaining water out of the water basin (Figure 68).



Figure 67, emtpying the water basin at the sink



Figure 68, the last bit of water in the water basin.

The curved edges of the water basin provide nurses with a rim to grip and control the basin more easily when emptying it (Figure 69). Nurses can also use the rim to lift the basin out of its base, which gives them more grip to prevent slipping. The rim also improves the water basin structural rigidity.

Additionally, the rim helps over-rotation during emptying, and prevents water from being accidentally emptied into the base (Figure 70). Additionally, the rim reduces the likelihood of water running down the sides.

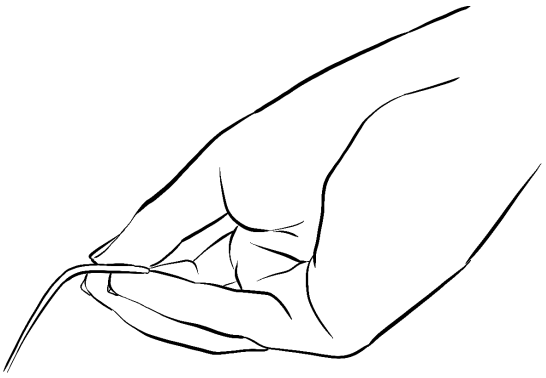


Figure 69, The rim of the water basin improves grip on water basin

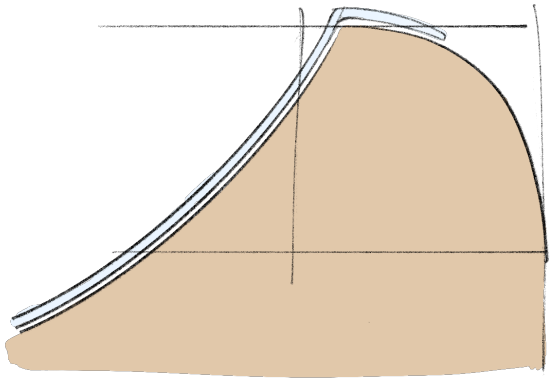


Figure 70, the rim preventing over-rotation

10.2.4 Wall Design

The water in the water basin is kept at a temperature between 4 and 10 degrees Celsius (Personal communication, 2026). Because ambient air in the hospital is warmer than the water, condensation can form on the sides of the water basin. This condensation could seep down into the base, which would have consequences for the tilting mechanism or over time become unhygienic and unpleasant.

To prevent this, the final design of the water basin features double-sided walls. The air in between the two walls improves condensation and temperature transfer, keeping the water cold for longer, while also improving the basin's structural rigidity.

To make sure that the water basin is sturdy in every place, spacers have been made to be placed between the two walls, see Figure 71. Because both parts of the waterbasin have the same radius, the spacers are also identical to each other for production. These spacers are transparent, so that they do not obstruct the view.

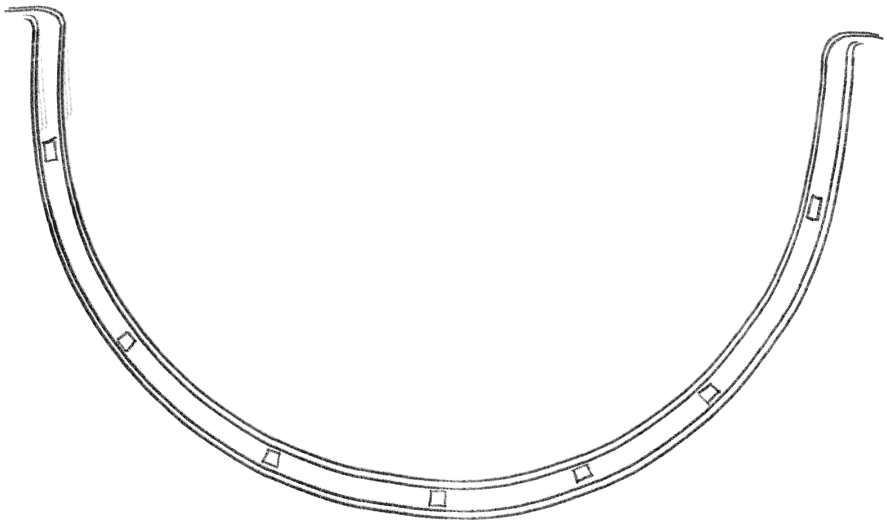


Figure 71, Double walled design of the water basin

10.2.5 Material of the Water Basin

Several factors were considered when choosing the material and production technique for the water basin. The material should be suitable for a hospital environment, easy to clean and have the desired transparency and shape. Furthermore, the cost of production and low quantity required should be taken into account.

The water basin is made of polyethylene terephthalate glycol (PETG). This is transparent sheet material that meets the visual requirements. It is a clear, transparent material, so that parents can see their child clearly. PETG has a high range of sheet thickness available and is highly thermoplastically deformable, which makes it possible to achieve the deep shape of the basin. Moreover, PETG is easy to machine, for a smooth and neat finish to the rim.

PETG is suitable for use in a hospital due to its chemical resistance. The material is resistant to disinfectants such as hydrogen peroxide, but can also be cleaned with soap and water (Curbell plastics, 2025; ERIKS, n.d.; personal communication, 2025) (Figure 72).



Figure 72, cleaning the water basin

10.2.6 Production of Water Basin

Based on the limited production run and the simple shape, vacuum forming was chosen as the production method. Vacuum forming is a suitable production method for small-volume production and a relatively inexpensive way to produce plastic products compared to, for example, injection molding (Heku Kunststoffen BV, 2019).

In vacuum forming (Dineen, n.d.), a heated plastic sheet is formed over a male mold by removing the air from beneath the sheet with a vacuum. For this design, the mold can be produced from milled foam (Figure 73). If the design were to be produced in larger quantities, it would also be possible to make the mold from aluminum, which can be used more often.

The chosen production method directly influenced the design. For example, a minimum release angle of 4 degrees was taken into account to ensure the mold releases from the vacuum-formed product (Dineen, n.d.). Sharp interior corners were avoided, and the maximum depth of the basin should not exceed 75% of the opening. These design rules were incorporated into the final shape of the water basin.

Two separate moulds are required to produce the double wall of the water basin, after which the two parts are assembled. The two parts must then be joined together seamlessly with no air between them.

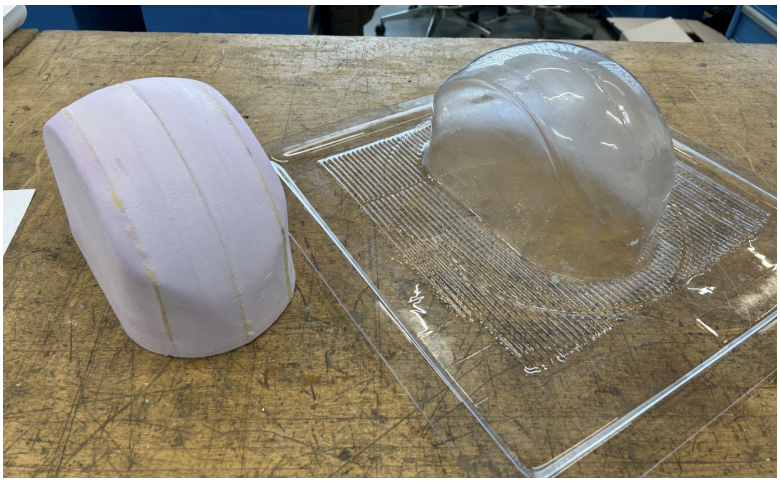


Figure 73, The milled foam mould together with the initial result of the water basin after vaccuum forming

10.3 The Base

The base of the Memora (Figure 74 and 75) is the part that helps to make it a personal space for the baby. The base keeps the water basin stable and facilitates easy emptying of the water basin.



Figure 74, The final design of the base



Figure 75, the base with the water basin

10.3.1 The Shape of the Base

The shape of the water basin is determined by functionality and aesthetics. The water basin fits directly into the recessed area, while the top of the base offers space for personal belongings. The base is designed to look soft, which is why it is rounded with soft curves.

10.3.2 Personalisation of the Base

10.3.2.1 The Platform

According to nurses in the department, parents often bring items for the baby after the birth (Personal communication, 2025). These could be items they received or bought during pregnancy, like stuffed animals, blankets or baby clothes, or they might be things they've brought for a memorial or farewell ritual, such as LED candles or drawings. The space next to the water basin provides a dedicated area for these personal items and facilitates these rituals (Figure 77). This makes the experience even more personal, giving parents the opportunity to say goodbye in their own way. The space on the platform can also be a place where parents can wrap their arm around the water basin (Figure 77).



Figure 76, space for personal belongings



Figure 77, placing arm around water basin

10.3.1.2 Magnets

Recognising the baby's identity, and with that the parents' identity as parents, has a positive influence on the bereavement process. Parents want to be acknowledged and addressed as parents through the actions and language of healthcare professionals. Calling the baby by their name and explicitly recognising the child as their baby contributes to this recognition and supports parents' bereavement process (Kingdon et al., 2015; Farrales et al., 2020; Nuzum et al., 2018; L. Smith et al., 2020)

This is why the final design has magnetic sides, so that the base can be decorated with magnetic letters that spell out the name of the baby (Figure 78 and 79). Once approved by the parents, nurses are recommended to attach the child's name to the base using magnetic letters in advance of bringing it to the delivery room. Adding the name not only decorates the base, but also establishes the product as the child's personal space from the moment it is brought into the delivery room.



Figure 78, adding the magnetic letters to the base



Figure 79, the magnetic letters on the base

Adding the name to the base is the first step in the personalisation process. Parents, siblings or other loved ones can then add extra magnets, like hearts, stars or rainbows if they wish (Figure 80 and 81). Involving other children of the parents in the process by letting them decorate the base further with magnets can be meaningful for them and the parents.



Figure 80, decorating the base with magnets



Figure 81, the base decorated with star magnets

However, not all parents choose to name their baby, want to emphasise their identity or want to decorate the base. The design takes these personal preferences into account, so the base of the Memora is also respectful and peaceful without the additional magnets or a name and does not force parents to personalise if they do not wish to do so.

10.3.3 The Drawer

The final design incorporates a drawer into the base to give nurses space to store essential items close to the baby (Figure 82). It provides space for the celstof cloths that nurses can use to wrap the baby in when they are taken out of the water, as well as ink pads and paper for taking hand and foot prints and the letters and magnets to decorate the base with.



Figure 82, the drawer with the suggested materials

Nurses can access the drawer from the back of the base, meaning that when they need to retrieve something, they won't have to move the product and take it out of the drawer. The base's look is not disturbed by a hidden handle that is integrated so that it is not visible from the outside. Furthermore, the drawer is fitted with a resistance lock to prevent the drawer from opening when the product is moved.

10.3.4 The Cover

A removable cover has been designed to give parents' privacy and conceal the baby's body when the water basin has to be transported through the hallway. This cover is placed over the top edge of the basin and secured tightly to the base by using a magnetic connection (Figure 83). Because of this magnetic fastening, the fabric remains taut over the opening of the water basin. This prevents the fabric from sagging and coming into contact with the water. This helps to keep the experience hygienic and respectful.

