Chapter 9: Salutogenic Design for Birth

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1.0 Introduction

This chapter focuses on one relatively small aspect of design thinking and practice that concerns the building of just one room, the space and place for birth. The argument we present is that much of current design thinking in this area falls far short of what is needed to support the ongoing health and wellbeing of the population this space is meant to serve; relatively young, healthy, pregnant women engaged in the salutogenic, physiologically normal activity of giving birth.

This designed space impacts on the way birth happens which has lifelong consequences for women, their babies and their families.[1] We also know that the design of the birth space has a powerful influence on the people who work there and influences their care-giving practices and interactions with women and their supporters.

We suggest that the design and construction of current birth environments is predicated on a belief that birth is a dangerous and risk filled undertaking; the woman's body is unreliable in its role of protecting the unborn child and safely delivering it into waiting hands. The resulting principles underpinning birth-space design are therefore oriented towards heightened surveillance of the woman and her baby and, ease of access to the woman's body to ensure immediate diagnosis of problems and transfer to an operating room to safely complete the birth process. The designed consequences are architectural structures and artifacts that communicate suspicion and fear.

More than a decade of research into the relationship between architecture and neuroscience has provided a wealth of information that can now be applied to establish salutogenic design principles that focus on the positive impact of design on human health. In this chapter we offer insights into how the body/mind of the woman giving birth is impacted upon by the birth environment. We suggest how a salutogenic design approach may result in radical new spaces that provide positive experiences for women, their babies and supporters and, their care providers.

1.1 Outline of the chapter content

The chapter begins by exploring the concepts of 'salutogenesis' and 'pathogenesis' in order to reveal the way society's view of childbirth has resulted in a particular set of familiar features in the architecture and design of birth units. A predominant pathological design inspiration is revealed in the description of common features that emerged following the historical 1930s move of birth from home to hospital; design features still in evidence today. Research describing correlations between place of birth and birth outcomes presents a plausible consequence of these pathogenically inspired design decisions. An understanding of the plausibility of such consequences is offered through exploring current knowledge of the neurophysiology of labor and birth and women's responses to stressful experiences. Subsequently, research investigating the impact of the birth environment on a woman's chosen birth companions and her care providers is presented in order to support the knowledge prevalent in other fields, that all bodies respond to cues in the environment which impact on their sense of wellbeing. The chapter concludes by offering a way forward for the salutogenic design of birth spaces that enable the laboring woman's neurophysiology to remain optimal and undisturbed.

Word restrictions have led us to include a select range of references. Please see the following sites where you will find further additional references and resources (http://www.uts.edu.au/sites/default/files/budset.pdf; www.worldhealthdesign.com).

2.0 Salutogenesis and Pathogenesis

Salutogenesis is a term describing an approach to health that focuses on factors that actively promote health and wellbeing, instead of the predominant approach to health, which focuses on pathogenesis; factors that cause disease, or are responses to illness/injury.[2] Salutogenesis proposes that optimal health for each individual is sustained through a dynamic ability to adapt to life's changing circumstances. This ability arises from the combination of three resources that make up a 'Sense of Coherence': 'manageability' which is the capacity to maintain homeostasis and physical function; 'comprehensibility' which is the capacity to understand and negotiate the contexts in which we find ourselves and, resources that enrich a sense of 'meaningfulness', constituted as the desires, causes and concerns that give us the need to resist illness and disease in the first place.[3] An inability to adapt to life's experiences can result from the ubiquitous challenges to these resources that exert a continuous disintegrative force allowing physical or mental illness to overcome a person.

A salutogenic approach to childbirth conceptualizes women's sense of coherence resources as; the capacity to grow a healthy baby and to give birth in a straightforward way utilizing the neurophysiological abilities inherent in the healthy, life-giving act of human reproduction (manageability); having an understanding of the narrative that women possess an innate and powerful ability to give birth, and can therefore anticipate experiencing a sense of trust, control and safety during the process (comprehensibility) and the affirming and enriching sense of purpose in producing a new member of the family, society and culture, to fulfill future dreams (meaningfulness).

Resources that enhance one's sense of coherence can be liberated through a salutogenic approach to architecture and design, thereby enabling a resistance to illness,[4] or in the case of the birthing woman, enabling a resistance to the need for pharmaceutical or operative procedures to safely complete the birth process.

