Health Environments Research & Design Journal

Childbirth supporters' experiences in a built hospital birth environment: Exploring inhibiting and facilitating factors in negotiating the supporter role.

Journal:	*Health Environments Research & Design Journal*
Manuscript ID	HERD-15-0040.R1
Manuscript Type:	Research Manuscript
Keywords:	hospital design, video ethnography, birth unit design, childbirth supporters, Evidence-based design, Maternity units

Abstract:

Objective: To explore inhibiting and facilitating design factors influencing childbirth supporters' experiences.
Background: Birthing women benefit from the continuous, cooperative presence of supporters. However, little research has investigated how birth room design facilitates or inhibits supporters' role navigation.
Methods: We conducted an exploratory video-ethnographic single-case study of childbirth supporters' experiences, within an Australian hospital birth environment. Video, field notes and video-cued reflexive interviews with the woman, her midwives and supporters were thematically analysed using ethnographic/symbolic interactionist perspectives to frame supporters' understandings.
Results: Findings suggest supporters' experiences are complex, made more complicated by sparse understanding or accommodation of their needs in the built environment. Supporters' presence and roles are not facilitated by the physical space; they experience "an unbelonging paradox" of being needed, yet uncertain and "in the way" during "tenuous nest building" activities.
Conclusions: Suggested design guidelines to facilitate supporters' well-being and their roles in designed hospital birth spaces are provided.

Abstract

Title: Childbirth supporters' experiences in a built hospital birth environment: Exploring inhibiting and facilitating factors in negotiating the supporter role.

Objective: To explore inhibiting and facilitating design factors influencing childbirth supporters' experiences.

Background: Birthing women benefit from the continuous, cooperative presence of supporters. However, little research has investigated how birth room design facilitates or inhibits supporters' role navigation.

Methods: We conducted an exploratory video-ethnographic single-case study of childbirth supporters' experiences, within an Australian hospital birth environment. Video, field notes and video-cued reflexive interviews with the woman, her midwives and supporters were thematically analysed using ethnographic/symbolic interactionist perspectives to frame supporters' understandings.

Results: Findings suggest supporters' experiences are complex, made more complicated by sparse understanding or accommodation of their needs in the built environment. Supporters' presence and roles are not facilitated by the physical space; they experience "an unbelonging paradox" of being needed, yet uncertain and "in the way" during "tenuous nest building" activities.

Conclusions: Suggested design guidelines to facilitate supporters' well-being and their roles in designed hospital birth spaces are provided.

Executive Summary of Key Concepts

Typically women give birth in hospital maternity settings, with her chosen supporter, who is usually untrained and often uncertain and anxious about their role. Most hospital birth environments are places that appear more medicalised than familiar or home-like. This Australian 'childbirth supporter study' describes and analyses the experiences of two supporters from their perspective. The primary author videotaped 15 hours of hospital labour and then later interviewed the participants while watching the hour-long video together. There was time for reflection and the authors occasionally made observations or asked questions that might direct the person's attention to a designed aspect of the birth environment. The findings were: 'unbelonging paradox' with the supporter feeling needed, yet awkward in the space; 'role navigation' indicating that the physical design of the space contributed to a few moments that helped their role, but many moments that impeded their role and 'supporting the supporter' as there was much lacking in the space to meet their needs. Some guidelines to improve the birth settings for supporters are suggested, to improve the experience for the supporter and therefore the woman. For example: flexible furnishings, increased familiarity, space to move and a family alcove.

Implications for practice

Designed birth environments should provide more guidance for childbirth supporters than is typically available, as identified from the study findings. To facilitate childbirth supporters' roles in the physical birth setting, specific design accommodations, as outlined in Table 4, are:

- Spacious, yet not cavernous, space to accommodate multiple supporters, as the birthing woman wishes.
- Easily accessible storage space for woman and supporters' belongings.
- Aesthetically pleasing colors in the room, including pleasant images - positive distracters - for people to view.
- A family alcove near the entrance to the room, to allow the presence of concerned outsiders.
- Medical equipment hidden behind aesthetically pleasing screens or cabinets.
- Comfortable and moveable furnishings to support actively shifting women and supporter dyads.
- Options to facilitate personal choice, such as:
    - adjustable lights;
    - music and volume control;
    - olfactory options, such as oil burners;
    - temperature control;
    - windows and blinds to control daylight and air;
    - tactile options such as soft pillows for squeezing;
    - space for personalization and privacy screens that can be opened or closed.
- Readily available built-in physical supports such as:
    - grab bars or mantels, at varying heights;
    - soft wall spaces to rest heads against;
    - pull ropes;
    - birthing balls;
    - beanbags;
    - mats and squat stools.
- Specific design recommendations for birth tubs are outside the scope of this article. However, from the supporters' perspective, the following is recommended:
    - railings to support women's access;
    - steps in and out at a predictable distance;
    - soft edges on which supporters may lean;
    - seats along the perimeter; and conveniently located cup holders.
    - Tub size should consider facilitating a supporter in the tub; yet remain suitable for access by the medical caregivers.
- Comfortable places to rest or sleep, located within proximity to the woman.
- Nourishing food and drink easily available.
- Easily accessible toilet facilities.
- Posters or brochures within sight, such as birth position options, physiological labor norms and tangible birth support activities.

Childbirth is one of the most intimate activities a woman and her chosen supporters can experience, yet in resource-rich countries hospital birth environments remain primarily 'sterile' (Jordan, 1987), 'technocratic' (Davis-Floyd, 2001) and 'medicalised' (Johanson, Newburn, & Macfarlane, 2002; Walsh, 2010). Evidence-based design (EBD) in healthcare "seeks to gauge the impact of specific designs on productivity, employee and patient morale, and patient outcomes" (Joseph et al., 2015) with improved outcomes and experiences for patients and staff (Ulrich, Zimring, Joseph, Quan, & Choudhary, 2004). Benefits arising from EBD include increased responsiveness of the built environment to patient needs, including the need for family support (Kotzer, Zacharakis, Raynolds, & Buenning, 2011). EBD research typically focuses on ailing patients and their caregivers and has provided design guidelines for improved safety and satisfaction for patients, caregivers and family. However minimal research exists on the impact of the birth environment on well women and their supporters during the birthing process, including the "softer aspects of hospital birth provision" (Walsh, 2010, p. 45). This paper presents findings from 'the childbirth supporter study' that explored childbirth supporters' experiences, with a focus on inhibiting and facilitating built environment factors, primarily on how the supporters navigated their support roles.

Supporters needs in the built birth setting

Supporter presence in the birth space has become a cultural norm for many (Hottenstein, 2005). Women seek to have one or more supporters, with evidence indicating that cooperative supporters are beneficial to labouring women (Bruggemann, Parpinelli, Osis, Cecatti, & Carvalhinho Neto, 2007), especially with continuous presence (Hodnett, Gates, Hofmeyr, & Sakala, 2013). However, supporters, especially fathers, tend to be confused about their role and

experience increased feelings of vulnerability (Dellmann, 2004; Johansson, Fenwick, & Premberg, 2015) and stress during (Bartels, 1999), and sometimes after labour (White, 2007).

Despite the desire of many women and their childbirth supporters to birth in a homelike, or non-medicalised environment (Newburn & Singh, 2003), technocratic birth units still prevail. Technocratic birth environments are those designed explicitly to facilitate the performance of medical personnel and technologies, and tend to largely overlook the needs of the woman and her supporters as active users of the space (Davis-Floyd, 2001; Johanson et al., 2002). Design strategies have been recommended by Shin, Maxwell, and Eshelman (2004) to increase the birthing woman's, and arguably her supporters', sense of control over the environment, via perceived hominess – a comfortable or residential-like setting – of the birth space. However, it has also been argued increased hominess can create unsatisfying hybrid environments, that feign hominess yet remain medicalised (Fannin, 2003).

There is limited EBD research into birthing women's needs, and an even greater lack of evidence regarding childbirth supporters' needs as facilitated by design. Childbirth supporter research reveals supporters want to be active, well informed and feel respected and cared for during the labour experience (Johansson et al., 2015; Porrett, Barkla, Knights, De Costa, & Harmen, 2013).

Despite an increase in childbirth support research, an extensive literature search has located only two empirical studies of birth supporters' experience as influenced by the built environment. Westreich and colleagues (1991) conducted a randomised clinical trial comparing outcomes and experiences of 114 couples in two hospital birth settings: one conventional and the other home-like. The study objectives were to assess fathers helping behaviours during labour, as well as later parenting behaviours.

The birth room in the Westreich (1991) study was surface decorated with such elements as a brass double bed and adjacent labour room, but not necessarily re-designed in a non-medical configuration. Observations during labour used a precoded checklist to measure fathers' active or affectionate support behaviours.

Surprisingly, Westreich and colleagues (1991) found that supporters allocated to the non-homey birth settings were more actively helpful than those allocated to homey birth settings. The authors suggested this may have been a compensating behaviour to offset the disappointment in not being assigned to the homey setting. An alternative explanation might be that the homey physical environment provided so much support that there was very little for the father-supporters to do other than provide a quiet supportive presence. As the study aim was not to research how design might meet supporters' needs the authors did not draw conclusions or specify recommendations regarding the birth space design from the supporters' perspective.