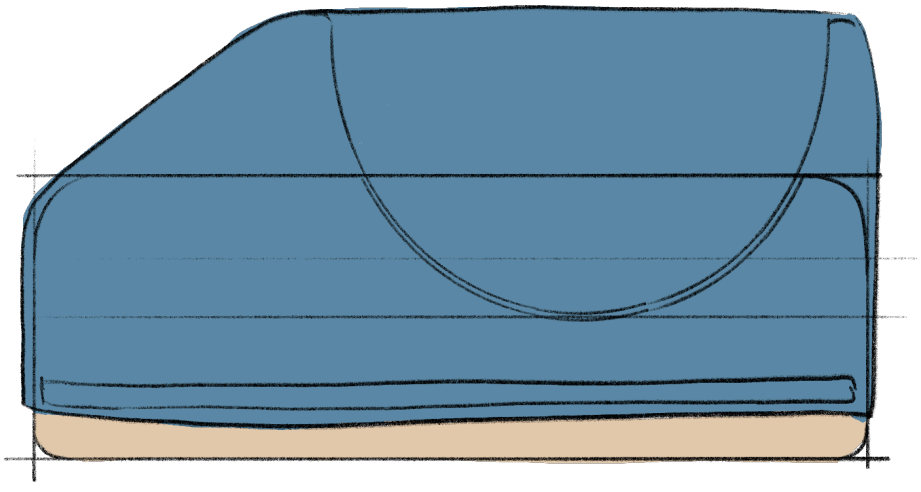


Figure 83, covering of the water basin

10.3.5 The Rolling Mechanism

When the basin is filled with water, the weight of the water exerts a significant downward force on the base. This increases the friction between the water basin and the surface of the base, making it difficult to rotate and empty. The water basin rests on three rollers to help with tilting, that are integrated in the base (Figure 84 and 85). The rollers allow the water basin to roll and rotate in a controlled manner with minimal effort when nurses have to empty or clean the water basin.



Figure 84, the rollers of the rolling mechanism



Figure 85, the rollers of the rolling mechanism

However, when the baby is lying in the basin, unwanted movement must be prevented for the baby's safety and to avoid water splashing. For this reason, the rollers are mechanically locked using plunger bolts (spring-loaded locking pins) (Figure 86).

In the locked position, the protruding part of the plunger bolt fits into a slot in the rolling part of the roller (Figure 87). This prevents the roller from rotating. Only when the nurse pulls the lever is the plunger bolt pulled out of the slot, so that it can rotate freely. The end of the plunger bolt moves along a guide so that the rotational movement is controlled. When the water basin is returned to the normal position after emptying, the plunger bolt automatically falls back into the slot in the roller, locking the system again.



Figure 86, plunger bolt

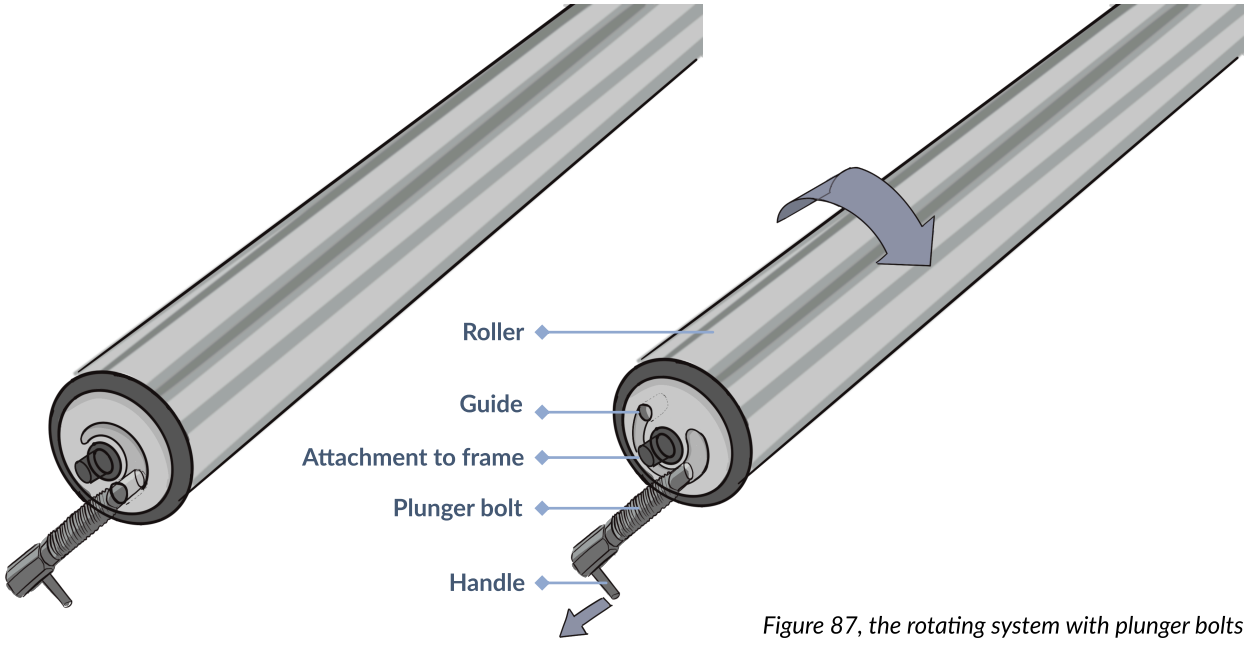


Figure 87, the rotating system with plunger bolts

The three plunger bolts are connected in series and linked to a single central lever (Figure 88), which is discreetly integrated into the bottom of the base. Nurses only need to pull this lever to unlock all three rollers simultaneously (Figure 89).

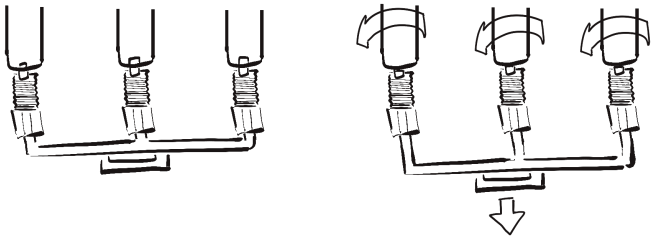


Figure 88, Plunger bolts set in series with the lever



Figure 89, the hidden handle to unlock the rollers

10.3.6 The Frame

The base of the Memora is a hollow frame construction (Figure 90) and balances weight and structure. The frame construction also makes it possible to attach rollers to the base and to attach the base to the stand. The base's frame is made of two rolled chromoly profiles. The upper profile has a larger radius, while the lower profile has a smaller one. The two chromoly profiles are connected by a plate. At approximately half the radius of the round profiles, the plate connects the two profiles together (Figure 91). These curved profiles and the plate determine the outer contour of the base.

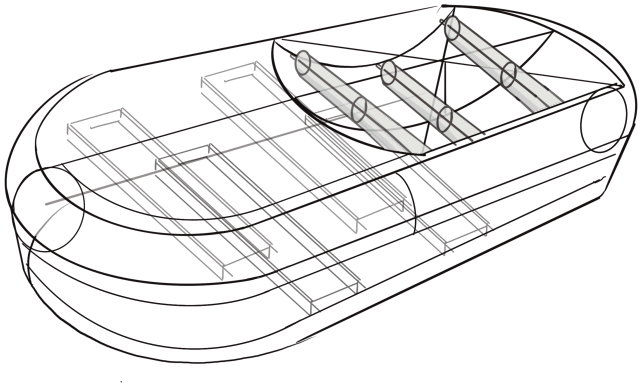


Figure 90, an estimation of the frame of the base

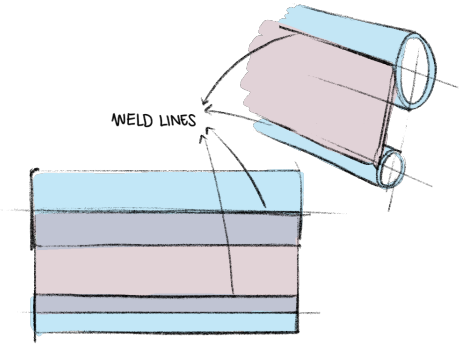


Figure 91, connecting the two profiles

To give the base the wooden look and a friendly appearance, the frame is surrounded by a thermoformed PVC layer that resembles wood (Figure 92).

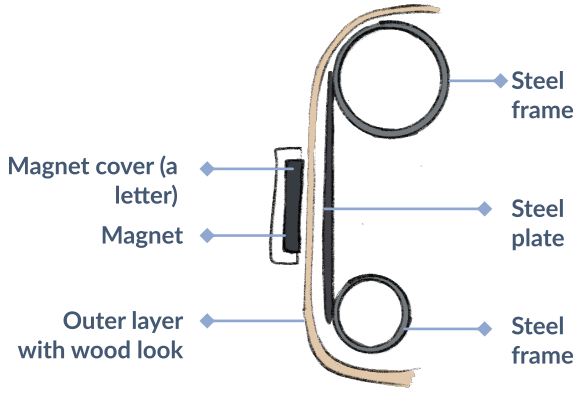


Figure 92, cross section of the frame and cover

10.3.7 Material of the Base

10.3.7.1 The frame

The frame is made of chrome-molybdenum steel (Chromoly, 4130). This is an alloy steel with high strength and good weldability (Demo, 2025). The material is magnetic, so that the magnetic letters can be attached to the base. Chromoly has high tensile strength and rigidity. Chromoly has great weldability, which is important for the connections between the curved round profiles and the steel plate, and can be corrosion-resistant when finished correctly (e.g.powder coating). Key properties of Chromoly Steel can be found in Table 6.

Table 6, properties of 4130 Chromoly steel (Demo, 2025)

Property	Value
Carbon Content	0.30%
Chromium Content	0.80–1.10%
Molybdenum Content	0.15–0.25%
Tensile Strength	560 MPa (81,200 psi)
Yield Strength	460 MPa (66,700 psi)
Elongation at Break	21%
Hardness (Rockwell C)	24–35 HRC
Density	7.85 g/cm³ (0.284 lb/in³)

Although steel has a higher density (≈ 7.85 g/cm³) than aluminium (≈ 2.7 g/cm³), it offers higher strength and is less expensive (Btiernay, 2024). By designing the frame as a hollow construction, the extra weight of steel is limited, but is still strong enough to support the weight of the water basin.

10.3.7.2 Wood-like Cover

The cover that goes over the frame is made from PVC (Figure 93). This material comes in wood like structures, is thermoformable (Vink, n.d.), and resistant to disinfectants such as hydrogen peroxide and alcohol-based cleaning agents (Tech, n.d.). The cover has no sharp edges, such that it can be easily cleaned with Oxi-wipes, but also with soap and water.



Figure 93, PVC with wood appearance

10.3.7.3 Privacy Cover

At Amsterdam UMC, it has been found that textiles that are washed in the central laundry do not always return to the same department. To avoid dependence on these laundry logistics, a maintenance-friendly material has been chosen that does not need to be washed, but can be cleaned in the department.

The privacy cover is made of polyester with a water-repellent PU coating (Figure 94). This material is resistant to moisture and can be easily cleaned with a disinfectant cloth. The cover is double-folded and stitched for extra strength, with the magnetic edge attached to the end and inside of the hem.

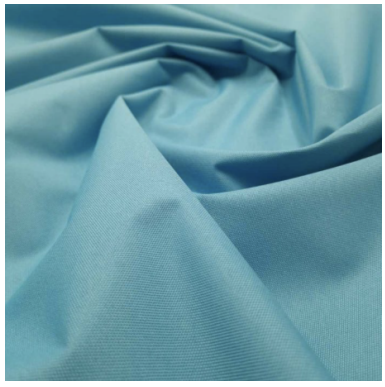


Figure 94, polyester with PU coating

10.3.8 Production of the Base

The metal sheet is cut from sheet material using a punch press. The sheet is then rolled into the curvature of the base. The round profiles are cut to length and then rolled to the correct radius.