However, the architecture and design of the majority of modern maternity settings are replete with examples of the ubiquitous challenges to one's sense of coherence. This chapter argues these challenges have arisen because of a pathogenic view of childbirth that evolved in the early 20th century when childbirth moved from home to hospital in what has been referred to as the largest uncontrolled and unevaluated experiment in the Western world.[5]

3.0 Evolution of current birth unit design

In most industrialised countries, women did not begin to move into institutional birth spaces until the 1930s. Until then, home was considered the safest place for birth and where women's family and friends provided support and midwives and doctors were invited to attend. Hospitals were places traditionally reserved for the sick and dying. The institutional spaces women encountered in hospital were initially shared spaces with birthing women in neighbouring beds. Women birthed without family support, in the care and control of professional strangers. With increasing use of interventions such as forceps for delivering the baby and chloroform for anaesthetizing the mother, birth was moved into operating-room-style single rooms, where it remained for decades. Calls for 'humanizing birth' were made in the 1960s seeking more homelike birth rooms and the inclusion of the woman's husband or supportive companions.[6] Some modifications were made with material decoration of the space and an invitation for supporters to attend, but fundamental design change to the birth room did not occur. The high narrow bed, similar to an operating room table, remained in the central position in the room and the large overhead light remained positioned above it. Other apparatus that might be needed to monitor the progress of the woman's labor or the wellbeing of her baby remained in the room, all of it in plain view.

The continued call for 'humanizing birth' saw the later evolution of birth centers, either attached to hospital labor wards, or as freestanding buildings. Birth centers were based on fulfilling the need for a more domestic aesthetic in the birth space as well as access to some of the pain relief options available in hospitals. Birth centers continue in many locations but access is usually strictly limited to an ever-decreasing number of women who are considered to be at 'low risk' of obstetric complications.

4.0 Impact of currently designed spaces on the woman: Place of birth matters

It is clear that place of birth matters. In a UK survey conducted by the National Childbirth Trust, nine out of ten women felt that the physical environment influenced how easy or difficult it was to give birth.[7] These views are supported by well-conducted studies of women's experiences and birth outcomes in differently designed locations for birth. A prospective cohort study of birth outcomes for 64,538 low-risk women conducted in England revealed there were fewer obstetric interventions with no impact on baby outcomes when women birthed in 'out-of-hospital settings' such as

midwife-led birth centres (freestanding or attached to a hospital), compared with obstetric hospital settings.[8] Studies have also been conducted in Canada[9] the Netherlands[10] and elsewhere with similar findings. Place of birth is associated with different outcomes with less intervention in out-of-hospital settings.

Many factors vary depending on the place of birth and any of these may have played a part in the findings of these studies. Characteristics include the architecture and aesthetics of the birth space as well as models of care and procedures available in the space. In out-of-hospital settings one or two midwives provide one-to-one care for each woman throughout her pregnancy and birth experience.[11] In most hospital settings, this model of care is rarely available with women receiving care from many different health professionals. A recent systematic review of 15 randomized controlled trials (RCTs) of the one-to-one model revealed that women received fewer interventions with no negative impact on baby outcomes.[12] However, in observational studies of one-to-one midwives' practices in many settings it is apparent that no matter the location for birth, these midwives alter the environment in an attempt to make it appear less medical, more homely and therefore potentially less stressful for the woman.[13] Therefore it may not be the model of care alone contributing to improved outcomes seen in RCTs. The architecture and aesthetics of the birth space are also critical elements to consider.