UK researchers conducted the second physical birth environment-supporter study, to investigate women and their partners' views and experiences of the physical birth environment in terms of the care received (Symon, Dugard, Butchart, Carr, & Paul, 2011) as part of a larger study (see Symon, Paul, Butchart, Carr, & Dugard, 2008a, 2008b, 2008c; Symon, Paul, Butchart, Carr, & Dugard, 2008d).

The findings show that although supporters generally felt positive about their experience, they felt significantly less positive than did their partner about their satisfaction with the physical birth environment. Supporters' satisfaction was lower in obstetric-led units, but not statistically-significantly so, than when in the midwife-led unit, due to "a range of environmental and care variables" (Symon et al., 2011, p. 880). For example, the supporters were more likely to circle the design characteristic option 'institutional' from a list of 16 adjectives (which also included

words such as 'homely', 'roomy', 'disappointing' and 'cramped') than were the mothers. Both partners found the midwife-led unit to be more 'calming' than the obstetric-led unit and also less 'cramped' (Symon et al., 2011).

The supporters in the Symon and colleague (Symon et al., 2011; Symon et al., 2008d) set of studies felt a lack of privacy, especially in obstetric-led units and that facilities for them were inadequate, for example separate but closely located toilet facilities, lack of food or drink and comfortable seating. Supporters also found the temperature and air quality in the birth unit to be uncomfortable. A lack of control over acoustics bothered a support person, as one woman noted, hearing other women in labour was "[o]ff-putting to [my] partner" (Symon et al., 2008b, p. 169).

The environmental stimuli included on the survey are important design factors to consider, yet it is difficult to determine how, or which – if any – individual design factors' contributed to the findings. Symon and colleagues (2011) suggest that improved facility design for supporters will likely lead to an increase in the quality of support they are able to provide for the woman, hence improving her childbirth experience. We agree with this assertion, yet further information to understand specific design influences on supporters is lacking. Our study was undertaken to address these gaps in the literature.

Study design

The results presented here are from an exploratory, short-term, focused video-ethnographic single case study of one family's experience. This case was selected from a group of six available within the larger Birth Unit Design (BUD) study, whose methods are explained in Author (Date), for several reasons: the active, mobile nature of the labour that demonstrated a diverse range of interactions with the environment by the birthing mother and her four

supporters; the three midwives perspectives; the extended duration of the hospital labour and filming (15 hours); and the use of a wide variety of birth props and range of movements.

The BUD study filmed women and their supporters from admission to the birth unit, during labour until just prior to their baby's birth and for a short period following the birth. In addition to video footage, observational field notes, and postnatal video-cued interviews, an additional research method for this case study was the use of the 'AEIOU' framework (Wasson, 2000) as illustrated in Table 1. Ethical approval for the Birth Unit Design study was granted in March 2010 [blinded for review].

The use of focused, short-term video-ethnography, as described by Knoblauch (2005); Pink and Morgan (2013), facilitated an intensive, complex and rich data set. The extensive analysis permitted immersion into the experience without being extensively intrusive in the family's life. An important outcome from this research is the development and establishment of an analysis template for large and complex datasets involving contexts such as healthcare settings and behavioural observations.

To achieve transferability, the findings reported here have been written to provide a thick description (Geertz, 1973), in what Lincoln and Guba (1985) describe as a process "essential for enabling transferability judgments" (p. 214). The thick description approach, which is illustrated in this article via exemplar quotes and naturalistic writing, invites the reader to evaluate the extent and truth of the phenomenon under investigation and how it may resonate with other environments, circumstances and people (Lincoln & Guba, 1985). Informed by Lincoln and Guba (1985), Wallendorf and Belk (1989) suggest for in-depth descriptive ethnography, such as this study, "that if other researchers are concerned with the applicability of the findings in

another context, they should do research using similar methods in another time or place and then compare" (p.76).

A technique for building credibility is the use of a negative case analysis, which uses purposive sampling to seek out an instance, as Wallendorf and Belk (1989) say, that would be "most likely to not confirm the emerging hypothesis" (p. 73). This remains to be tested in relation to the other five women who used different settings, as it was beyond the scope of this project.

Viewing the video footage while interviewing participants, regarding what was happening for them based on the built environment, served as both a data generating technique and member check to assess credibility. A key participant in the 'childbirth supporter study' was asked to read a version of the thematic data analysis with this response: "I read through it…I think your observations were spot on. I hope it will make a difference and be helpful in future design!…I think it's a brilliant study and I'm so glad to be apart of it."

Setting and participants

The setting was a labour and birth room with an en suite bathroom, located within a maternity unit of an Australian metropolitan hospital. The analysed labour experience occurred between 11pm on day one and 2 pm the following day in early March 2012. The main room can be seen in Image 1 (Sketch from video of birth room arrangement) (and in appendix Image 1a - The main room after a night of labour), with an ensuite bathroom equipped with a bath tub, shower, toilet and sink, located behind this viewpoint, as seen in Image 2a (The ensuite bathroom) in appendix.

[Insert Image 1: sketch of room]

The participants, provided with pseudonyms, included: the woman Felicity; her primary supporter – mother Frances, who was with her for the majority of her labour; her two sisters, not interviewed but present on the footage; and Felicity's secondary supporter – husband Martin. This was the couple's first baby. Felicity fitted the study's criteria with a normal, low-risk, full-term pregnancy, carrying only one baby who was in a head down position (vertex). In addition to these supporters, Felicity had two midwife teams: her first midwife Lori worked with a student midwife Veronica for 9 hours of her labour; and her second midwife was Abby, who cared for her for 7 hours until the baby was born.

Video-cued interviews

Five one-hour long video-cued interviews were conducted six weeks post-partum. Two occurred at the woman's home, the first with the woman (Felicity) and her mother (Frances) together and the second with the woman and her husband (Martin). Three occurred at the hospital with each midwife who had provided Felicity's care during her labour and birth (Lori, Veronica and Abby). Two researchers (the first and last authors) were present at each interview; one took notes and one asked open-ended questions in reference to the video footage of the labour, viewed simultaneously, which was paused as needed based on the discussion. Although this was a childbirth supporter study, we included midwives to develop contextual understanding and to attain a more comprehensive understanding of the supporters' roles and experiences.

Data analysis

Systematic, reflexive reduction used to generate thematic analysis was based on Saldaña's (2013) coding cycle processes. The data analysed for this case study was: 15 hours of observation and field notes during hospital labour; 1 hour of video footage edited (to reduce redundancies) from the original 3-hour film; field notes from the interview sessions; and more

than 140 pages of verbatim text generated from the five interviews previously described. Two types of data were analysed: text and video, each underwent three analysis cycles, as seen in Table 1 for the video and Table 2 for the text.

Key findings

Analysis of the data revealed three major themes, which can be seen in Table 3**: 'unbelonging paradox', 'role navigation' and 'supporting the supporter'.** The subthemes that comprised the 'unbelonging paradox' theme were: 'tenuous nest-building behaviour'; 'elusive privacy'; 'technocratic environment conveys mixed-messages'; and 'lack of control'. The subthemes revealed for the 'role navigation' theme were: 'role navigation by social interactions' and 'role navigation by space, place and activity'. The subthemes revealed for the 'supporting the supporter' theme were: 'supporting the supporters' instrumental aid activities' and 'supporting the supporters' informational and emotional activities'. Data is presented in support of each theme and subtheme with images, quotes from the participants and verbatim field note excerpts. The main room was darkened and it was night, so the video footage from the first eight hours is also quite dark. Therefore some images are represented as line drawings based on the video footage to better show the details of the space, as seen in Image 1.

'Unbelonging Paradox'

'Unbelonging paradox' was identified as a major theme. While the birthing woman and her supporters appeared to settle in (as described in field notes and seen on the video), their experiences were challenging. The supporters were aware of their own desire to be present to support Felicity but also the hospital's expectation that they would be there to provide support. Their later comments, upon viewing video footage of their time in the birth room, revealed that their experience was of feeling unwelcomed, under-supported and impeded in the performance

of their roles, by the built environment. They found it difficult to create a safe, undisturbed nest. The 'unbelonging paradox' theme was comprised of the following four subthemes: 'tenuous nest-building behaviour', 'elusive privacy', 'technocratic setting conveys mixed-messages', and 'lack of control'.

'Tenuous nest-building behaviour'

'Tenuous nest-building behaviour' is the first subtheme in the 'unbelonging paradox' theme. Nesting has been identified as a central desire for women, prior to birthing (Singh & Newburn, 2006; Walsh, 2006), and arguably for their supporters. Nesting in humans is marked by changes in behaviours and attitudes during pregnancy that facilitates safety and protection, which benefits mother-infant bonding and healthy attachment (Anderson & Rutherford, 2013).