After rolling, the tubes and the steel sheet are welded together. The welds connect the parts into a single frame. When welding of the frame is completed, the PVC layer is thermoformed over the structure. The heated PVC is shaped to fit the contours of the frame.

The transitions where the ends PVC meets can be finished with a connecting plate. This plate is attached to the frame and forms the connection point with the mobile stand.

10.4 The Stand

The stand of Memora (Figure 95) allows the water basin to be easily moved through the delivery room and obstetrics department. It can be placed close to, over or next to the delivery bed, depending on the preference of parents. The stand is height-adjustable, so that it can be adjusted depending on height of the bed or sink.



Figure 95, the stand of Memora

10.4.1 Positioning in the Delivery Room

By placing the base and water basin on a mobile stand, nurses and parents can position the water basin anywhere in the delivery room. Parents can decide for themselves where they want to place the Memora depending on their needs. Nurses can easily move the Memora from storage to the delivery room, around the room and to the sink for emptying.

The off-centre positioning of the stand under the base allows the water basin to be partially moved over the bed (Figure 96 to 99). This makes it possible for the mother to be close to her baby, even when she is less mobile. Positioning the water basin above the bed also symbolically refers to co-sleeping. Co-sleeping is often practised after birth to strengthen the emotional bond between parent and child.



Figure 96, the memora in context next to the delivery bed



Figure 97, positioning the water basin over the bed*



Figure 98, positioning the water basin over the bed*



Figure 99, positioning the water basin over the bed*

**prototype of 1:2 scale*

10.4.2 COW AMT200

As a stand's design must meet numerous medical standards and safety regulations, the base is a purchased component. The COW AMT200 base was chosen for the design because of its reach, lockable wheels and appearance (Figure 100).

The AMT200 has four lockable wheels (Figure 101). These wheels make the Memora easy for nurses to transport to the nursing room. The AMT200's brakes make sure that it does not suddenly roll away or spill the water in the basin if it is hit accidentally. They also help with stability and control when emptying the water basin into the sink.

The AMT200 has a maximum pushing force of 500 N, which, when converted to mass, means that the total system weight is approximately 51 kg. Due to the weight of the water basin it is important that the frame is strong but not too heavy so that it remains within the maximum pushing force. The combined weight of the filled water tank and the child (averaging 4 kg) is approximately 30 to 35 kg. Therefore, the frame may weigh a maximum of 16–20 kg to remain within the maximum pushing force.



Figure 100, mobile base COW AMT200.

To distribute forces evenly and strengthen the connection between the base and stand, a connecting piece was included in the final design (see Figure 102). This part helps create a stable connection between the base and the mobile stand.



Figure 101, wheel break on the mobile base



Figure 102, connection piece between stand and the frame

10.4.3 Reach and Context

The AMT200 is mechanically height adjustable, such that the Memora can be set at the correct height for every situation. The minimum height of the AMT200 is 815 mm, and the maximum height is 1115 mm.

10.4.3.1 Reaching the Bed

The height of the hospital bed from the floor to the mattress is 640 mm to 1000 mm. To determine how high Memora should be above the mattress, the average thigh length of men and women in a sitting position was taken into account, which is 153 mm (Dined, 2025). To allow some space between the legs for comfort, the basin should be 10 mm above the thigh. If the bed is at its lowest height at 640 mm, the stand has to be extended to approximately 893 mm, which falls within the range of the AMT200 stand.

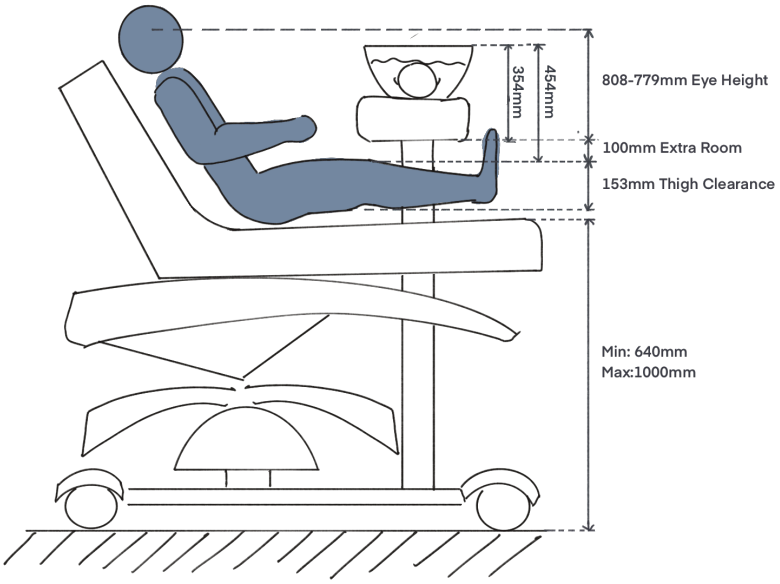


Figure 103, Measurements of reaching the bed

10.4.3.1 Reaching the Sink

It is important that the water basin can be moved and reach the two sinks that can be found in a delivery room at the obstetrics department in Amsterdam UMC (Figure 104a & 104b), so that nurses can empty the water basin. The stand plays a role in whether these sinks are accessible.



Figure 104a, Sink A



Figure 104b, Sink B

One of these sinks is attached to a back panel and has space under the sink (see Figure 104a). The height of this washbasin is 950 mm. The edge between the front of the cabinet and the water basin itself is 80 mm deep. There is sufficient space to move the Memora far enough over the edge so that the water basin can be easily emptied, as shown in Figure 105.

There are also no issues with emptying the water basin at the second sink in the delivery room. The distance between the front edge of the sink and the point at which the stand can be positioned is 60 mm. The distance between the wheels and the edge of the basin is 278 mm, which allows the water basin to be placed close enough to the sink to empty (Figure 106).

In addition, there is sufficient space for the nurse to stand next to the Memora and tilt the water tray in a controlled manner during emptying. The water basin can be removed from the base when it needs to be emptied and cleaned with soapy water. It can then be placed in the sink for easy cleaning.

Sink A has a length of approximately 700 mm. The longest side of the basin is 500 mm. Sink A is 270 mm wide, and the basin is 250 mm wide. This means that the water basin can be rinsed in the sink as it fits within its dimensions.

Sink B is smaller, measuring 400 mm by 400 mm. The distance between the worktop and the tap is approximately 230 mm. This sink is smaller and less suitable for rinsing the water basin. However, if the bottom of the basin is partly positioned within the sink, it will fit just under the tap.

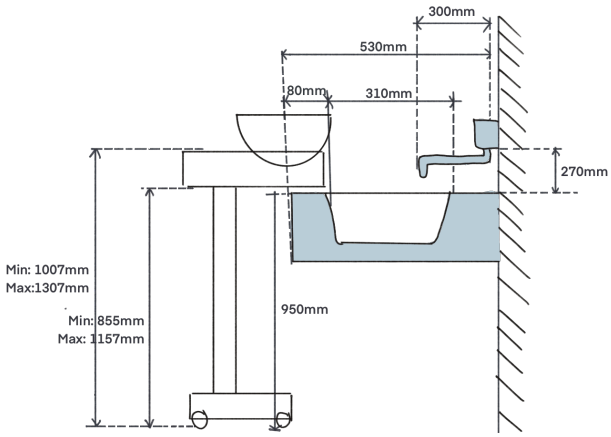


Figure 105, Measurements of reaching sink A

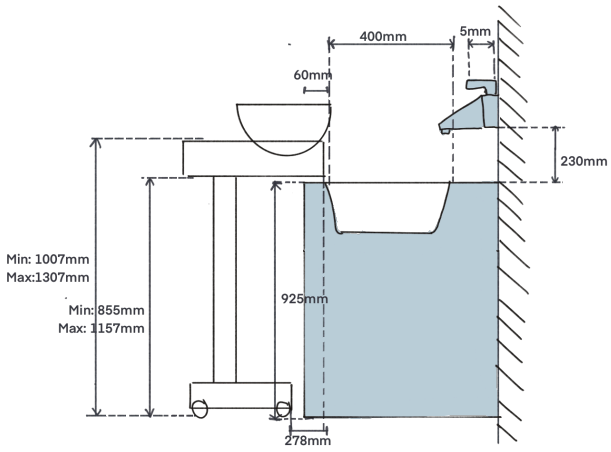


Figure 106, Measurements of reaching sink B

10.4.4 Stability and Tipping Point

As the water basin contains a significant volume of water, the stability of the stand and its moments of force must be considered. The critical tipping point occurs when the centre of gravity moves beyond the support base (Libretexts, 2024). For the stand of the Memora, the critical tipping point would be the front wheels. If the front wheels exceed the critical tipping point of 10 degrees, the stand would not return to its original position and tip over. To minimise this risk, the centre of gravity of the water basin is positioned directly above the tipping point. This way, the moment acting on the system is reduced.

As the water basin rotates around its own centre while being emptied, its centre of gravity remains relatively constant. This prevents it from shifting forward and exceeding the tipping point, which would otherwise create a moment that could cause the stand to tip over. Consequently, the chosen rotational mechanism contributes to the system's overall stability.

Figure 107 shows an FBD illustrating the forces working on the Memora, together with the relevant dimensions of the design.

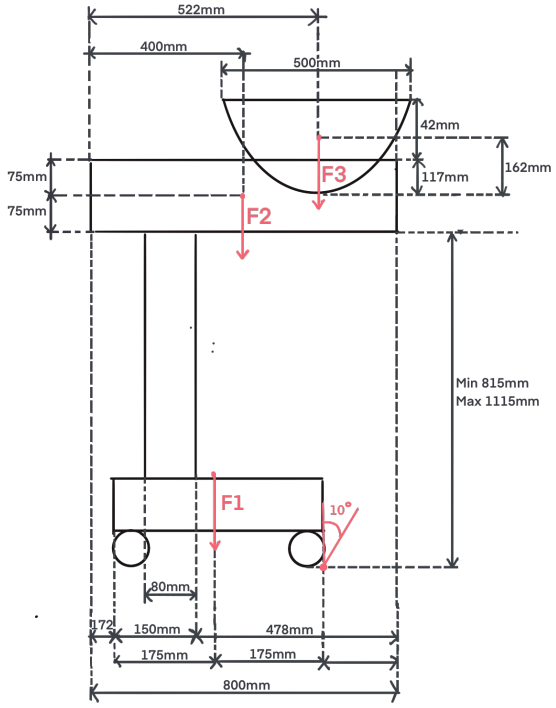


Figure 107, FBD of the final design

10.5 Components

This section describes all components of the final design of Memora. Section 10.5.1 lists all parts together with their quantities and materials, and Section 10.5.2 makes a cost estimation of the final design.

10.5.1 Bill of Materials

Table 7 lists all the parts that are included in the final design, along with their quantities and materials.