4.1 Surveillance rooms

The following illustrations comparing hospital and out-of-hospital settings reveal the design features and artifacts that may positively or negatively influence the user's experience. The hospital birth rooms in Figures 1a and 1b are typical, current examples of the enduring design established in the first half of the 20th century, described elsewhere as bed-centric, surveillance rooms.[14] The equipment located next to the bed indicates the need for continuous surveillance of the baby's heartbeat with a cardio-toco-graphic (CTG) machine in a prominent position. The infant resuscitaire located beside the CTG machine is a constant reminder that in this setting, birth is regarded as a situation of high risk for the baby who may need urgent resuscitative measures at birth. The bed itself is not the comfortable resting place one might find at home but a high, narrow, industrial model with stirrups to which the woman's legs may be strapped and poles for hanging intravenous lines. The bed is moveable and its shape can change to assist the woman to sit up or lay down, a feature that implies a passivity and inability to control her own movement that is rarely seen in laboring women who are un-medicated. The linen consists of white sheets and pillows without decoration or suggestion of comfort or coziness. Figure 1b reveals the prominence of the operating room light positioned over the bed to clearly illuminate whatever is happening to the person on the bed. Each object implies its use for something to be done to the woman's body during the process of labor or birth, or to her baby. The narrative is that birth here is a risky event but every risk can be managed with the array of equipment displayed, a narrative that some women find comforting, but most find fearful.

Figure 1a: New South Wales (Australia) Hospital Birth Room (personal photograph M. Foureur 2016).

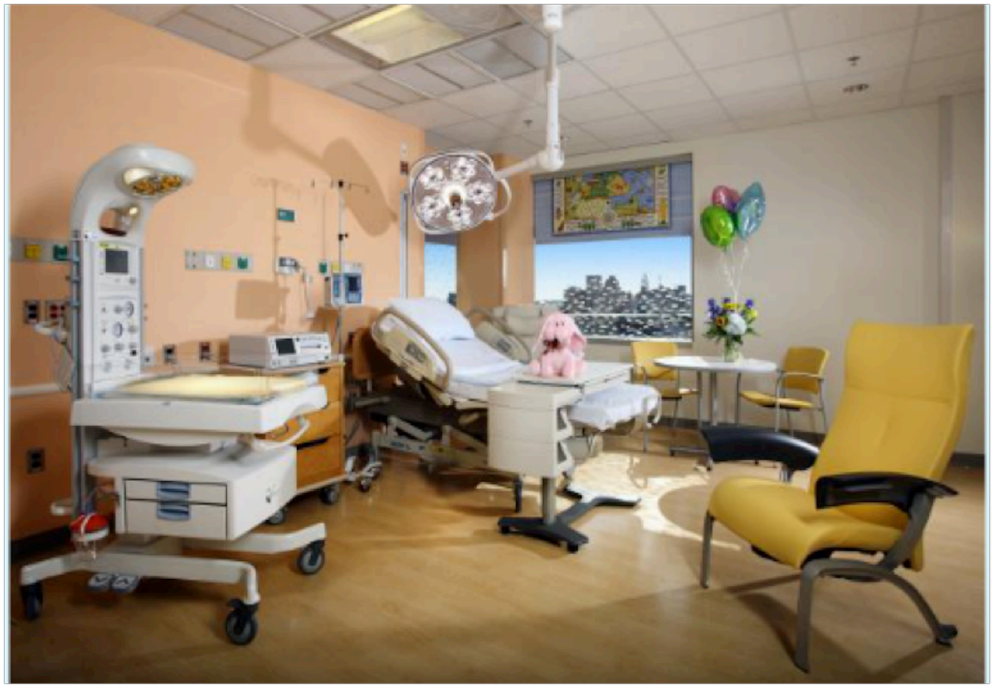

Figure 1b: The Hybrid Space: Hospital Birth Room (Johns Hopkins 2016).

4.2 Sanctuary

Figures 2a and 2b are of a typical modern birth center with an entirely different narrative. Here the prominent feature is a large birth pool/bath for water immersion during labor to aid relaxation and pain relief and potentially water-birth. The bath is deep and wide to ensure the woman's pelvis can be completely immersed if the baby is born under water. The wide bed is of a low domestic design and covered with

domestic bedding suggesting home-like rest and comfort. Infant resuscitation equipment is contained within the bank of timber cupboards and remains out of sight unless needed. There is no overhead operating room light. At night, the lighting is low and soft suggesting calmness and intimacy. This room design has been described as a sanctuary and meets women's expressed desire for private rooms that have a spa-like aesthetic that suggests they will be treated with respect and gentleness and their bodies will be touched with care.[15]

Figure 2a: Cossham Birth Centre, North Bristol, UK (Google Images, 2016).

Figure 2b: Cossham Birth Centre, North Bristol, UK (Google Images, 2016).