As with other mammals, many women experience a powerful need to create a safe, comfortable nest or space for birth where they feel confident they will remain undisturbed (Author, date). A desire for familiarity – knowing who is in the space with her – has been noted as customary for women cross-culturally in a social-selectivity process, that is, a process of selective narrowing of social interactions and determining who is in a woman's environment during late pregnancy and labour (Anderson & Rutherford, 2013). We argue that this process could be facilitated by supporters having increased control over the physical space to facilitate a safe bubble around the woman (Author, date and Fahy & Parratt, 2006).

Analysis of the field notes, interviews and video found that midwives and researchers saw the participation of supporters in this nest building behaviour, through their attempts to adapt the birth room to the birthing woman's needs, as important to their sense of autonomy within the space. However, the experiences reported by supporters were very different to what was assumed by the midwives and researchers, based on their observation.

It was identified from the interview transcripts that the family's reactions to the built environment was a feeling of disorientation and inhibition. Despite having had a tour of the facility during pregnancy, they could not remember the process for entering the birth unit upon arrival. A belief that she will be welcomed into the birth unit has been shown to reduce a woman's anxiety levels and increase her confidence to stay at home longer (Green, Spiby, Hucknall, & Richardson Foster, 2012). Although there is no evidence regarding the positive benefit gained when the supporters also feel welcomed, it may be reasonable to assume feeling welcomed would also benefit the supporters. Frances described a feeling of uncertainty during the wayfinding process of entering the unit:

> We didn't realise that there were still people in the delivery reception…[because] that was behind the door…we had to be buzzed in order to get through. We didn't know that would be how to get through that [door]. Or if there was anybody on the other side.

Once in the birth space, the group appeared relaxed. As a researcher wrote in her field notes:

> The woman's support people are friendly, relaxed and seem comfortable in the space. The three women walk barefooted around the room and have spread their supplies: snacks, drinks, mobile phones, CD's and an oil burner (which the woman's mother has brought from home) on the tables and desk.

However, later interviews revealed that their experience continued to be characterised by uncertainty. The perception by others, that they were making themselves comfortable – building a nest – was noted in the field notes and by the midwives during the video-cued interviews.

One aspect of feeling settled is the perception that there is a designated place for belongings. The main supporter expressed a feeling of being cluttered due to scarce storage space.

The field notes and video observations confirm lack of storage and a lack of sufficient segmentation between areas of the room (such as dividers or partitions to separate one large room), seen Image 3a – appendix - Tenuous nest-building behaviours.

The family had brought bags and personal objects they perceived as necessary for a labour and birth experience (such as bags of extra clothes, extra pillows, aromatherapy oils and snacks). The lack of storage space in the room suggested the redundancy, or unwantedness, of what they had brought.

> I felt like we had brought a lot of things…bags and all of that…stored them on top of the couch…maybe if we had stored our belongings in a corner somewhere, or in another room or something, it might have been better. It might have helped. Not cluttering the place. – supporter

The lack of a clear place for things contributed to the difficulty the supporters experienced, in settling. The meaning associated with this absence of a clear place for things (and perhaps, by extension, for the supporters themselves) was unbelonging. Unbelonging was experienced as difficulty settling in:

> It just took a while to settle in and just see *where are we*? Where do we fit in, in this place with everything around there? How do we move around and feel comfortable without being too cautious? – supporter

Women tend to be aware, at least peripherally, of their supporters' activities, comfort and mood, even when the women are in the birth "zone", as described by (Dixon, Skinner, & Foureur, 2014, p. 371). Felicity recalled her supporters' nest building attempts:

> My mum and…sister had all my stuff so they were just trying to get ready. Like my mum had set up the oil burner and put…a couple of drops of this and that, trying to set that up. Set up my music and they were trying to do all that while I was just trying to breathe and trying to use whatever positions.

A midwife describes her observation of the supporters' nest building attempts:

> On reflection, she [Felicity] was creating her environment in that room, which was great – doing what…she needed to do. Having her two sisters there, running the bath, having her mum being there…helping her create that space for her.

Nest building can provide supporters with an opening role, however the space did not invite or support this activity. Frances, Felicity's mother, felt foreign in the space, and was not comfortable. When asked what she would change about the physical birth environment, Frances replied:

> …Just to make it more of a home. It is so foreign…I'm not the mother that's going to go there and give birth. But when I walked in there, it took me a while to settle down, for me to feel like I'm comfortable in this place. Because I was really a bit…lost.

The capacity a space has: 'to be made familiar' or 'to be personalised' emerged as an important criterion in the development of design guidelines, consistent with research in personal space preferences (Gosling, Craik, Martin, & Pryor, 2005), especially in the context of nest

building in this study. The supporters' ability to provide access to things from home was an important part of their role in creating comfort, as seen in Image 4a (appendix - Familiar hominess with own pillow facilitates nest building). For instance, Felicity said, "We brought our own pillows…I had been using it at home…I preferred my pillow." The familiar scent and feel of her own pillows appeared to have created a positive olfactory and sensory response for Felicity, which may have positively contributed to experience. It is important to consider all sensory stimulation in the nest-building process.

Another birth space characteristic that inhibited nest building was the inability to play favorite music at appropriate volumes. Frances found it especially important to be able to have familiar music playing continuously – described as a 'music stream' by Kopec (2012) – as a way to keep acoustic consistency:

> [It] would have been nice to just keep that energy and…that environment of sound, calmness and tranquility. Because music is wonderful! It holds the space. It keeps the energy and keeps things constant…it's a…nice cover, to keep music going. But we weren't able to always do that so there was always this lapse.

The positioning of the electrical power points made it difficult to establish an intimate soundscape. As a supporter said:

> I think where we could plug in the CD was quite a distance away and I felt that if we were to turn it up to a decent volume [so] that she [Felicity] could hear wherever she is, it would be really loud. - Frances

Felicity recognised and appreciated that her mother actively sought to take care of her, by providing her with comfort and familiarity. The presence of her own pillows was a materialisation of Frances' care for her. Their presence was meaningful as something that not

only takes care of Felicity's comfort, but also represents the mother's care for her daughter's comfort. Nest building by the supporters was important in establishing a caring environment for the woman. The things that will take care of the woman materialise the desire of her supporters to care for her. Finding a place for the things brought from home, such as snacks and extra clothes, enables the supporters to establish a locus of care within the space, and thus to place themselves.

'Elusive privacy'

The second subtheme identified, building upon 'tenuous nest building' and expanding the 'unbelonging paradox', was the perception of 'elusive privacy'. Women prefer to feel their privacy is protected and that they are safe and secure, without unnecessary distractions, in order to facilitate labour progress (Buckley, 2003). Supporters also appreciate a sense of privacy, consistent with the literature (Johansson et al., 2015). However, there is a conflict between meeting this desire for privacy and the hospital culture, which is focused on surveillance and observation of the woman. If nest building is an attempt to establish ownership of the space, then the goal of ownership remains elusive, as the space is actually owned by the institution, and is beholden to the institution's agenda of achieving a safe birth by medical means. This creates a challenge for designers.

[Insert Image 2 here: Windows in door and mat on wall]

One example of a design decision that impacted privacy is in the design of the door to the birth space. In the studied birth space, the design of the door allowed people outside the birth space to look through a window located at the top, as seen in Image 2 (Window in door and mat on wall - examples of unbelonging paradox and role navigation themes). This allowed those outside the room to make judgments about when to enter, and reduced the chance of

inappropriate or unnecessary intrusion. As researchers we were among those who benefitted from the window in the door. We had agreed that stepping out during procedures was the appropriate action, but the ease of monitoring the setting that this viewing window provided, highlighted the reality of elusive privacy for the participants.

> 23:47 – 00:45 Researchers wait in neighbouring room, and then in hallway, outside of door looking in through glass window during Felicity's exam. – researcher

The supporters also interpreted the window-in-door feature as an example of elusive privacy. The supporter proposed a possible solution; in the context of her daughter's own straightforward labour experience:

> I think there was just one door and when you open the door…if anybody was walking out they could see right in. It's not like you have a double door…[where you have] one door to walk in and when that door shuts you can open this one.

The institutional requirement that privacy may be breached at will by the medical team (for the sake of a safe birth) shapes the design of the space and influenced the support role for both the husband and the mother-supporter. The design of the door and the window negotiate that breach of privacy, limiting it, but also facilitating it. Three of the four supporters were regularly observed entering and exiting the room (for example to return to a waiting room or to visit the bathroom or vending machine, where they may have inadvertently invaded other families privacy just by being out in the hallways). This negotiation between medical safety and family's privacy is a good example of the ambiguous status of many designed elements within the birth unit. Is the door participating in the project of the woman and her supporter, in their desire for privacy? Or is the door a participant in the larger institutional project of monitoring

the birth process? Such ambiguities unsettle the space, and contributed to this family's experience of an unbelonging paradox.

'Technocratic setting conveys mixed-messages'

The third subtheme contributing to an 'unbelonging paradox' was identified as the 'technocratic setting conveys mixed-messages'. While this technocratic setting assured the birthing family of the presence of back-up medical support, it also reminded them of their potential inadequacy to their task. It conveyed both reassurance and disempowerment. As a supporter said:

> There's just equipment everywhere…even when I looked at it, it actually scared me. Because I sometimes think I'm going to walk back and reverse into it or knock it…I felt like I always have things within my peripheral vision but I didn't feel safe that if I have to walk back, I know that I'm not going to knock something.