Table 7, bill of materials of final design

	Part	Material	Quantity
	Water basin outer part	PETG	1
	Water basin inner part	PETG	1
	Inserts	PETG	1
	Rollers	Vinyl, Stainless Steel	3
	Plunger bolts	Stainless steel	3
	Handle - frame	Chromoly, 4130	1
	Handle - cover	PVC	1
	Round frame (r=...)	Chromoly, 4130	1
	Round frame (r=...)	Chromoly, 4130	1
	Connecting frame pieces	Chromoly, 4130	numerous
	Roller bearing	Stainless steel	2
	Frame for drawer	Chromoly, 4130	1
	Cover for drawer	PVC	
	Sheet metal, side of frame	Chromoly, 4130	1
	Sheet metal, top of frame	Chromoly, 4130	1
	Sheet metal, bottom of frame	Chromoly, 4130	1
	Cover over base	PVC	1
	Privacy Cover	Polyester with PU coating	1
	Magnetic strip	Ferromagnetic material	2
	Connecting part between base and stand	Chromoly, 4130	1
	Bolts	Stainless steel	numerous
	The Medical Stand	mix	1

10.5.2 Cost Estimation

Table 8 gives a rough estimate of Memora's production costs. Multiple assumptions have been made because the exact design of certain parts has not yet been finalised. For example, labour cost of €50 per hour and the length of material required for the frame are estimations. An additional margin has also been included to account for errors during assembly and production. Where possible, costs have been substantiated using information from manufacturing and procurement websites.

The parts with the highest costs are the mould for the water basin and the stand. The mould requires a high initial investment. However, if the Memora would be produced in larger production, the cost per product will decrease as the mould can be distributed across multiple products.

The total estimated costs range from €3,931.13 to €7,649.74 per product. This indicates that costs still depend on production and scale choices and will need to be specified further in the next phase.

Table 8, Cost estimation of production Memora

Part	Material	Production	Purchased	Labour costs	Total	Source
Water Basin	€102,69 for PETG sheet material (4mm)	€1500-500 for mould €20 for machine operating costs		€35-50 for 30 min	€147,69 without mould €1647,69 - €5147,69 with mould	(S-Polytec, n.d.) (Jingfei, 2025)
Inserts	€3 PetG 3D-printed material	€3 for operating 3D printer		€8* for 10 min	€14*	
Rollers			€81 for 3 rollers of €27 each		€81	(RS, n.d.)
Frame of the base	€16.35 for 6 meters Chromoly round frames (D=40mm) €23,09-€40,72 for cold-rolled steel sheet material (1 or 2 mm)		€35-50 transport costs	€200* for 4 hours	€89,44 - €107,05 without labour cost €289,44 or €307,05 with labour cost	(Chassis Parts, n.d.) (Metaal Winkel Online, n.d.) (Personal communicati on, 2026)
Privacy Cover	€25* PU coated polyester			€100* for 2 hours	€125	
Magnets			€15*		€15	
Medical stand			€1800		€1800	
Bolts					€10	
Assembly costs				€150* for 1,5 hours	€150	
				Total (range)	€3931,13 - €7.649,74	

**** estimation made without sources or calculations***

11

EVALUATION WITH FINAL DESIGN



11 EVALUATION WITH FINAL DESIGN

This chapter evaluates the final design with two user studies. The first user study is with a bereavement specialist, and the second user test is with nurses of the obstetrics department. During these studies, the final design is evaluated using a final prototype and an interaction storyboard to gain insight into how stakeholders value the new concept and whether the workflow is suitable in the context. The outcomes of these studies are used to evaluate and further improve the design, and to inform recommendations for future research.

The research aim of these studies is to gather feedback from nurses and the parent perspective on the final concept of Memora for further development. The following research questions are formulated:

From a bereavement specialist point of view, how would parents experience the Memora?

How do nurses from the obstetrics department experience the Memora?

Are there any bottlenecks in the usage scenario?

11.1 Evaluation Final Design Method

11.1.1 Participants

In the first study, a bereavement specialist of Steunpunt NOVA participated, an organisation that shares knowledge and offers guidance on the experience of stillbirth. She is also a mother of her baby who was stillborn. The bereavement specialists is also part of Ima Afscheidszorg. Since 2014 Ima Afscheidszorg has supported families that have lost their baby. Since 2017, ima Afscheidszorg has offered the water method in a home setting. Given her work caring for bereaved parents, she was invited to share her perspective of how parents might experience the final design.

In the second study, 23 nurses of the obstetrics department participated. Nurses were included in the evaluation of the final design, as they are the primary users of the water basin and responsible for moving, emptying and cleaning it. Nurses' feedback is essential to evaluate the usability and design features in the clinical context.

11.1.2 Procedure

This user study consisted of three parts.

1. Review final concept, gather initial thoughts.
2. Review storyboard and provide feedback.
3. Use prototype and empty the water basin at the sink.

For the first study with the bereavement specialist, a brief introduction, the final concept was first presented. The 1:2 scaled prototype was used to further clarify this concept. The participant was then presented a flip through a user interaction storyboard, and they were able to ask questions. For each step, the participant wrote feedback on sticky notes. The participant was then asked to provide a general reflection on the presented concept. Finally, the participant was asked to fill and empty the prototype at the sink, while explaining what they were doing.

The second study with nurses, the final concept was first presented to the entire group. The 1:2 scaled prototype was used to further clarify this concept. The group was then presented with a flip through a user interaction storyboard. Then, going through the storyboard again, for each step, participants were able to give their feedback, ask their questions or discussion the user scenario with colleagues. The participants were then asked to give their final thoughts on the presented concept.

11.1.3 Materials

The following materials were neccesary for this evaluation (Figure 108):

1. Consent forms
2. Prototype 1:2 scale
3. Printed storyboard
4. Baby doll
5. 2 colours of Sticky notes
6. Pen
7. Towel
8. Phone to record audio and take pictures



Figure 108, set up and materials for user test

11.1.4 Data Processing and Analysis

The audio of the interview and scenario reflection was recorded and transcribed into a transcript. Feedback on the user scenario was categorised in a table by its corresponding scenario number and supported with illustrative quotes. The final reflection on the final design was analysed and categorised, and supported with quotes from their statement. Finally, the test of emptying the water basin and prototype was filmed on a phone, to fully capture and analyse the interaction.

11.2 Evaluation Results

This section presents the results of the evaluation of the final Memora concept with a bereavement specialist and nurses. Both studies present the feedback results on the interaction scenario and the themes that emerged from discussions about the final design. Finally, a test was done with a bereavement specialist to empty the water basin.

11.2.1 Evaluation Results with Bereavement Specialists

11.2.1.1 Scenario Discussion

The main conclusions of the bereavement specialist feedback on the user scenario steps, supported with quotes, can be found in Table 9.

Table 9, feedback from scenario by bereavement specialist

Senario #	Feedback	*Quote*
1	Sometimes during birth, parents are not aware that their baby has passed away yet.	*"sometimes this is the moment where parents believe they will still leave the hospital with a healthy baby"*
3	The conversation of using the water method is not always after birth, sometimes parents know they want to use that method before giving birth.	*"Sometimes the dicussion about the water method has already taken place"*
4	Perhaps making all parts detachable so it can be stored easily.	*"... I know what these sorts of storage rooms look like, and that sometimes there isn't a huge amount of space. Then it's easy to say, 'Put the base in the cupboard over there and the water basin over there'"*
5	Instead of putting too much supplies, stock the drawer for one family and baby and refill after use.	*"In those delivery rooms, there are piles of them in the room. When you put them away, you just keep restocking them."*
6	Ask or parents want to add the magnetic letters for the name or if nurses should	*The moment we place big letters of the baby at home, parents are moved. Because they have so few memories, parents often want to place down the letters themselves during a funeral"*
7	Ice packs should be flexible and should be covered easily with the lay-in	*"They do need to be flexible ice packs, so they fit nicely, so you don't end up struggling with 'oh, now you can see it after all.'"*
13	Give parents the opportunity to lay the baby in the water basin Clean the baby slightly before laying them in the water basin, so that the water doesn't get dirty as fast.	*"Some parents want to do that themselves too."* *" [...] it's quite a shame, with so many litres of water, that it's dirty after two seconds."*
14	Opportunity to look at the baby in different ways is positively received	*"Yes, I think it's really fantastic that it's possible and that it also creates a parallel where you look through the long side."*
15	When decorating, give opportunity to parents put LED candle on the base. Add it to the supplies together with the magnetic decorations.	*"I think that when you see a little LED candle like that, you think, 'Oh, I'd quite like to put this there.' And who actually brings [an LED candle]... well, you don't really think of that.* *There's plenty of space on there. And people do indeed bring stuffed animals or toys."*
16	Decorations should come in colour and white. Colours are engaging for children, but if parents want to keep it neutral, have the white option.	*"... not everyone has children around them yet, and those parents are still very keen on it staying within a theme."*

Senario #	Feedback	*Quote*
18	When taking the baby out of the water basin and to parents, the baby should be slightly dried off, or else the baby will slip in the plastic mat.	*"If the baby is soaking wet on the back of a celstof cloth, they tend to slide off the plastic. So you need to dry the baby off gently."*
20	The in-lay is also great for laying the baby during cleaning the basin.	*"I actually quite like that inlay already, to hide the ice pack."*
22	Make sure the water basin can be locked at the right position so the water basin is standing straight, so that parents are not annoyed when it stands crooked.	*"Parents can get annoyed about all sorts of things because the whole situation is so sad. So we do sometimes get comments from parents, where I think, 'you wouldn't have made a issue of this last week or in 15 years' time', but then you also have parents who are very perfectionist."*
25	Refilling the basin could also be done in the shower.	*"We fill the basin very often in the shower."*
29	Its nice that the water basin is resistant to alcohol, so that it can be cleaned with disinfection wipes after use, so that it won't smell.	*"... so if a baby has been in the basin for five days and we take them home, I put the basin in the car, but then I can smell in the car that a dead baby has been in there for five days."*
Other	Keeping a natural wooden colour will be neutral for parents, as the goal of it that it doesnt take the attention away from the experience.	*"I think light wood, nobody has a problem with that. And that's what we want. That's what we aim for with our own appearance too—you always try not to let the focus drift too far."*

11.2.1.2 Final Concept Evaluation

After the participant finished reviewing the user scenario, a discussion followed on how parents might experience the final concept. The following results are themes found in this discussion.

The value of choices
The bereavment specialist emphasises the value of choice throughout the process. Parents can decide how to position the Memora, whether the child lies in the lay-in or lower part of the water basin, whether the nurses or parents decorate the edge of the base with the name, whether they hold the baby while refilling the basin or not, and more. At several moments, parents can decide what they feel they need.

> *"And that you have a choice in everything. It can be placed far away in the room so you can watch from a distance; you can let the baby lie reclined in it, you can use that insert, you can choose whether or not to place the baby in it yourself, you can choose whether or not to have those letters on it, and even when it comes to changing the water"*

User-friendly design affects the experience
One of the bereavement specialist insights is that the user-friendliness of the Memora is not only practical for nurses, but also influences the emotional experience of the parents. She describes how fumbling with a basin or losing items can create negative energy around the experience. She says that when handling the water basin goes smoothly, it will also be pleasant for parents.

> *"And then there's the ease of use for the nurses, but consequently for the parents as well. Because if you're fumbling about, it doesn't give parents a smooth experience, whereas if you roll in with that unit, it's all lovely."*
>
> *"Then the energy just... It gets overrun by a more negative energy. If it all feels like a bit of a hassle [...]*

The bereavement specialist states that the user-friendly design of Memora creates more opportunities for partners to get involved and help out. For instance, the threshold for partners to get involved is lower because Memora makes it easier to empty the water basin.