What impact these differently designed rooms and artifacts have on women's experience and behavior and subsequent birth outcomes is beginning to be explored.[16] One theoretical explanation is that differently designed spaces for birth and the artifacts found within may have a significant impact on the neurophysiology of laboring and birthing women.[17] In the next section we explore this idea further.

5.0 The neurophysiology of mammalian birth.

All mammals share many aspects of the neurophysiology of birth. One shared principle is the need for the birth environment to be experienced as safe-enough for labor and birth to unfold; spaces that are protected, private or hidden away from the eyes of others who may wish to harm the vulnerable mother (at least in the competitive animal world) or her even more vulnerable newborn.[18]

Research in this area has convincingly demonstrated the impact of disrupting this fundamental need for ensuring safe birth environments. Advances in neuroscience have established the role of the brain and "the way a person perceives and orientates themselves in unfamiliar places …[establishing how] the environment impacts on cognition, problem solving, pain tolerance and mood".[19, 20] A growing number of scientists have begun to examine what has been termed, the 'peripartal neurohormonal scenery of the brain' of the mother, her unborn infant and newborn and its role in maternal-infant attachment.[21] These studies reveal a complex interplay of emotion-based neurohormones that orchestrate the physiological process of human reproduction leading to mothering behaviors that ensure the survival of the infant.

Studies of the neuro-hormone oxytocin, which is the main driver of uterine contractions leading to birth (amongst many other complex functions), have revealed its production can be disrupted, slowed or stopped altogether by exposing the laboring female to experiences that are perceived as fearful.[22] This may be as overt as making loud noises or turning on bright lights or roughly handling the mother, or may be as subtle as the rising of the sun that heralds daylight and the possibility that the hidden birth space may be exposed.[23] While laboring women are considered to have more highly developed thought processes than other mammals, it is apparent from correlational research that similar processes can also disrupt the neuro-hormonal responses of human mammals during labor.[24]

The concept of the "Fear Cascade" describes neurohormonal responses women may have to birth spaces that may be overtly or covertly considered to be unsafe or fear inducing.[25, 26] Decades of research tell us that fear stimulates the brain to produce catecholamines which are brain based hormones that can alter our physiology and behavior. For example, when the catecholamine, adrenaline/epinephrine is secreted in response to experiencing fear, blood is diverted away from the trunk of the body and towards primitive parts of the brain and to the muscles of the arms and legs (to run away, or stand and fight, or to maintain stillness and appear immobile, as if dead) – this is the well known, fight, flight or freeze response.[27] During labor this reaction can cause labor to become irregular, slow down or stop altogether, as adrenaline has a particular inhibiting impact on the release of oxytocin. This is an adaptive response to cues of danger so that the mother can move to a safer place to give birth. Diverting blood to the extremities may also restrict blood supply to the placenta and thereby

disrupt the oxygenation of the baby, triggering acidosis in a vulnerable fetus. Once labor has begun, these physiological processes are reflected in the two main reasons for all intervention in childbirth; uterine inertia (the slowing or stopping of uterine contractions) and fetal distress.

The experience of 'fear' may not be a conscious response to overt cues, but may occur unconsciously when stimulated by more covert cues from the environment that the eyes may not directly see but that the brain perceives, through its many senses. For example subtle smells may trigger memories of unpleasant experiences; symbols may trigger negative thoughts or associations; different kinds of light stimulate a range of brain based bodily functions and behaviors; and surveillance activates the amygdala deep within the limbic system of the brain to translate emotions into actions.[28]

What is increasingly apparent is that the design of many current institutional birth spaces triggers both overt and covert fear responses in laboring women that disrupt the normal neuro-hormonal or brain based hormonal control of childbirth. As one woman said:

Adding to the normal stress and pain of labor, constant surveillance of the woman by professional care providers, watching and waiting for something to go wrong, in environments replete with artifacts designed to rescue, is perceived by many as fear inducing rather than comforting. In recognition of this stress hospitals encourage women to bring one or more supportive companions with them, but providing positive emotional support and encouragement in unfamiliar environments is a challenging task.