The room feels foreign for those who do not regularly inhabit such settings (Timmermann & Uhrenfeldt, 2015), exemplars of this can be seen in Image 2 (Supporter felt anxious she would bump the nearby equipment) and Image 5a in the appendix.

Felicity's husband Martin perceived himself as in the way. He attempted to defuse his sense of awkwardness with humor, remarking: "What are you going to do? Just hang like this off a machine?" Martin pantomimed a 'cool guy' pose, with his arm draped over an IV pole, saying, "Hey, how's it going?" Martin's humor was triggered by a desire to dissipate his discomfort, and a sense of the incongruity of his awkwardness in this particular technological environment, given the commonplace association between masculinity and technology (Lohan & Faulkner, 2004).

The woman, supporters and midwives perceived the medical equipment as inhibiting movement. As described by a midwife:

> [If there is] an IV pole and then maybe the battery runs out and so you've got to plug it into the wall and then [it] can only reach, the power cord can only reach so far, and then you don't have telemetry, you're then stuck with the CTG on the wall. So…that definitely restricts where you can go. – midwife

The hospital bed suggested a disempowered patient, as the supporter said, "You're just sitting there like you're the sick…or…a patient on a hospital bed." The script and design indicated the supporter was a patient, even when they perform a support role.

A supporter described how the medical equipment conveyed the meaning, 'not authorised to touch'. She had a confessional tone here, "I think I might have moved something actually. I might have moved something. It might have been that [pointed to IV pole] or something. I remember moving some equipment out of the way. Away from the bed."

The medical equipment typically relays an unnerving message to families, as a midwife described:

> It can be a little bit confronting I find when I show people rooms. That's the first thing [infant resuscitaire] that they talk about – 'what's that?' It is a little bit scary…for some people and most of the time we just do a baby check on there…if that was away, that would maybe change the feel of the room a little bit and give you a lot more space in there.

Ideally technocratic environments as guided by experts and technology would embrace the latest research and evidence on promoting physiological birth. However, the separation between the human person and the technological equipment is entrenched (Davis-Floyd, 2001)

and the space is dictated by the 'other' (such as the CTG machine) as having the power to 'do the birth' – not the woman. For example the birth space did not facilitate an active, mobile and upright labour as recommended by research on physiological birth (Lawrence, Lewis, Hofmeyr, & Styles, 2013). Image 3 (Sketch from video of supporter holding woman, who holds sink) shows an example of Frances holding Felicity, who holds onto the sink. Frances describes this design oversight, "Clearly the place doesn't have enough places for the [birthing] mother to hold, like a railing or a hand thing or something that juts out or something that you can hold on… A comfortable padded leaning counter."

[Insert Image 3 here: Sketch from video of supporter holding woman, who holds sink]

This is one example of how technocratic design can create additional burden for the supporter, who must provide the physical support required by a woman's physiological need to lean or pull to enable support for all four limbs during labour (Jowitt, 2014). The technocracy of the situation aligns with Italian architect Lepori's (1994) statement that, "the organisation of the entire setting is a function of the patterns of movement that occur during intervention" (p. 4). The equipment in the current design of birth units is intended to assist the staff, whereas there appears to be a deficit of equipment that assists the supporters and women during labour.

Supporters and women in labour want to know equipment (for the medical staff) is available if needed, but we agree with others (Author, date; Duncan, 2011) that this sort of equipment should remain hidden to create an anxiolytic (anxiety-reducing) space. Medical-based equipment communicates that 'something might go wrong'. The woman and her supporter, for the most part, are capable of managing the labour and the presence of **thoughtful design and more woman/supporter assistive equipment throughout the birth space would override the current day message of the need for trained staff to use equipment to 'do the birth'**.

'Lack of control'

The last subtheme to comprise the 'unbelonging paradox' theme was 'lack of control'. This corresponds with territorial behaviour research, exemplified by Kaya and Weber's (2003) study of college dorm room personalisation behaviour. Felicity's family sought control where they were able, however they had no control over most design features. As the supporters attempted to personalise the space and create a nest (for example adding pillows from home, familiar music, favorite scents), overall they experienced an unbelonging paradox in their inability to take control of the physical environment they inhabited for the labour and birth. Lighting design in the birth space could have offered a greater range of choices. A supporter expressed, "I prefer it dim...sometimes the lighting is really harsh…that was harsh, that spotlight."

Another supporter agreed, "A dimmer in the bathroom would have been good…because you couldn't have the light on. It was too uncomfortable. You just had to rely on the light from the window or from the other room."

The aesthetics of the space, specifically furnishings, fixtures, equipment and wall colour aligned with 'tenuous nest-building' and 'technocratic space convey mixed-messages' subthemes, but the aesthetic aspect strongly overlapped with occupants' perception of 'lack of control' over the space. Shiny metal equipment contributed to the technocratic, medicalised aesthetic, while dreary white walls and old, grey, faded upholstery did not facilitate reduced anxiety or a sense of domestic familiarity. Lack of art in the space also contributed to a lack of domesticity with a clinical feel. It wasn't possible for the supporters to change the aesthetic environment to suit their preferences or encourage a sense of belonging. A supporter interpreted the space as cold:

> It's the colour, that grey or white, it's so cold. Maybe some murals or something…paintings…or pictures of a baby on the wall…a beautiful piece of

> sketching or something of a baby…or stars or the moon, or nature, that sort of thing [would make the space more appealing].

A midwife described her feelings about the unappealing aesthetics, "The white walls and the grey furniture…now I'm so used to it, I don't think about it but I'm sure the women [and presumably the supporters] get that sense [of discomfort] as soon as they walk in."

'Role Navigation'

The second major theme identified was 'role navigation'. Typically the childbirth support experience is one non-professional supporters rarely perform; therefore the act of supporting a birthing woman requires in-the-moment learning and role navigation (Bäckström & Hertfelt Wahn, 2011).

'Social interactions'

The first subtheme comprising 'role navigation' was 'social interactions'. According to the field notes, there were some tense conversations between Frances and one of the midwives and between Frances and Martin during the night, during a time labour did not seem to be progressing. Despite this, Frances navigated her support role with focused determination and a calm affective state. Throughout labour, Frances murmured encouragement and offered gentle touch for her daughter, despite her own lack of sleep and discomfort. She defended Felicity's tenuous nest space by conversing with Martin and the midwives when she felt Felicity's birth zone was being disturbed by conversations in the room.

> [My primary concern was to provide] comfort and to minimise annoyances…granted she was safe in there, but sounds are important and…if things become annoying and distracting…it's not really good for her because I

want her to feel calm and allow the process to take its course naturally without hindrance. - supporter

The room layout and supporters' lack of space may have contributed to a sense of redundancy for them – feeling unneeded and without a 'job' to perform, as will be described further in the 'supporting the supporter' section. Communication amongst the support team including the midwife could alleviate this perception of redundancy, by discussing possible activities to do to fill a support need. These moments could be better facilitated if there was a designated space for such conversations. A midwife described a common scenario; cooperative versus obstructive support:

You are more aware of the support people when they're not supporting the women, as opposed to when they are supporting the women – it seems to flow nicely. They're in the space you work around them, but when they're not, they're kind of clumped. That's when it gets really difficult. – midwife

This midwife mentioned clumped supporters as problematic. It is possible the act of clumping may be supporters' coping mechanism to foster familiarity and group-support during an anxious time, albeit resulting in increased feelings of redundancy. Navigating roles is an important aspect of the childbirth support process when no continuous role has been identified. On other occasions, separating the supporter and woman may reinforce roles, for instance, reinforcing the midwife's role while undermining the supporter role by the midwife directing a conversation to occur outside of the room, outside of Felicity's range. This was noted in the field notes:

03:40 L asks mother if they can talk outside. They leave the room. They return 5 min[utes] later together. Mother has returned with her eyes downcast. It is

> obvious that the conversation has not been an easy one. Mother sits in the large comfortable chair and places her hand over her eyes. She seems distressed by the conversation outside. - researcher

'Space, place and activity'

The second subtheme identified in 'role navigation' was 'space, place and activity'. The physical environment appeared to influence supporters' role navigation, either by providing a place to be and therefore ability to attend to Felicity's needs; or inhibiting close proximity and therefore sending an obstructive message. There was an atypical instance of support facilitation when Frances tried to tidy the room. She moved the gym mat from the middle of the floor, to lean up against an empty wall area. Unprompted, Felicity gripped the mat's top edge, seen in Image 2, and alternately rocked her body and pressed her forehead against the mat, appearing to shield against outside distraction and gain a focal point. This was an unintended shift in support approaches for Felicity, based on Frances' ability to work with and feel comfortable taking initiative with the furniture and equipment in the birth room.