> *"even when it comes to changing the water, though it does depend a bit on how mobile the mother is and how much the father wants to help with the changing. The fact that the basin can be easily tipped over is also very nice for a father if he wants to help with refreshing the water."*

Soft shapes and a design that is thought out
It was indicated that the Memora is almost like a nursery, where all the necessary items are close at hand.

> *"Of course, all of this together just makes it feel like a sort of nursery. I can reach all the supplies."*

She experiences the shape and appearance of the Memora as soft, and as something that the Steunpunt NOVA has long been searching for as an organisation to support parents between the hospital and the funeral.

> *"We've been looking for years for a large basin with a nice shape, so when it comes to that, it's soft, well, the material isn't soft, but the shapes are. That's really lovely."*

Furthermore, she believes that parents can feel that the design of the Memora has been carefully thought out, and that it makes them realize that they are not the only ones experiencing this situation.

> *When you bring that piece of furniture in, [...], parents say, 'Goodness, they've really thought this through.' Whilst they think I'm the only person in the world who's lost a baby, they see from everything around them that that's not the case, because otherwise something like that wouldn't be brought into the room."*

Personalisation of the name with magnets
According to the bereavement specialist, some parents spend a lot of time searching for their child's name. She explains that parents take photos of digital screens showing the progress of the birth and the child's name as it appears on these screens.

> *"... then that name is [on the board]. Naturally, all parents take a photo of it. Parents of a living baby too, but certainly also [parents of a stillborn baby], because the name rarely appears anywhere else. It will never be written in a notebook."*

That's why the bereavement specialist is also enthusiastic about personalizing the border with the child's name, so that parents can create memories for their child and see their name more often.

> *"I think that personalisation is lovely, because in those few days you have, that's when you want to create those memories."*

A lifelong impact
The bereavement speclist emphasizes that the Memora not only has value for parents in the moment, but also has an impact on the rest of their lives.

> *"I don't think you even half realise what parents' memories of this period are like, and how important it is that it's a valuable and loving experience."*

She says that it is valuable to be able to look back on a beautiful experience, and that it is important for the experience to be valuable and loving. She believes that the Memora can help preserve these memories.

> *"I think it helps, [...], to look back fondly. Yes, the baby may not be with them, but for parents, this memory remains. And for a lifetime. Because even if you're 30 when you lose your baby, by the time you're 90, you haven't suddenly forgotten it. It stays with you for the rest of your life."*

Implementation of Memora for the NOVA Foundation
Steunpunt NOVA itself is also interested in using the Memora in the home situation, to offer parents a beautiful experience between the period of hospitalization and the funeral. They would not need the mobile base, and would only need the base and the water basin. However, it is important that all Steunpunt NOVA employees who accompany families have a water basin available for use at parents' homes. It is also important that the cost of the base with the water basin falls within the Steunpunt NOVA's budget.

> *"We work with nine people, and if we were to go ahead with this, I believe all nine of them, those women, should have one of these water basins with a base. Because you can't have a situation where one IMA parent receives one and then you meet up at a remembrance day or during a Baby Loss Awareness Week, and people start comparing their experiences within the same organisation. So we'd like to have at least nine sets, so that everyone has one, plus one spare. We've looked into this before, but it never really gets off the ground because it's just not quite right."*

11.2.1.3 Performing the Emptying Test with Prototype

An emptying test was done with the bereavement specialist (Figure 109 to 111). The water basin of the prototype is easiest to empty at the beginning, when it contains a lot of water, because the flow does not touch the base. However, as the outflow of water slows down during emptying, water starts flowing past the side of the base. Also, towards the end of the process, the water begins to run down the wall of the basin into the recessed area of the base. The bereavement specialist suggested that if there were less space between the edge of the basin and its base, the water would be less likely to touch the base or flow back into it.



Figure 109, filling the water basin under the sink during evaluation



Figure 110, emptying the water basin with the rolling mechanism



Figure 111, emptying the last bit of water

11.2.2 Evaluation Results with Nurses

11.2.2.1 Scenario Discussion

The main conclusions of the nurses of their feedback on the user scenario steps, supported with quotes, can be found in Table 10.

Table 10, feedback from scenario by nurses

Senario #	Feedback	*Quote*
2	Pictures taken by institutes are usually not in this phase, but later, when the baby is lying in the water basin. In this phase, photo's are taken from parent devices.	*"This is often a moment when they're using their own phone. Profesional pictures are often later on"*
3	Let parents know how the Memora looks beforehand so that parents can get an image of how it looks and it is also easier to decide wether they want to do this and who will do it.	*"I think parents often want a visual of where the little one will lay in, and what it will look like once we've added the letters,"*
4	The storage space is full, but they will find space for it.	*"We will have to see where it'll go. It's already so full."* *"Yes, so I think in the spot where we've got the supplies now, by the ink and so on."* *"There'll definitely be a spot for it there."*
5	The drawer should be opened smoothly; Nurses liked having the magnetic letters close to the water basin; However, the added value of the drawer was questioned, and magnetics with the name could also be stored where supplies of the ink is stored. According to the nurses, this may help with the magnetics possibly getting lost.	*"If it's a bit stiff to open."* *"Yes, or if there's something in front of it or something, so it gets a bit stuck. That you've just got it a bit too full."* *"In principle, those letters could also go where we keep the ink now."* *"The chance of the letters disappearing is a bit smaller then, because you're taking the whole name. Of course, when parents leave, you can see if the whole name is still there."*
6	Nurses mentioned the amount and logistics of the magnetic letters was important so that all names can be spelled. This means enough double letters, but also special signs.	*"Do you have any special characters? For example, sometimes you have a name with a comma or a diaeresis."*
7	The nurses questioned wether an icepack would be as efficient in cooling a water basin compared to ice cubes, even if they aesthetics of ice cubes is not ideal.	*"I wonder if this works just as well, cools just as effectively as ice cubes. Ice cubes aren't very elegant, but they do cool water down well."*
8	it was slightly unclear how the water basin was supposed to be filled.	*"How do you fill that basin then? Because you can't take it out."*
10	Nurses think that besides the magnetic letters, all other supplies that were in the drawer were a bit unnecessary. The ink pads are usually stored in but they should be kept available for other families that have not chosen for the watermethod Some nurses did mention it was nice to have all supplies together, Nurses found no issue with the locking mechanism.	*"I think we won't end up using anything from that drawer... it'll just disappear again anyway.* *I just think it's handy for those little letters, actually, because they really belong with that water basin. But those prints, if people don't want the water method, we'll still make prints, and then we'll have to take them out of there, instead of having them in the usual spot."* *"If it gets a lot more expensive, I wouldn't do it,"*

Senario #	Feedback	*Quote*
11	Nurses found no issue with the locking mechanism.	*"Yes, it works."*
12	Make sure that when laying the baby in the water, nurses can reach the water basin with ease.	*"As long as it's not set too high."*
13	Nurses did see the added value in positioning the basin over the bed, but found stability important, so that water woudnt be spilled onto the bed. Nurses mentioned that it's important that the mobile base fits under both bed types in the department, because there is a frame that sits quite low.	*"As long as it doesn't start wobbling, so it doesn't tip over."* *"It's nice that it's possible, isn't it."* *"I think you need to check briefly how high the bed frames are, to make sure the wheels at the bottom aren't set too high. So you can get underneath them."* *"We have two different types of beds: a delivery bed and a caesarean section bed."*
14	Nurses appreciated that parents have space to personalise with personal belongings.	*"Yes, lovely."*
16	For the celstof cloth, nurses have them available everywhere in the nursery rooms, so it wasnt neccesary to have it in the drawer.	*"I don't think we'll put any cellulose mats in there, as they're readily available in the rooms anyway."* *"I don't think you'll use the drawer at all."*
17	Nurses appreciated the Lay-in, and believed it was better for the baby's skin in comparison to laying the baby on a celstof cloth when parents do not want to hold the baby during the cleaning of the water basin.	*"Then you won't have to go and fetch a celstof cloth again so that the skin does not stick. I think it's just nice for the baby."* *"Some parents might also find it a bit scary to hold the baby again."*
22	Nurses wondered if the rollers would still keep the basin in place if they got wet. They mentioned if there was a smaller water basin available (size similar to the 1:2 scale prototype), that this one might not need rollers, to keep it more affordable.	*"And if the bottom is wet, won't it slip?"* *"You wouldn't just lift 30 litres either.* *Actually, you can lift this little container of water [1:2 scale prototype]."* *"That saves on costs too. If you don't put rollers on that little one."*

11.2.2.2 Scenario Discussion

After the nurses finished reviewing the user scenario, a discussion followed on they experienced the final concept. The following results are themes found in this discussion.

Friendly and personal
The nurses appreciated the final design and found that the Memora offered parents a more attractive and friendly way of using the water method.

> *"Yes, it's a bit more considerate for the parents this way."*
>
> *"I think it's a lovely idea."*

The nurses also appreciated the letters added to the side of the base. However, they questioned whether the magnets would stay with the Memora and whether parents would take them home. They also wanted to ensure that there would be enough magnets to spell all names correctly.

> *"I quite like this."*
>
> *"Maybe people who like those little letters will take them home."*
>
> *"Do you have any special characters? For example, sometimes you have a name with a comma or a diaeresis."*

Ice pack instead of Ice cubes
Although the nurses were dissatisfied with the use of ice cubes to cool the water in the basin, as this created an ice mass, doubts were expressed as to whether a cooling element would be as effective. Nurses did appreciate that the cooling element was not visible and found it important that the cooling element would not fog up the entire water basin.

> *"It looks a bit nicer [with a cooling element] than a whole block of ice on top."*
>
> *"Does the whole thing still get covered in condensation?"*

Positioning above the bed
Although nurses appreciated the option of sliding the Memora over the bed, they felt it was important that it could not be knocked over easily. They also indicated that it was important for the mobile base and the wheels to fit under the two different hospital beds: the delivery hosptial beds and the Sectio hospital bed.

> *"Yes, it does need to be sturdy, of course, because you don't want to accidentally knock it over."*
>
> *"You're saying it's secure now, but if you accidentally bump it with your elbow, it'll fall out."*
>
> *"I think you need to check how high the bed frames are, to make sure the wheels aren't too high at the bottom. So you can get them underneath."*

Questioning the drawer
Although the nurses said that having all the supplies together was helpful, they had some concerns about whether the drawer was the right solution. It was suggested that the drawer should be locked to prevent children from opening it. Nurses also pointed out that if you had a push system to unlock the drawer, the water would slosh around.

> *"Is it a normal drawer, or do you have to press it to open it? For those little fingers that think, 'Oh, fun, open the drawer.'"*
>
> *"Yes, but if you're pulling it open so hard, the water might just splash out again."*

In addition, nurses said that of the items currently recommended for the drawer, only the magnetic letters would be useful and that the other items did not necessarily need to be in the drawer. The celstof cloths were often already in the delivery room, and the ink was already in the storage room and has to remain available for other babies.

> *"[...] you don't need those mats in the drawer then."*
>
> *"I just think it's handy for those letters, actually, because they really belong in that tray. But those prints—if people don't want the water method, we'll still make prints, and then we'll have to take them out of there, instead of having them in the usual spot."*

Smaller Memora for stillborn babies born before 24 weeks
The nurses also wanted to have a smaller version of Memora for younger babies who were stillborn between 20 and 24 weeks. They mentioned how the size of the prototype (1:2 scale of the actual size) would be a great size for these babies. They said that putting babies of this age in the large water basin would look unfriendly. They suggested that the base of the smaller Memora could be simpler and would not need rollers or a drawer.