6.0 Women need and want cooperative, continuous supporters

The continuous presence of cooperative, encouraging supporters has been linked to many benefits for the mother and baby.[30] Supporters may be active or passive. The active supporter demonstrates support through eye-to-eye engagement and facial expressions that the woman can easily read and will unconsciously 'mirror'[31] or through physical comfort, touch, praise and encouragement. The passive supporter acts as an 'observer' with calm patience and by 'just being there', which is also valued by women.[32] Anxious, stressed or otherwise uncooperative supporters may create additional feelings of worry or judgment of the woman. Exploring how the built environment facilitates or inhibits the supporters' role provides additional insights into the experiences of women during childbirth.

6.1 Supporters experience an unbelonging paradox

A recent Australian, video-ethnographic study revealed the designed birth space as having a profound impact on the supporters' experience.[33] Supporters did not feel welcomed or supported in their role by the physical attributes of the space. Video and interview data identified that supporters also need to feel supported in what is an extremely stressful event and revealed their inability to easily negotiate their support role. They experienced what we have identified as an 'unbelonging paradox'; being needed and expected to be present, yet feeling uncertain of what do and feeling 'in the way' of the birthing woman and her professional carers. The mother of one birthing woman, who served the primary support role in the 'childbirth supporter study', stated:

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? - Florence.[34]

This supporter sought centred, calm focus to attend to her daughter's needs, but experienced equipment everywhere, which made her anxious. She felt as though she might back into it or bump it. The medical equipment was a close, constant presence in both her peripheral vision and her thoughts.

At a neurophysiological level, the supporter who has entered the foreign birth space is likely to feel anxious or even fearful of what is to come, emotions that will be translated into neurohormones that influence behavior. Fear triggers the amygdala that will flood the supporter's brain with adrenalin. This will prevent high level neocortical processing, meaning frightened supporters are less able to problem solve and come up with creative suggestions for how the woman might move or position herself differently in order to feel less discomfort or pain. A level of mental confusion may result that compounds the feeling of 'unbelonging' and not knowing what to do.

6.2 Providing support for the supporters

Other studies have also shown that childbirth supporters are in need of support themselves.[35] They can be supported by feeling welcome by the care providers, but also by elements of the built space such as intuitive design, comfortable/flexible seating and ample storage for the range of supplies women and their families bring to the birth space to make it more home-like (soft pillows, aromatherapy, comfortable clothing, music). They also can be supported by the presence of easily accessible facilities that address their bodily needs, specifically nourishing food and drink provisions and access to toilet facilities. However, the design of the birth space must also attend to supporters' emotional and physical needs (in human-factors terms, such as protecting their knees and backs), needs that are very similar to those of the woman's professional care providers.

7.0 Impact of currently designed spaces on the woman's professional care providers

Arguably, if the space works well for women and their supporters, it will also be an optimal working environment for the woman's professional care providers who are predominantly midwives and nurse/midwives. Existing research shows that midwives are affected by the spaces and places within which they work and importantly studies reveal that they change their practices depending on the environment.[36, 37]

A fundamental aspect of the midwives' role in birth is "the initiation and facilitation of trusting social relationships and the provision of emotionally sensitive care".[38] A key mediator of human social and emotional behavior is the neuropeptide oxytocin, which was explored earlier in this chapter. Research examining midwives' reactions to differently designed birth spaces reveal themes that reflect the same emotional and therefore neurophysiological responses to the spaces as experienced by women and their supporters. Midwives' primary goal is to support women to experience a straightforward birth but studies have revealed this is difficult to do in a biomedical birth space where the narrative is one of risk and where constant surveillance is the

goal supported in design characteristics.[39] With no support for their professional, psychological or social needs the birth environment is experienced as stressful for midwives, which generates negative feelings towards the space and their professional and emotional work with women.

In an interview study with 11 midwives working in two differently designed maternity hospitals in Australia, several themes emerged reflecting poor design with inflexible and impractical layouts that were at odds with the professional role of midwives.[40] Themes included 'finding a space amongst congestion and clutter; trying to work underwater; creating ambiance in a clinical space and being ill-equipped for flexible practice'.[41] Rooms quickly became crowded and cluttered with objects soon after the woman entered since there was inadequate storage for equipment and the woman's belongings. The typical prominent position of the bed in the centre of the room was a key component of this inflexibility as reported by one of the midwives:

Well there isn't anywhere to move it (the bed) out of the way because then you're blocking off some other thing you might need all of a sudden. Everything has got a spot and so if you move the bed over here you've blocked off the oxygen or you've blocked off the sink - it's not flexible. That's how it is and it is very difficult. - Annie.[42]

Surprisingly, there was also no space to accommodate the midwife in the room in which she worked:

There isn't anywhere for us (to sit) so its almost like you're not meant to (sit down). If you feel you need a break, I would go out to the nurses' station (central desk) because there's not really anywhere in the room that you can go off into a little corner. – Annie.[43]

The midwives frequently supported women who were laboring in either the shower or bath, since there are many documented benefits of water immersion during labor and birth. They found themselves literally 'trying to work underwater'. However supporting and monitoring women in poorly designed baths caused the midwives considerable discomfort:

Because of the height of the bath I can't sit down because I can't see. So I'm standing, leaning on my knees as a lever on the bath, leaning over, holding the torch with my left hand, holding the mirror with my right – it hurts. I've got a really sore back. - Lisa.[44]

Midwives reported feeling embarrassed by the inflexibility of the spaces and the poorly designed equipment with which they were forced to work. This resulted in making excuses to the women and their families and trying to cover up or minimise the clumsiness and inadequacies of the environment and its artifacts.

8.0 Towards salutogenic design for birth

Salutogenic design for birth requires much more than providing a restful 'ambiance' in the birth space or even simply adding nature views.[45] It requires a narrative that understands childbirth as a complex, neurophysiological process that is for the most

part, not under conscious control. Childbirth is also a social process embedded within a culture and the political and institutional priorities of its time. Both neurophysiological and social perspectives will influence the architect and designer, and the users of the spaces we create. Salutogenic design for birth requires a finely nuanced understanding that every created and curated space is invested with meaning and value and non-verbally proscribes how the space can be used. For straightforward birth to unfold, the environment needs to consider design issues for all users of the space, beginning with meeting the woman's needs for her neurophysiology to remain undisturbed, as paramount.

Salutogenic design elements may include: curved rather than straight lines and sharp angles in walls, ceilings, fixtures and equipment;[46] enveloping nooks as well as open spaces for active movement at different phases of labor;[47] options for water immersion including a deep bath/pool[48] and no direct line of sight to the spaces where the woman might locate herself so that her privacy is protected at all times.

We propose that the inclusion of more women-centric equipment and 'everyday' design features, as opposed to the current over-abundance of visible medical-surveillance equipment, will also benefit the movement towards normalizing birth, with salutogenically designed birth spaces. Examples of women-centric equipment that the woman may use include: leaning mantels or pull-ropes, plentiful 'yoga'-balls, padded mats for kneeling and beanbags. These are all easy software elements that can be included within the interior design of birth units and can support both the woman and her active supporter.

From a 'hardware' perspective, the design of the birth room should include a floor plan layout with a family alcove – a small space near a window or the entryway to the room, allowing for passive supporters to have access to privacy, while still being together.[48] Importantly, design features that facilitate both space-definition and personal control are an overarching recommendation for the improved design of birth units. Incorporating lighting, temperature, audio and privacy controls that are easy to use (such as adjustable lighting, explicit permission to adjust the climate and audio) will provide increased sense of personal control.

The list of design ideas is long and this chapter can only serve to bring to the architect and designer's attention that there is a need for well-informed Salutogenic design for birth. Further resources are available, some in development and others well validated[49] (see the Birth Unit Design Spatial Evaluation Tool – BUDSET, available from http://www.uts.edu.au/sites/default/files/budset.pdf). Research in this area is ongoing.

9.0 Conclusion

No space or place is neutrally constructed.[50, 51] Modern imaging technologies and knowledge of neuro-endocrinology have enabled us to gain valuable insight into how emotions are used by the limbic system of the brain to constantly monitor the environment to check for danger in order to keep us safe. This system is powerfully in evidence during human reproduction and this chapter has explored how the designed birth space can disrupt neurophysiological birth processes by stimulating the senses to perceive danger and threat. Salutogenic design for birth is not only aimed at reducing

anxiety but is primarily focused on negentropic or order-promoting forces that celebrate life-giving. Subsequently we have provided signposts for the architect and designer wishing to create a Salutogenic Design for birth. It is not hyperbole to suggest that the future of humanity depends on it.

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