This midwife provides an example of the built environment's inhibition script, regarding lack of proximity and role to play:

> It was hard for [Martin] because the mum [Frances] was on one side; the sister was on the other side. Unless he snuck himself up high, so he could get to her [Felicity's] head as well. Then a lot of support people don't feel comfortable doing that if they think they've already got support people doing that. They feel like there's no place for them.

Martin described the feeling of no role to fulfill and being in the way, "Sometimes when I went in and…then [Felicity] wanted to move, 'move out of the way', go to the corner and there is not really a place to [be]."

As mentioned, a family alcove or window seating, could communicate acceptance of a passive supporter's calm presence nearby. Martin expressed a similar idea:

> If I was doing the room, it would be near the entrance, you would have a sort of section almost like a viewing area…it can be still part of the room but a place where you can chill out maybe if you need to have a rest...a single bed length in an alcove that's not in the way… just a few square metres near the entrance where people can go in and out without having to cross over to get to this place.

Martin's role shifted to a more primary support role during the last few hours when Felicity laboured in the bathtub, while Frances shifted to a secondary support role. This relocation to the bathroom created a spatial 'opening' for Martin to enter the scene, and place himself in a supportive way. By this time Frances appeared exhausted and can be assumed to have appreciated Martin's more active support role. The data revealed Martin's emotional state shifted when he perceived the birth was imminent. Becoming less anxious, he observed a physical space for him near Felicity at the bed, as seen in Image 7a (appendix - Role negotiation – adapting to changing needs and available space) and later, by the tub. Frances and Martin both shifted their roles to accommodate change in location, and their own and Felicity's needs.

'Supporting the Supporter'

The third main theme identified was 'supporting the supporter'. These findings are consistent with work on social support that has identified four types of social support, ["(1) emotional concern (liking, love, empathy), (2) instrumental aid (goods and services), (3)

information (about the environment), (4) appraisal (information relevant to self-evaluation)"] (House, 1981, p. 39). Three of the four social support types described by House (1981) were identified as subthemes: 'instrumental aid activities'; and 'informational and emotional activities'.

'Instrumental aid activities'

The first subtheme for 'supporting the supporter' was identified as 'instrumental aid activities'. It was observed that the physical environment hindered meeting some of the supporters' needs.

The room was considered too small and may have increased stress for the participants. Felicity said, "[I wish there was] more space for family, support people."

Felicity often varied her position in search of comfort, including being on the floor or squatting. The supporters attempted to keep their eye-level the same as Felicity's eye-level, so had to kneel, squat or be on the floor. No padding or soft areas were available for kneeling. When asked how his legs felt the next day, Martin was thankful for his physical fitness training, "I train actually a lot. No it wasn't comfortable at all but if I didn't I would have been like whinging [whining]…our instructors make us do squats up and down the hall. Walk in a deep squat."

The furnishings account for one supporters' perception of diminished strength. For example, seated in a plastic chair in the bathroom, this supporter struggled to hold Felicity under her arms. "It did feel uncomfortable for me but I felt because of my discomfort, I…felt I wasn't in a position to be strong enough in my upper body to be able to hold her or to support her."

The ergonomic birth ball, meant for use by the woman, appealed to a supporter, as can be seen in Image 4 (From the video supporter uses birthing ball to support herself) where she is

using it as a seat since it enabled her to be at the right height for supporting Felicity who at that time was on the bed. It also provided Frances with the ability to move easily whilst seated.

> Because the ball, you can…manoeuvre it for your comfort. It is just like when you're lying in bed and you move for a comfortable spot. Well you can do that on the ball. On a chair it is pretty fixed. You can't really find a comfortable spot on a chair. But on a ball you can move it.

[Insert Image 4 here: supporter uses birthing ball to support herself]

Felicity was distracted by the need to consider her supporters' well being, "I didn't like the fact that my support people, I could tell were uncomfortable. Because I could see them kneeling there on the hard floor. That's not nice and it was for quite a while."

The comfort of the supporters in the birth tub area was similarly challenging, as Martin noted, "The research should say that the sides of the bath should be designed to be comfortable for people to use to support someone in labour." In addition, supporters found the seating to be inadequate, "Comfortable lounges should be provided in the [waiting] room".

Martin felt frustrated due to no place to rest, "When I got really tired, I think I just conked out on that [floor mat in the birth room] for a while, just on the ground. I mean that couch is totally pointless. A couch with arms is ridiculous!"

Nutrition is important for maintaining energy during long labour support. During this nighttime labour, the long trip to access the vending machines and the available choices of food were concerns. A supporter said:

> [I wish there was] a bit of kitchen facility. I'd pay ten dollars for a drink, if it was nice. Twenty dollars for a sandwich, it doesn't matter. At that time…it's just like, give us something good to eat, instead you're making toast and trying to get those

> little [plastic knives to spread butter]…drinking from a Styrofoam cup and drinking coffee and all that. That's a bit [shrugs shoulders].

'Informational and emotional support'

In addition to 'instrumental aid activities' to support supporters, the built environment should attend to supporters' 'informational and emotional needs', which was identified as the second subtheme for 'supporting the supporter'. Supporters' informational needs may range from: knowledge about the normal labour process; positions the woman might try; location of comfort equipment (for instance hot or cold packs); how to keep the space safe and peaceful, and how the labour is progressing. Emotional needs are any that facilitate the supporter to feel "supported, included, and prepared for the reality of risk and uncertainty in pregnancy, labour…and for their role in this context" (Steen, Downe, Bamford, & Edozien, 2012, p. 422).

Martin, Felicity's husband, became a secondary supporter by default. The original plan was his passive proximity, as the family's belief was "birth is 'women's business'." However, due to the labour's duration, Martin cycled through various activities: nervous pacing; attempted rest in an uncomfortable waiting room chair; messenger between the midwives and Felicity and Frances; to his final activity as intimate cooperative supporter. The three roles Martin negotiated between were: 'concerned outsider', 'messenger' and 'supporter'.

During the night and morning, he sporadically checked on Felicity's progress. One midwife communicated how difficult it can be for supporters without any discernable role: "It's hard for them [supporters] to just be in the room. They feel awkward too." The perception of redundancy, which can be debilitating, can arise from a long labour without identified tasks, or the belief that one is incapable of performing needed support roles (for reasons that might be personal, cultural, physical or environmental).

An example of Martin's anxiety and his desire to find a role occurred when he was able to inadvertently invade the acoustic privacy of an adjacent birth room. He entered Felicity's room and compared her progress to the woman in the adjacent room, whom he had overheard giving birth, declaring the neighboring woman had "beat [her] to it." This action and message seemed to increase everyone's stress. Martin appeared to need more informational, emotional and appraisal support than the other supporters, to reassure him of labour's wide range of 'normal'. "I think he [father] was more fearful than any of us were."

> Sometimes I felt it was a bit – 'oh no he's come back in again and I still haven't done this, I still haven't completed it'…it was a bit of a disappointment that every time he came back in there was still no improvement or so little improvement…obviously that wasn't his intention. – Felicity

As there was insufficient space in the room for Martin to be a passive supporter, he waited in the waiting room, located out of sight and sound to Felicity. This lack of proximity may have contributed to his anxiety. Research has indicated that family members may have differing privacy needs, which can be satisfied by the presence of family alcoves, especially those located at a window (Shin et al., 2004). Rippin (2011) described an intensive care unit ethnographic study, with examples of "family studios [as a] saving grace" (p. 77). At one point Martin chose to take a nap on the birthing mat on the floor of the birth room (see Image 6a in appendix - Supporting the supporter theme – supporter slept on mat intended for woman), exemplifying the need for supporters to be supported.

Discussion

The interactions between the physical spaces, the people involved in the experience, and the behaviours and meanings attached to the experience can be complicated. This family's

experience, with one woman at the centre, may resonate with others who labour and birth in hospital birth settings. The findings presented here add to existing knowledge by accentuating childbirth supporters' specific needs in this designed birth space context. The design of birth units must take into account the needs of all users of the space, including, not only women, midwives, obstetricians and birth staff, but also the women's supporters. The findings from our study aligns with and endorses the Westreich and colleagues' (1991) study by contributing evidence that the physical environment influences childbirth supporters' behaviours. The Symon and colleagues' (2011) study is also endorsed, built upon and refined, suggesting that supporters in familiar, adaptable or personalised environments may feel more engaged, able to provide appropriate support, find openings to perform their role, yet are also in need of personal support.

Our study findings indicate that supporters' ability to make safe and comfortable nest-like spaces for the woman was a primary role. Interior design that permits adaptations and ability to control aspects of the ambient environment was important to these supporters. The layout and aesthetic design may facilitate role negotiation and cooperative support by communicating a welcoming and empowering message. The birth environment should facilitate childbirth supporters' roles in all forms, so they can provide and locate: instrumental aid support (such as provisions for rest, nourishment and self-care, or a place where the labouring woman could lean, for instance, a mantel piece that would invite women's upright mobility, thereby freeing up the supporter for other support roles), informational support (such as an area with posters communicating ways the supporter could be involved) and emotional support (such as seating alcoves allowing passive supporters to feel part of the labour process but not necessarily intimately involved). From these findings it is suggested that supporters who feel supported by

the built environment may be better able to provide continuous, cooperative support birthing women require and desire.