> *"Yes, and this size too [points to prototype size], because it's very often 20 to 24 weeks"*
>
> *"One small one and one large one [for the department] is better than two large ones, I think. Because we never really [need] two large ones. It's a bit sad to put such a tiny one in such a big container."*

11.1 Evaluation Final Design Discussion

The two studies show that both nurses and bereavement specialist appreciated the idea of having the supplies necessary for memory-making available around the water basin. The addition of the lay-in was perceived positively, as it offers parents a choice in how their baby lies in the water basin, the baby can be taken out of the water basin during cleaning without the need for a celstof cloth. Furthermore, it conceals the cooling element, resulting in a friendlier appearance than if the ice were visible in the water. The bereavement specialist notes how parents are actively searching for the name of the baby and believes that the magnetic letters can help create a more personal experience. She also believes that the Memora could be part of a life long memory and that the improved user friendly design for nurses contributes to a smooth experience for parents. Overall, the water basin was perceived as soft and calm in both studies. Nevertheless, nurses question the practicality of the drawer and suggested the magnetic letters to remain near the base. Nurses also mentioned that opening the drawer can cause problems, such as difficulty opening due to an overfilled drawer, which can cause water to splash out of the basin when the drawer is opened. Based on this, it seems reasonable not to incorporate the drawer into the base, but to come up with a solution for how the magnetic letters and magnetic decorations can remain with the Memora.

Reflect on method
There was a slight miscommunication during the user testing at the obstetrics department, which caused the one-to-one conversations to turn into a presentation for around three-quarters of the department during a clinical hour. Although the user study had not been designed for this, the testing went well.

However, it is important to note that when conducting user testing with large groups, some people who might have valuable insights may not speak up. Conversations were also sometimes difficult to transcribe as multiple people were speaking at once. Additionally, some of the nurses participating did not seem engaged with the study. Nevertheless, since it was a group discussion, participants received more information from questions asked by other nurses, which led to valuable group discussions. Despite it being a group conversation, it was still possible to identify areas for improvement and pinpoint any remaining questions in the final design. Also, instead of only interviewing 4 nurses of the department, a much bigger part of the team was able to be included in the study. Next time, when asking the department if anyone has time to participate in a user study, it should be made clear that the study will consist of one-to-one conversations and is not a group discussion.

Only one bereavement specialist participated in the user study in the study. Although the bereavement specialist has a lot of experience future work should gather more information on what other bereavement specialists think of the Memora.

During the user testing, it was mentioned that other hospitals might also be interested in the Memora. In the future, concept evaluation could continue outside the Amsterdam UMC to explore its potential in hospitals across the Netherlands and even Europe.

10.2.4.2 Discussion: Evaluation with Bereavement Specialist

Offering opportunities to reconsider decisions
The bereavement specialist states that the Memora gives parents a lot of options throughout the entire process, such as holding the baby while cleaning them and placing them in the water basin. At each stage, parents can decide how involved they wish to be. This aligns with Chapter Two's findings that it is important for parents to have multiple opportunities to reconsider their choices, as their decision-making capabilities are often influenced by the shock and grief after the stillbirth.

For instance, parents may initially be reluctant to have physical contact with their baby, but later realise that they need it. The Memora provides parents with multiple opportunities to get involved; they can decide for themselves what they need at any given time and can reconsider their earlier decisions. Additionally, these choices are presented to parents gradually rather than all at once, so they do not have to decide in advance what they need and are not overwhelmed by having to make choices.

Lowering the barriers to initial contact
The Memora makes it easier to take small steps towards connecting with the baby. It is similar to how nurses encourage reluctant parents to start by taking a small action, such as touching or applying baby oil to their child's feet, before gradually coating their entire body (Personal communication, 2025). This approach lowers the threshold and can boost parents' confidence and encourage them to take further steps. With the Memora, for example, personalising the rim with the child's name can be a first step in connecting with them without physical contact.

As the bereavement specialist mentioned, by making the water basin more user friendly for nurses, it can also lower the threshold for partners to help with tasks like emptying the water basin. This may help partners, as previous interviews with nurses have shown that partners value playing a role in caring for their child.

The Memora itself becomes a memory
As discussed in Chapter 2, previous research indicates that memory-making rituals that enable parents to create memories of their child have a positive impact on their bereavement process. The bereavement specialist's argument is that the experience of using the Memora can be a memory that parents carry with them throughout their lives In this way, not only are memory rituals supported by the Memora, but its use becomes a memory in itself.

Emptying the Water Basin
The water basin of the prototype is easiest to empty at the beginning, when it contains a lot of water, because the water flow does not touch the base. However, as the outflow of water slows down during emptying, water starts flowing past the side of the base. Also, towards the end of the process, the water begins to run down the wall of the basin into the recessed area of the base. The bereavement specialist suggested that if there were less space between the edge of the basin and its base, the water would be less likely to touch the base or flow back into it.

One limitation of the prototype is that it has no rollers on its frame. Due to the weight of the basin and the greater resistance against the base's bottom, the basin rolls less easily over the recess than it would if the frame had rollers. The question is whether the water would still run along the edge if the pouring were done more smoothly. However, when the outflow speed slows down, there is a greater chance that the water will run along the edge of the basin and flow into the recessed area of the base.

Further tests could be carried out to determine whether rollers are enough to prevent the water flowing back into the base through smoother and quicker emptying, or whether further measures are needed. For example, the distance between the edge of the base and the water basin could be reduced, as the bereavement specialist suggests, or adjustments could be made to the edge of the water basin.

10.2.5.3 Discussion: Evaluation with Nurses

A smaller water basin for babies below 24 weeks
The need for a smaller water basin was not mentioned during previous user studies with nurses. During the first interview, nurses said that the smaller basins were fine since they were round and see-through, and not too big, which would have caused problems when emptying and cleaning them. However, after hearing about a new solution, the nurses realised that this could also be ideal for smaller babies, just on a smaller scale.

Chapter 3 states that nurses believe it is important to offer all parents equal care, so that they will not compare their experiences. During the first user study, this was intended to apply to families who had lost a child between 28 and 42 weeks of pregnancy. However, it may apply not only to these families, but to all parents.

In terms of production, scaling down the Memora for a smaller water basin should be possible. Vacuum forming is easier for smaller products than larger ones. Furthermore, the stand would carry less weight.

11.4 Evaluation Conclusion

Two studies aimed to validate the final design of the Memora on how to further improve the design, and to inform recommendations for future research.

From a bereavement specialists' point of view, how would parents experience the Memora?
From the bereavement specialists perspective, parents would find the final concept neutral, and carefully designed product. The thoughtful design communicates that the situation has been prepared for, which may help parents feel acknowledged and less alone in their experience. The use of soft shapes, natural and cleanable materials contributes to a friendly and clean appearance.

The Memora is expected to contribute to a smoother experience for parents. According to the bereavement specialist, when handling is calm and organised, this positively influences the experience for parents. She believes that Memora can contribute to a loving and meaningful experience for parents, one that may become part of a life long memory of their baby.

How do nurses experience the Memora?
The nurses appreciated the design of Memora and described it as a more friendly and beautiful way of offering the water method to parents, compared to existing water basin solutions. Nurses found that the lay-in was beneficial to hide the ice cubes floating in the waterbasin, but also gentler for the baby when the baby rests there during cleaning of the water basin. Nurses appreciated that parents had space for any personal belongings, and the possibility to position the water basin over the bed.

The nurses found it important that the mobile base fits under the different types of bed in the department, and that it does not wobble or risk spilling water. Nurses questioned the added value of the drawer, since opening and closing might cause problems and it might slosh the water. Even though they would appreciate it if the magnetic letters could stay with the water basin, all other supplies for memory making would not need to be stored in a drawer in the base.

Are there any bottlenecks in the usage scenario?
Both studies did not identify any major conceptual bottlenecks. However, the bereavement specialist and the nurses did suggest several practical and technical improvements. The bereavement specialist noted that the ice packs should be flexible, and should not be difficult to conceal them beneath the lay-in, so they do not disturb the visual appearance of the water basin. She also suggested against overfilling the drawer and stocking it with limited supplies per baby. Furthermore, she recommended to dry the baby slightly before placing them on a celstof cloth to prevent slipping.

The bereavement specialist emphasised the importance of involving parents in the process, and suggested to involve them in steps such as placing the name on the base, laying the baby in the water, and assisting during the cleaning the water basin. Finally, she suggested making the water basin lock when in resting position to prevent it from standing crooked.

Nurses recommended providing parents a visual representation of the Memora beforehand, that would explain how the water method works, but also to show how the base appears with and without the magnetic letters to spell the name of their baby. This could support nurses in explaining what parents might expect, and may help parents make a more informed decision about whether they want to add letters to the base of the Memora.

How is the tilting mechanism experienced with the prototype?
The water basin of the prototype is easiest to empty at the beginning, when it contains a lot of water, because the flow does not touch the base. However, as the outflow of water slows down during emptying, water starts flowing past the side of the base and into the recessed area. Further tests could be carried out to determine whether rollers are enough to prevent the water flowing back into the base through smoother and quicker emptying, or whether further measures are needed.

12

DISCUSSION



12 DISCUSSION

This chapter reflects on the main challenges and personal learning goals during the process of designing a new water method experience. Section 12.1 presents a general reflection on the project, and Section 12.2 includes a reflection on personal challenges during the project and the process. Section 12.3 concludes with a message to future designers working on emotionally sensitive projects.

12.1 Reflection on project

This study aimed to design a new, dignified experience for the water method for stillborn babies between 28 and 42 weeks, supporting both parents in their grieving process and nurses in their clinical work. The results show that it is possible to combine emotional and practical requirements within a single design. Memora offers a warm, soft and personal experience for parents, while also fitting into the clinical workflow of nurses. A user-centred design approach was adopted during this thesis, and the involvement of nurses from the obstetrics department and bereavement specialists contributed to the validity of the findings, as insights were gathered from multiple stakeholder perspectives.

Previous research stated how parents have limited decision-making capabilities after experiencing stillbirth because of shock and grief, and have the need to reconsider their decisions (Kingdon et al., 2015; Helps et al., 2022). During the evaluation of Memora, the bereavement specialist emphasised the value of offering choices throughout the experience and how this would allow parents to consider step-by-step what they feel ready for. Literature also mentions the importance of recognising parental identity and the baby's identity, through actions such as naming the baby (Nuzum et al., 2018; Kingdon et al., 2015). This was reflected in the evaluation of Memora, where personalisation elements such as adding the name to the base were positively received. The bereavement specialist mentioned how parents are often looking for their baby's name, and how Memora supports this.

Literature also mentions the importance of recognising parental identity through actions such as naming the baby (Nuzum et al., 2018; Kingdon et al., 2015). This was reflected in the evaluation of Memora, where personalisation elements such as adding the baby's name to the base were received positively. The bereavement specialist mentioned that parents are often looking for their baby's name, as it is rarely visible or written down. Adding the magnetic letters to the base therefore supports this need and reinforces the baby's identity.

Furthermore, initial interviews with nurses revealed the importance of a gentle, warm and respectful environment. They also showed that the current water basin for larger babies feels inappropriate and sometimes shameful to offer to parents. The nurses also felt that it was important to avoid any associations with household products or any other uses besides the water method. During evaluation of the final design, both nurses and the bereavement specialist described the design as more friendly, soft and dignified compared to existing water basins. In addition, the bereavement specialist noted that the presence of a dedicated and thoughtfully designed product for parents experiencing stillbirth can communicate to parents that their experience is prepared for. This may help reduce feelings of isolation, as it shows that others have gone through a similar experience. During the evaluation, no household associations were made with the Memora design, and was even associated with a nursery.

Additionally, literature indicated how healthcare professionals strongly influence the experience of stillbirth for parents through their actions and communication (Kingdon et al., 2015; L. Smith et al., 2020). Evaluating the final design further expands on this understanding, showing that the user-friendliness of the design also contributes to this experience. Smoother handling improves the experience for both nurses and parents, as it creates a calmer atmosphere.

Literature shows the importance of memory-making rituals like photographs, hand- and footprints and how these rituals can support parental bereavement (Oxlad et al., 2023). The way in which these memory-making rituals are supported influences how parents remember their experience. During the evaluation of the final design, the bereavement specialist believes that using the Memora can create a meaningful memory that parents can carry with them throughout their lives. Therefore, the Memora supports memory-making and may also become part of the memory itself.

12.1.1 Challenges

Initially, it was expected that some needs of nurses would contradict the needs of the parents. However, the needs of nurses and bereavement specialists frequently overlapped. Initially, it was expected that nurses would care mostly about the practical considerations, however interviews proved that nurses valued providing parents with a meaningful and beautiful experience. It was also expected that parents would care about the experience and not the practical implications, but bereavement specialists recognised the importance of the practical considerations, as these would create a smooth experience for parents. However, nurses and bereavement specialists did have different views on personalisation, as some nurses questioned the added value of personalisation during parents' stay in the hospital and the bereavement specialist found the personalisation very valuable also in the hospital environment.

Another challenge was balancing creativity with the health and hygiene regulations of the hospital. When exploring the project, these regulations were set aside to make room for creativity. In later phases, the regulations were included again to make practical design choices. Through focussing on key requirements first and redefining the details later, combined with discussing the health and hygiene with experienced designers from the studio, helped integrate these requirements into the project, while also thinking out of the box and finding creative ideas.

Designing for a vulnerable group of stakeholders was challenging. Instead of direct interaction with parents and possibly interfering with their bereavement process, the parent perspective was gathered from direct insights of nurses and bereavement specialists. This created some uncertainty when making design decisions, as they were made without direct evaluation from parents. Trusting instinct and designing with emotion in mind helped to overcome these uncertainties.

12.1.2 Limitations

One limitation was achieving consistency in evaluation methods, since more nurses were available to participate in evaluations than bereavement specialists. Furthermore, evaluations with bereavement specialists were more in-depth, since it was not possible to take nurses away from their work for too long. Future research should try to include opinions of multiple bereavement specialists.

During concept evaluation, one of the concepts had integrated a filter system. This feature seemed promising and was received positively by stakeholders during evaluation. However, this filter was later found to be incompatible with hygiene regulations. This forced to try to understand underlying qualities that made the elements of the concepts valuable. In future projects, the feasibility and hospital requirements should be validated before concept evaluation with stakeholders.

12.2 Personal reflection

Designing a new experience for the water method for stillborn babies is not a project that you start without careful consideration. However, when I heard about this project, I instantly felt like I should do this. Before I officially accepted the project, I reflected on whether I would be able to do it. The longer I thought about it, the more convinced I became. While I received a lot of support from people, I also got some concerning looks. “Are you sure you want to do this?” and “You're still a young woman, maybe you should really think about this,” were some of the comments I received. However, I felt emotionally strong, and after diving into a literature research on parental bereavement I felt that my heart was set. During the first day at the Verbeterde Zorgstudio, I was eager to get started (Figure 112).

At the beginning of this project I interviewed nurses, and I asked them how they experienced the emotional side of caring for families after a stillbirth. The nurses mentioned that sometimes there were heavy emotional moments. However, all of the nurses said that being able to help these parents during this difficult time can be very fulfilling. They also said it was important to talk to their colleagues for peer support. After those initial interviews, I remember thinking, “That must be such a beautiful feeling.”

The co-creation sessions with nurses and designers were valuable learning moments. The first session resulted in general insights that were already gathered during initial interviews. The research question was too broad, resulting in generic answers, and not all participants were engaged during the session. After reflecting on the session, the approach for the second session was adjusted by focussing more on the interaction and dividing the research question into smaller specific questions, which led to more valuable outcomes and more engaged participants. Also, during the second co-creation sessions, insights were gathered from discussions between participants, and the focus was not only on the quality of the end results.

Prototyping throughout the entire design process helped explore ideas, identify problems in the design and support communication during evaluation sessions with stakeholders. The 1:2 scaled prototype helped make the final design tangible and improved understanding for stakeholders (Figure 114).



Figure 112, The first week of starting the project at the VZS



Figure 113, Preparations for observing a correction osteotomy surgury (OWO)

All projects have their challenges, and the emotional weight of this one was one of mine. However, it was also a major source of my motivation. This project spoke to me on a personal level, and my internal drive to create something beautiful in this situation gave me a lot of motivation and discipline throughout the entire process.

However, having such an emotional connection to a project like this also has another side. When I had to define concepts, I put a lot of pressure on myself to create the “perfect” product. I am always a designer with an eye for detail, but with other design projects, I was able to leave some questions unanswered. With this project though, I felt the need to answer every question that came up. This made me sometimes lose sight of the bigger picture and I sometimes would get overwhelmed with designing the details. I was also sometimes hesitant to make design decisions as I worried about their potential impact on bereaved parents and the fact that not all decisions would suit every family. In this moments, it helped to discuss these feelings with my coaches. In this project I learned to trust my instincts when making design decisions.

With a project like this, it is important to realise it is impossible to design a product for everyone. While some parents will find Memora meaningful, others might not. Nevertheless, Memora is already a major improvement on the current situation. It helped me realise that this project would be worth it if it can already create a meaningful experience for a small group of families. That helped release some pressure.

It is important to realise that you are not designing to take away the pain of parents. The grief and sadness cannot be ‘taken away’, nor should that be the goal. However, instead, you can design something that helps parents create memories with their child, and take a beautiful memory with them for the rest of their lives.

It was also very important to reflect on the project and how I felt during the process. When something became too much, I learned to take a step back and return to it later. Talking to friends and family about the project, and continuously reassessing my feelings, was very important throughout this thesis.

Although it can never be compared to what nurses do to support these families, I feel that I now have a better understanding of their sense of fulfilment. Whenever I mentioned the topic of my thesis to someone, many of them reacted with pity or sadness, saying how difficult it must be to design something like this. However, I would always tell them that being able to do something meaningful also brings a sense of fulfilment, as I understand now what the nurses meant when they answered that question in the first interviews.



Figure 114, Brainstorming supported by making prototypes

12.3 Message to fellow designers

Dear fellow designers,

designing for an emotionally sensitive context can come with responsibility and pressure. Sometimes we strive for a perfect design that suits everyone, but I learned that this perfect design does not exist. Everyone is different, and has different preferences and needs. It is the role of the designer to take the step to honour their narratives and design with care, by including stakeholders in user studies throughout the entire design process. If a design can support a small group or improve their current situation, it already holds value. Throughout these projects, it is important to take care of yourself and keep reflecting and discussing it with those around you. It is also important to take mental breaks and change direction when something does not feel right.

The aim of designing for sensitive context is not to take away someone's pain or replace grief, but to give space for these emotions and help shape the experience around it, so that people can take the memories with them for a lifetime.



13

CONCLUSION AND RECOMMENDATIONS



13 CONCLUSION AND RECOMMENDATIONS

The objective of this thesis was to design a new, dignified experience for the water method for stillborn babies between 28 and 42 weeks that supports parents in their grieving process and fits with care professionals in their nursing work. In this project, the goal was to design the technical requirements for the water basin and the interaction between primary stakeholders, nurses and parents, and the water basin. Three key design challenges were initially identified; health and safety requirements may complicate the design, stakeholders may have contradicting demands, and the design must address the needs of a vulnerable user group. This chapter concludes key insights from the design process and provides recommendations for future work.

The stakeholders of the project were identified and research was done to understand their needs and experiences. Nurses and parents were explored through literature research, online medical sources, interviews and co-creation sessions with nurses from the obstetrics department from Amsterdam UMC. Existing interventions, actions or products that support human health in relation to stillbirth were also explored.

Parents who experience stillbirth often face intense emotions, must make many decisions while in shock, and have a need for recognition of their parental identity. Parents have different grieving styles and needs, which makes it important that the experience can be adjusted based on these needs.

Memory-making rituals such as seeing, holding and photographing the baby can have a positive impact on parental bereavement. The water method can support these rituals, improve the condition of the baby's skin, slow down deterioration, and give parents more time with their baby. Research showed that nurses value the water method because of its positive effect on the baby' s appearance and the opportunity for parents to spend more time with their baby. However, nurses also expressed feelings of shame when offering the current water basin for larger babies to parents, as they felt it did not match the quality of care they want to provide. Additionally, nurses raised practical and ergonomic concerns for moving and emptying the current water basin.

The insights of the research phase were translated into four design drivers: personalisation without pressure, creating memories and connections, creating a dignified experience, and supporting nurses in their work. Together these drivers formed the foundation for the conceptual phase. Four concepts were developed and evaluated with nurses of the obstetrics department and with bereavement specialists, who provided a parent-oriented perspective on the concepts.

The final design, Memora, is a transparent water basin with a soft and calm appearance. The water basin is partially recessed into the base that offers parents space to place personal belongings of the baby. The base also has magnetic sides for attaching letters that spell the baby's name, creating a special place in the delivery room. In addition, the base facilitates easy emptying for nurses through a tilting mechanism. The stand ensures that the baby can be positioned close to or over the bed and can stay close to the parents, even when the mother is less mobile after giving birth.

The final design was evaluated with nurses from the obstetrics department and a bereavement specialist using a scale 1:2 prototype and interaction storyboard. Both stakeholders perceived Memora as a more dignified and friendly way to offer the water method compared to the current solution. The soft appearance and shape, possibilities for personalisation, and emptying mechanism were appreciated. The evaluation aimed to improve the interaction storyboard and illustrated several considerations for further development, such as improving the stability of the stand, reconsidering the drawer in the base, and testing the emptying mechanism. Overall, the evaluation showed that Memora has great potential to improve the experience of the water method for babies between 28 and 42 weeks for parents and nurses.

13.1 Recommendations for Further Work

Several recommendations were made for further work, which should be addressed before implementation.

The stand
It is possible to position a stand below the nursery bed and the c-section bed. However, the AMT200's foot is too large to fit under the delivery bed, as the stand has a battery attached to its base. Furthermore, AMT200 is a very expensive stand.

Recommendation:
It is recommended to use a different medical stand with a lower base height than the AMT200. This could be a stand that cannot be adjusted in height, a stand without a battery (Figure 115), or a stand where the battery is not attached to the base. For example, this could be a stand that is also used for nursery beds (Figure 116). If the stand is not height-adjustable, it is important to determine an optimal fixed height that suits both the beds and the sinks.



Figure 115, a stand without height adjustments and a battery



Figure 116, a baby bed that can be placed over the bed (NovyMed, n.d.)