The findings from this study of one woman's birth experience and that of her birth supporters provides evidence that **the childbirth support experience is a complex one, made more complicated by a lack of recognition of supporter's needs in the design of the space.** Design recommendations to facilitate supporting the childbirth supporters can be found in Table 4 and in the 'Implications for Practice' section. Supporters may not feel supported by the physical space; they experience an unbelonging paradox, being needed, yet feeling uncertain and in the way. The space felt foreign and conveyed mixed-messages perhaps compounding societal expectations to be cooperative, supportive and take care of their own needs – with limited positive guidance from the physical birth environment.

Future Research

With a range of detailed, descriptive and real-world design suggestions generated from this research, several avenues for future research are available. Based on the recommendations listed in Table 4, research designed specifically to test the validity of these recommendations would be beneficial. 'The childbirth supporter study' created a data analysis template that may be beneficial for future video-ethnographic research in a wide variety of childbirth settings. Additionally, this analysis template for childbirth supporters in hospital settings may well be applicable in non-birthing hospital units. For instance the findings here support the importance of personalisability, appropriate storage, and recognising the influence of aesthetics, which are by no means limited to childbirth environments.

Conclusion

The evidence presented here suggests that when observed by others and through video recordings of the event, childbirth supporters may appear at ease in their occupation of the hospital birth space. However, the evidence consistently revealed an unbelonging paradox for childbirth supporters, who remark on physical design inhibitors to nest-building behaviour; elusive privacy; lack of control; and the need for instrumental, emotional and informational support for their own needs and role navigation as childbirth supporters.

References

Anderson, M. V., & Rutherford, M. D. (2013). Evidence of a nesting psychology during human pregnancy. *Evolution and Human Behaviour, 34*(6), 390-397.

Bäckström, C., & Hertfelt Wahn, E. (2011). Support during labour: first-time fathers' descriptions of requested and received support during the birth of their child. *Midwifery, 27*(1), 67-73.

Bartels, R. (1999). Experience of childbirth from the father's perspective. *British Journal of Midwifery, 7*(11), 681-683.

Bruggemann, O. M., Parpinelli, M. A., Osis, M. J. D., Cecatti, J. G., & Carvalhinho Neto, A. S. (2007). Support to woman by a companion of her choice during childbirth: a randomized controlled trial. *Reproductive Health, 4*(5), np. doi: 10.1186/1742-4755-4-5

Buckley, S. J. (2003). Undisturbed birth: Nature's blueprint for ease and ecstasy. *Journal of Prenatal & Perinatal Psychology & Health, 17*(4), 261-288. doi: 10.1046/j.1523-536X.2001.00013.x

Davis-Floyd, R. (2001). The technocratic, humanistic, and holistic paradigms of childbirth. *International Journal of Gynecology & Obstretrics, 75*, S5-S23.

Dellmann, T. (2004). 'The best moment of my life': a literature review of fathers' experience of childbirth. *Australian Midwifery, 17*(3), 20 - 26. doi: 10.1016/S1448-8272(04)80014-2

Author, Date

Duncan, J. (2011). The effect of colour and design in labour and delivery: A scientific approach. *Optics & Laser Technology, 43*(2), 420-424. doi: 10.1016/j.optlastec.2010.02.008

Fahy, K., & Parratt, J. A. (2006). Birth Territory: A theory for midwifery practice. *Women and Birth, 19*(2), 45-50. doi: http://dx.doi.org/10.1016/j.wombi.2006.05.001

Fannin, M. (2003). Domesticating birth in the hospital "family-centered" birth and the emergence of "homelike" birthing rooms. *Antipode, 35*(3), 513-535.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture *The interpretation of cultures: selected essays* (pp. 3-30). New York: Basic Books.

Gosling, S. D., Craik, K. H., Martin, N. R., & Pryor, M. R. (2005). The personal living space cue inventory: An analysis and evaluation. *Environment and Behaviour, 37*(5), 683-705. doi: 10.1177/0013916504274011

Green, J. M., Spiby, H., Hucknall, C., & Richardson Foster, H. (2012). Converting policy into care: women's satisfaction with the early labour telephone component of the All Wales Clinical Pathway for Normal Labour. *Journal of Advanced Nursing, 68*(10), 2218-2228.

Author, Date

Hodnett, E. D., Gates, S., Hofmeyr, G. J., & Sakala, C. (2013). Continuous support for women during childbirth. *Cochrane Database of Systematic Reviews.* Retrieved 20 June, 2012, from http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD003766/frame.html

Hottenstein, S. E. (2005). Continuous labour support: creating optimal birth experiences through theory-driven nursing care. *AWHONN Lifelines, 9*(3), 242-247.

House, J. (1981). *Work, stress and social support*. Reading, MA: Addison-Wesley.

Johanson, R., Newburn, M., & Macfarlane, A. (2002). Has the medicalisation of childbirth gone too far? *BMJ, 324*(7342), 892-895.

Johansson, M., Fenwick, J., & Premberg, Å. (2015). A meta-synthesis of fathers' experiences of their partner's labour and the birth of their baby. *Midwifery, 31*(1), 9-18.

Jordan, B. (1987). The hut and the hospital: Information, power, and symbolism in the artifacts of birth. *Birth, 14*(1), 36 - 40. doi: 10.1111/j.1523-536X.1987.tb01446.x

Joseph, A., Harris, D. D., Becker, C. M., Hamilton, D. K., Shepley, M. M., & Zimring, C. (2015). The Center for Health Design, Moving healthcare forward. Retrieved 1 July, 2015, from https://www.healthdesign.org/store/products/books/practitioners-guide-evidence-based-design

Jowitt, M. (2014). *Dynamic positions in birth: A fresh look at how women's bodies work in labour.* London: Pinter & Martin Publishers.

Kaya, N., & Weber, M. J. (2003). Territorial behaviour in residence halls: A cross-cultural study. *Environment and Behaviour, 35*(3), 400-414. doi: 10.1177/0013916503035003005

Knoblauch, H. (2005). Focused ethnography. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, 6*(3).

Kopec, D. A. (2012). *Environmental Psychology for Design* (2nd ed.). New York: Fairchild.

Kotzer, A. M., Zacharakis, S. K., Raynolds, M., & Buenning, F. (2011). Evaluation of the built environment: staff and family satisfaction pre- and post-occupancy of The Children's Hospital *The Health Environments Research & Design Journal, 4*(4), 60-78.

Lawrence, A., Lewis, L., Hofmeyr, G. J., & Styles, C. (2013). Maternal positions and mobility during first stage labour. *The Cochrane Library*.

Lepori, B. (1994). Freedom of movement in birth places. *Children's Environments, 11*(2), 1-12.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.

Lohan, M., & Faulkner, W. (2004). Masculinities and technologies. *Men and Masculinities, 6*(4), 319-329.

Newburn, M., & Singh, D. (2003). Creating a better birth environment: Women's views about the design and facilities in maternity units: a national survey. *www.nctpregnancyandbabycare.com*. Retrieved 15 Jan, 2012, from http://yhhiec.org.uk/wp-content/uploads/2012/01/Creating-a-better-birth-environment-report_3110031.pdf

Pink, S., & Morgan, J. (2013). Short-term ethnography: Intense routes to knowing. *Symbolic Interaction, 36*(3), 351-361.

Porrett, L., Barkla, S., Knights, J., De Costa, C., & Harmen, S. (2013). An exploration of the perceptions of male partners involved in the birthing experience at a regional Australian hospital. *Journal of Midwifery & Women's Health, 58*(1), 92-97.

Rippin, A. S. (2011). *"Challenging families": the roles of design and culture in nurse-family interactions in a high acuity intensive care unit.* (M.Sc in Architecture), Georgia Institute of Technology. Retrieved from https://smartech.gatech.edu/bitstream/handle/1853/43614/rippin_allyn_s_201105_mast.pdf?sequence=1

Saldaña, J. (2013). *The coding manual for qualitative researchers* (2 ed.). London: Sage.

Shin, J.-H., Maxwell, L. E., & Eshelman, P. (2004). Hospital birthing room design: A study of mothers' perception of hominess. *Journal of Interior Design, 30*(1), 23-36. doi: 10.1111/j.1939-1668.2004.tb00397.x

Singh, D., & Newburn, M. (2006). Feathering the nest: what women want from the birth environment. *RCM Midwives, 9*(7), 266-269.

Steen, M., Downe, S., Bamford, N., & Edozien, L. (2012). Not-patient and not-visitor: a metasynthesis fathers' encounters with pregnancy, birth and maternity care. *Midwifery, 28*(4), 422-431. doi: 10.1016/j.midw.2011.06.009

Symon, A., Dugard, P., Butchart, M., Carr, V., & Paul, J. (2011). Care and environment in midwife-led and obstetric-led units: a comparison of mothers' and birth partners' perceptions. *Midwifery, 27*(6), 880-886.