Improve (visual) stability of the base
As the design of the Memora was not finalised, details regarding the weight of the base was not finalised and the medical stand that was initially selected might change, exact calculations were not done. During the user studies, both the nurses and bereavement specialists emphasised the importance of stability. The actual stability of the stand does not necessarily reflect on how stable it ***feels***. It is important that parents and nurses are convinced of the stability of the design.

Recommendation
It is recommended to place the stand directly under the water basin, so that the centre of gravity is positioned directly above the stand (Figure 117). This may make it appear more stable. When the water basin is placed over the bed this way, the side with space for personalisation would be closer to the parents and the baby would be more on the outside. However, nurses indicated that the ability to position the basin closer to the bed is already a major improvement to the current situation.

It is important to bear in mind that the water basin should still be able to be emptied at the sink in the delivery room. For floating sinks, there should be no problem repositioning the stand. However, this may be more difficult for non-floating sinks. Here it is important to consider the space between the front of the basin and the front wheels, as well as the distance between the sink's edge and the counter.

Once a suitable stand has been selected and the frame design finalised, stability calculations should be performed. If necessary, a counterweight can be added to the base to improve stability further.

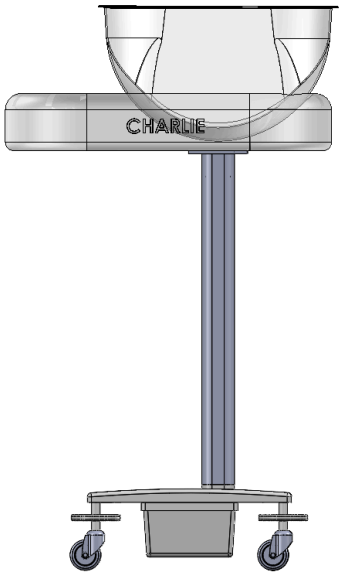


Figure 117, the repositioned water basin

Storing supplies and magnets
The drawer in the base increases costs, production difficulty and possibly detracts from the user experience. Nurses indicated that only the magnets need to stay close to the water basin, and that other supplies can remain in the storage room or are already available in the nursery room.

Recommendation:
It is recommended that the drawer is removed from the base. This would also reduce production costs. Instead, the magnets are placed in a container that fits on top of the base, which can be a cost-effective purchased component. When the water basin is in use, this container can be stored together with all other memory making supplies. When the basin is returned to storage, the container can be placed on top of the base to keep the magnets together (Figure 118). The cover can then be placed over the base and water basin and attached by the magnetic strip. The water basin remains stored dust free in the storage room and all supplies are kept together.

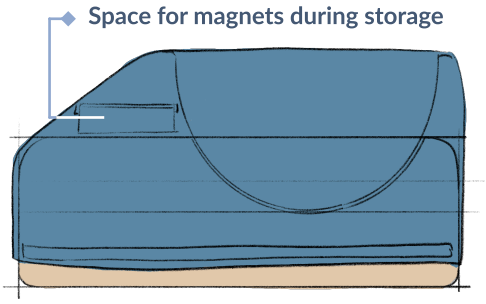


Figure 118, storing the magnets under the cover

This also reduces the risk of the magnets getting misplaced or used for other purposes. When parents want to use additional magnets, nurses can easily place the container on top of the base without increasing the workload for nurses or disrupting the existing workflow.

Visual introduction of the water method and Memora
Nurses indicated that it can be difficult for parents to make a decision on whether they want to choose the Memora and the water method without a clear understanding of what it looks like. This also includes decisions made about the personalisation with the letters and adding the baby's name.

Recommendation
To thoroughly inform parents on their decision, a visual representation of the Memora, for example a folder or booklet, should be provided when introducing the water method to parents (Figure 119). This can help parents in making an informed decision and can help nurses explain the process of the water method more clearly.



Figure 119, informing parents of the water method with a visual representation

Memora for home use
Bereavement specialists expressed an interest in using the Memora in a home setting, as this would also be a beautiful experience outside of the hospital. However, the medical stand significantly increases costs, which is not viable for home use.

Recommendation
It is recommended to develop different variations of the Memora: one for hospital use and a simplified version for home use without a medical stand. Additionally, caregivers should be given clear instructions along with Memora on how to correctly apply the water method in a home setting, as not all caregivers are familiar with this method.

Different sizes
During the final evaluation, nurses were positive about the smaller prototype, which was half the size of the water basin intended for babies aged 28 to 42 weeks. They expressed that they found the size of the water basin of the prototype perfect for smaller babies below 28 weeks. Additionally, previous research indicated that nurses found it important to offer equal care to all parents.

Recommendation
It is recommended to develop multiple sizes of Memora to accommodate babies of different gestational ages. For example, there could be a smaller size (50% of the original size) for babies under 28 weeks, and the original size for larger babies (Figure 120). This way all parents can be offered a similarly dignified experience. It can be researched to determine whether the smaller size would require rollers to support the rotational movement during emptying, or if the design could be simplified to reduce production costs.



Figure 120, Smaller and larger edition of the Memora

Prevent water spilling back into the base
Testing the water basin's emptying mechanism showed that the water could sometimes spill into the recessed area of the base or come in contact with the base's sides during emptying. This was more likely when the water basin was emptied slowly. This should be prevented for hygienic reasons and to protect the rollers and the mechanism inside the base.

Recommendation:
It is recommended to perform additional tests with emptying the water basin, and to optimize the water outflow. The shape of the water basin's rim may influence the outflow (Figure 121), as well as the size and shape of the base. Further testing should also determine how water spilled onto the rollers would affect the durability of the rollers and their ability to keep the water basin locked in place.

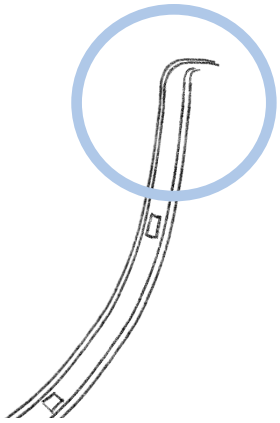


Figure 121, the rim of the water basin

Transition between base and the stand
The base of Memora looks very natural, whereas the stand has a clinical appearance. This contrast might reduce the intended calm appearance.

Recommendation:
It is recommended that an additional component is designed to visually connect the stand and the base. For example, a component with a wood-like appearance that covers the upper part of the stand and matches the appearance of the base (Figure 122). This will make sure that when Memora is placed over the bed, everything visible to parents has a natural appearance. This transition piece could make Memora look more cohesive.



Figure 122, transition piece

Shape and production of the Lay-in
The shape and production for reusable lay-in should be further developed, so that the baby can lie comfortably in the water basin.

Recommendation:
It is recommended to take inspiration from the shapes of baby bath seats (Figure 124), so that the baby can lie comfortably and is supported to prevent them from sliding down further in the water basin (Figure 123). However, it should be made sure that the sides of the lay-in do not obstruct the view of the baby. In terms of production, the lay-in could be manufactured using vacuum casting, a low-cost method suitable for small production volumes (RAPIDPrototyping, 2024). This technique would also support the lay-in's complex and rounded shape. ABS is typically used for vacuum casting and would be suitable for repeated use.

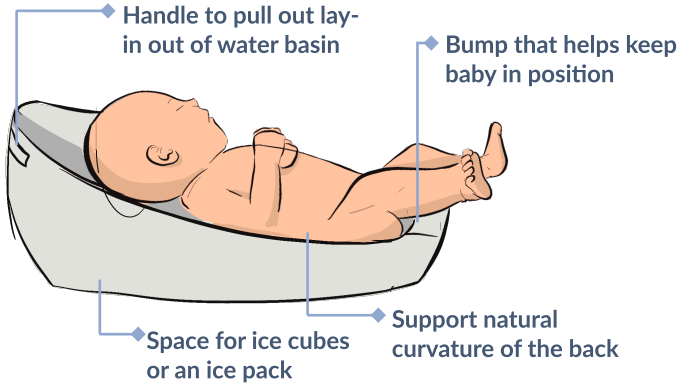


Figure 123, baby lying on the lay-in



Figure 124, example of baby bath seat (Mamas & Papas UK, n.d.)

Optimise the frame of the base
The weight of the frame (Figure 125) inside the base should be as light as possible, and ensure that it does not exceed the stand's maximum pushing capacity.

Recommendation:
It is recommended that a detailed analysis of the structural integrity should be carried out, as well as a further analysis of the load distribution, to guarantee that the frame can safely support the weight of the filled water basin during use and movement. Furthermore, additional research can be done wether Chromoly material is the best, or that cheaper materials like an RVS frame would also be able to carry the load of the water basin.

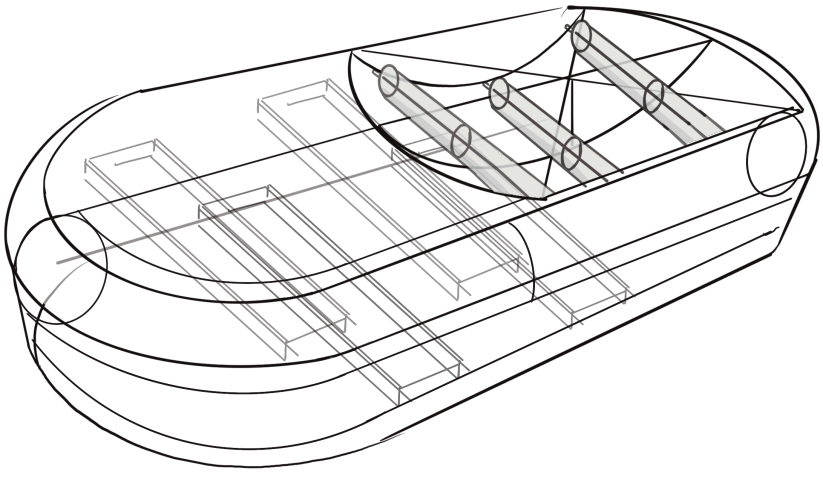


Figure 125, the frame of the base should be improved

Improve the roller mechanism
Currently, the water basin has a double curved surface complicates the roller system. Because the rollers are vertical. the basin only makes contact with a small part of the roller. This results in an uneven weight distribution, and could cause the water basin to deform over time on the pressure points due to creep. Furthermore, there are some concerns about the locking mechanism of the rollers. The rolling mechanism locks forward and backwards rotation of the water basin. Due to the required draft angle of the water basin of 4 degrees, there is an additional gap in the recessed area of the base. Without this clearance, the water basin would be fixed in place and unable to rotate. However, this gap might reduce lateral stability.

Recommendation:
Further research is needed wether the water basin can be redesigned with a single curved surface, so that the rollers have full contact and improving the weight distribution. Another possible solution would be to place the water basin within an additional guiding or supporting frame (Figure 126). This single curved surface of the frame would make full contact with the rollers while also preventing direct wear on the water basin itself.

It is also recommended to further investigate the locking mechanism and to assess whether the water basin is sufficiently secure in all directions. An additional locking mechanism beyond the current roller mechanism may be necessary. The additional guiding or supporting frame would be restricting lateral movement and would only allow forward or backwards rotation when the rollers are unlocked.

However, adding a guiding or supporting frame would increase production costs and complexity. It should be therefore considered carefully wether this outweighs the benefits, or wether simplifying the shape of the water basin would be a more efficient solution.



Figure 126, additional frame around the water basin

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