Symon, A., Paul, J., Butchart, M., Carr, V., & Dugard, P. (2008a). Maternity unit design study part 2: perceptions of space and layout. *British Journal of Midwifery, 16*(2), 110-114.

Symon, A., Paul, J., Butchart, M., Carr, V., & Dugard, P. (2008b). Maternity unit design study part 3: environmental comfort and control. *British Journal of Midwifery, 16*(3), 161-171.

Symon, A., Paul, J., Butchart, M., Carr, V., & Dugard, P. (2008c). Maternity unit design study part 4: midwives' perceptions of staff facilities. *British Journal of Midwifery, 16*(4), 228-231.

Symon, A., Paul, J., Butchart, M., Carr, V., & Dugard, P. (2008d). Maternity unit design: background to multi-site study in England. *British Journal of Midwifery, 16*(1), 29-33.

Timmermann, C., & Uhrenfeldt, L. (2015). Patients' experiences of wellbeing in the physical hospital environment: a systematic review of qualitative evidence protocol. *The JBI Database of Systematic Reviews and Implementation Reports, 12*(12), 67-78.

Ulrich, R. S., Zimring, C., Joseph, A., Quan, X., & Choudhary, R. (2004). The role of the physical environment in the hospital of the 21st century: a once-in-a-lifetime opportunity. *The Center for Health Design - Research*. http://www.healthdesign.org/chd/research/role-physical-environment-hospital-21st-century?page=show

Wallendorf, M., & Belk, R. W. (1989). Assessing trustworthiness in naturalistic consumer research. In E. C. Hirschman (Ed.), *Interpretive Consumer Research* (pp. 69-84). Provo, UT: Association for Consumer Research.

Walsh, D. (2006). 'Nesting' and 'Matrescence' as distinctive features of a free-standing birth centre in the UK. *Midwifery, 22*(3), 228-239. doi: http://dx.doi.org/10.1016/j.midw.2005.09.005

Walsh, D. (2010). Birth environment. In D. Walsh & S. Downe (Eds.), *Essential Midwifery Practice: Intrapartum Care* (pp. 45-61). Oxford, UK: Wiley-Blackwell.

Wasson, C. (2000). Ethnography in the field of design. *Human Organization, 59*(4), 377 - 388.

Westreich, R., Spector-Dunsky, L., Klein, M., Papageorgiou, A., Kramer, M., & Gelfand, M. (1991). The influence of birth setting on the father's behaviour toward his partner and infant. *Birth, 18*(4), 198-202. doi: 10.1111/j.1523-536X.1991.tb00102.x

White, G. (2007). You cope by breaking down in private: fathers and PTSD following childbirth. *British Journal of Midwifery, 15*(1), 39–45.

Table 1: Examples of video data analysis process

Analysis process	Illustration of the process
First 'Descriptive Coding' cycle	**Filming occurred during these situations (discussed and determined before labour)** • Setting the scene (whenever there was time) – footage of the surroundings, the entrance to the birthing suite and rooms, etcetera. • Before and following (not during) any procedures (for example taking blood pressure, vaginal examination, etcetera). • Whenever there was a new use of the space by the laboring woman, her supporters or the attending midwife (for example walking, standing, sitting, leaning, kneeling, in shower, in bath, etcetera). • Whenever the woman changed position. • When dialogue occurred between the woman and her midwife and or supporter. • Patterns of behavior by staff coming in and out of the room. • Positioning of support people within the environment and use of features. [redacted](anonymized for blind review)
Second 'Pattern Coding' cycle	 The second cycle was selecting representative stills in a short series to demonstrate aspects of the video in 2 dimensional format, labeled with descriptive text.

Third 'Code weaving' stage	**AEIOU frame work -** analysis method used to gain comprehension of each element as indexed in the prior analyses and the *interactions* between these elements				
	(scene)	**A**ctivities ("goal-directed set of actions– things which people want to accomplish")[1]	**E**nvironment ("entire arena in which activity takes place")	**I**nteractions ("are between a person and someone or something else, and are the building blocks of activities")	**O**bjects ("are building blocks of the environment, key elements sometimes put to complex or even unintended uses, changing their function, meaning, and context")	**U**sers ("the people providing the behaviors, preferences, and needs")
	Supporter helping woman into tub 	• Frances helps Felicity • Felicity steps on stool • Lifts leg over side of tub • Steps into tub	• Ensuite bathroom • Hospital lights on – bright • Video camera view shows area by doorway – medical equipment	• Frances stands close to the right side of Felicity • Frances holds Felicity's arm • Felicity steps into tub	• Stool – small and low to ground • Birth tub – white and large • Infant resuscitaire in view • White plastic hospital chair on opposite side of tub	• Felicity – labors, climbs into tub between contractions • Frances spots Felicity – mostly stands erect, leans to side to follow Felicity's movement

[1]All quotes in video table from (Wasson, 2000, p. 382).

Table 2: Examples of analysis of text data

Data analysis audit trail	First 'Descriptive Coding' cycle	Second 'Pattern Coding' cycle	Third 'Codeweaving' cycle
Verbatim reflexive-interview analysis exemplar	**DATA verbatim** • "I prefer them dim. There was no choice, only on or off. So I chose off." – Felicity (p. 15) • "I prefer it dim... sometimes the lighting is really ha mother (p. 15) • "That was harsh, that spotlight." - mother (p. 18)	**CODES or CONCEPTS** **Lighting was harsh and did not provide appropriate options – dimmers needed.** "I prefer them dim. There was no choice, only on or off. So I chose off." "I prefer it dim...sometimes the lighting is really harsh."	**THEMES ARISING** **Major Theme: Unbelonging Paradox** **Subtheme: Lack-of-control** regarding lighting – inappropriate lighting options creates discomfort for supporter/woman team
Observational field notes analysis exemplar	**DATA verbatim** • "00:55 [student midwife] moves to the midwives station, shuts down the computer and then pushes the baby bassinet to the other side of the room. There is so much standing against the walls of the room, clogging up the space. Two unused poles standing by the bed (could they be elsewhere while not being in use?), the baby bassinet, the resuscitaire (which makes a fan like sound while it is on). Everything is out in the open and must be a distraction. Mother sits on the lounge behind the woman, who sits on the birth ball. 'Relax, just relax beautiful, just relax the muscles in the face, in the eyes. Relax in the breathing. Beautiful.'" – mw researcher (p. 2) • "One sister says to other: 'CD', when music stopped. The air is permeated with scented oils: lavender, rose otto, jasmine, clary sage and neroli." – mw researcher (p. 2)	**CODES or CONCEPTS** description of medical equipment in room mw researchers assessment of how room must feel to supporter/woman team (distracting) noise of resuscitaire – fan-like sound Example of nurturing words spoken by mum-supporter interactions between secondary supporters (keep music on) details of olfactory scent	**THEMES ARISING** **Major Theme: Unbelonging paradox** pervasive medical equipment familiar hominess **Major Theme: Role navigation** providing affective support *(social interactions or activity in space, and place)*

Table 3: Key results

Research Question: How does the birth space design facilitate the role of the woman's birth supporter?	
MAIN THEMES	**SUBTHEMES**
Unbelonging paradox	**Tenuous nest-building behavior –** supporters are inhibited and struggle to feel empowered to personalise and modify the environment, upon arrival and throughout labor, to create home-like, familiar and safe space for the woman and themselves.
	Elusive privacy – Privacy needs are difficult to satisfy in a public hospital birth unit.
	Technocratic environment conveys mixed-messages – the objects and the designed space itself send messages of 'act like a patient', which sends conflicting messages to supporters who need to feel calm and confident, not passive, in their support roles.
	Lack of control - Hospital environment did not provide appropriate choice making for any occupants; acoustic, olfactory (fresh air), visual, light, water and air thermal regulation.
Role navigation	**Social interactions** – working with others in supporting a woman in labor requires the supporter to be aware and sensitive to their own and others abilities and skills, including how to position oneself in the space.
	Activity, space and place – Whether one is an active or passive supporter, finding a place and purpose in the birth unit can be challenging.
Supporting the supporter	**Instrumental aid needs** – supporting the physical needs (nutrition, rest, space, bodily needs) of the supporter is essential to prevent exhaustion, mistakes, poor communication and lack of support for woman. There is room for improvement in designing the space to take care of all the users of the space.
	Informational and emotional needs – supporters often need information, emotional reassurance and assistance in working with others. This may be provided by a soft, nurturing physical space.

Table 4: Design recommendations

Theme	Subtheme	Design recommendation addressing subtheme
The design recommendations that meet the childbirth supporters' needs, as revealed by the analysis are:		
Unbelonging paradox	Tenuous nest-building behavior	• Spacious, yet not cavernous, space to accommodate multiple supporters, as the birthing woman wishes. • Easily accessible storage space for woman and supporters' belongings. • Aesthetically pleasing colours in the room, including pleasant images - positive distracters - for people to view.
	Elusive privacy	A family alcove near the entrance to the room, to allow the presence of concerned outsiders.
	Technocratic environment conveys mixed-messages	Medical equipment hidden behind aesthetically pleasing screens or cabinets.
	Lack of control	• Comfortable and moveable furnishings to support actively shifting women and supporter dyads. • Options to facilitate personal choice, such as: ○ adjustable lights; ○ music and volume control; ○ olfactory options, such as oil burners; ○ temperature control; ○ windows and blinds to control daylight and air; ○ tactile options such as soft pillows for squeezing; ○ space for personalisation and privacy screens that can be opened or closed.
Role navigation	Role navigation – social interactions	• Readily available built-in physical supports such as: ○ grab bars or mantels, at varying heights; ○ soft wall spaces to rest heads against; ○ pull ropes; ○ birthing balls; ○ beanbags; ○ mats and squat stools.
	Role navigation – space, place & activity	Specific design recommendations for birth tubs are outside the scope of this article. However, from the supporters' perspective, the following is recommended: ○ railings to support women's access; ○ steps in and out at a predictable distance; ○ soft edges on which supporters may lean; ○ seats along the perimeter; and conveniently located cup holders. ○ Tub size should consider facilitating a supporter in the tub; yet remain suitable for access by the medical caregivers.
Supporting the supporter	Supporters' instrumental aid needs	• Comfortable places to rest or sleep, located within proximity to the woman. • Nourishing food and drink easily available. Easily accessible toilet facilities.
	Supporters' informational and emotional needs	Posters or brochures within sight, such as birth position options, physiological labor norms and tangible birth support activities.
These design recommendations are intended for conventional hospital birth units, however, they may also be applicable in alternative birth units.		

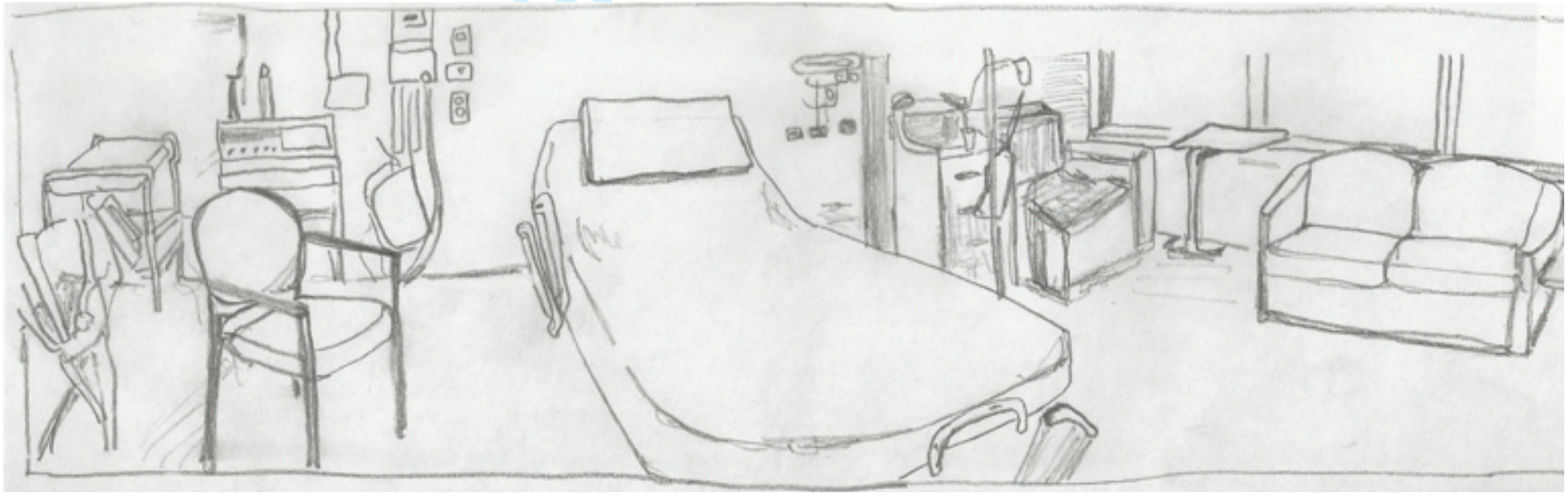

Image 1: sketch from video of birth room arrangement

Image 2: Window in door and mat on wall

Image 3: Sketch from video of supporter holding woman, who holds sink

Image 4: From the video supporter uses birthing ball to support herself

Image 1a: The main room after a night of labour

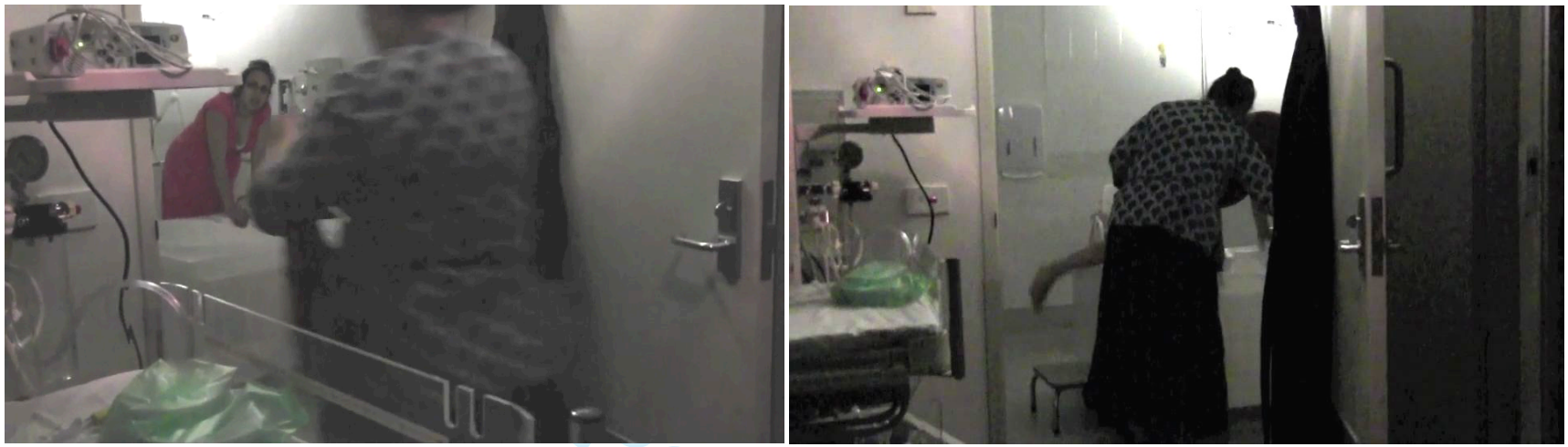

Image 2a: The ensuite bathroom

Image 3a: Tenuous nest-building behaviours

Image 4a: Familiar hominess with own pillow facilitates nest building

Image 5a: Supporter felt anxious she would bump the nearby equipment

Image 6a: Supporter slept on mat intended for woman

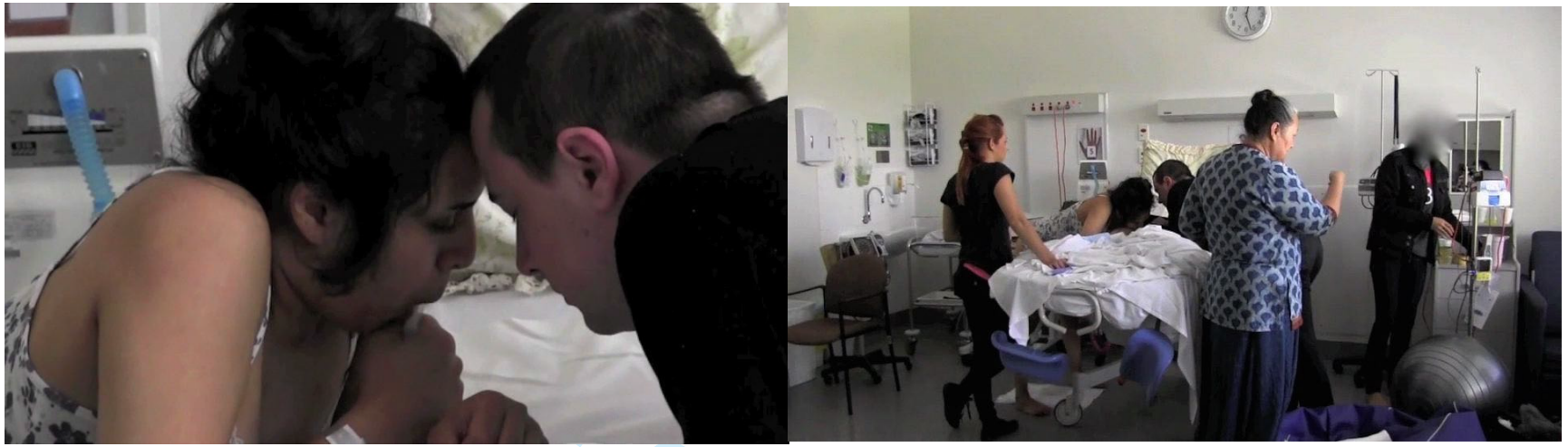

Image 7a: Adapting to changing needs and available space