

Methodological insights from using a mixed methods design in the study of a restorative postnatal hospital environment

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Abstract:

The patient-centred practice is an essential component in healthcare and the hospital environment play a vital role in its actualisation. Additionally, the interior space of a hospital can affect our perception of pain, restoration and wellbeing. Women, who use hospitals for birth, require sleep and rest crucial for their recovery and wellbeing. The uncondusive and unrestful situations in hospitals, especially within the postnatal hospital layouts impact on recovery experiences and wellbeing of the new mothers. The short hospital stays following the birth implies that women need an optimum environment that can facilitate the rest and recovery experience while in hospitals. Best and ideal restorative postnatal design features to facilitate the rest and recovery experience for postnatal women are unclear. This study utilised a mixed methods design as a likely effective way to understand the intricacies of short hospital stay, interactions of design layout and women's wellbeing postnatally. This methodological paper aims to provide insights that may be beneficial to researchers combining questionnaire surveys and focus groups as techniques in the study of an ideal hospital environment for optimum postnatal care.

The paper discusses the process for engaging the participants (postnatal women and midwives), their backgrounds and experiences of the postnatal space, especially in large, tertiary hospitals, and how their rich, multiple perspectives contribute to an understanding of a restorative postnatal hospital environment. Best practices regarding design features that could be beneficial to care givers for effective and quality postnatal care for women prior to going home are presented.

Key words: Design features, focus groups, hospital environment, restoration, wellbeing

1. Introduction

Prior to the 2000s, many hospitals were built to satisfy the functional efficiency of medical services and costs but which were at variance with the psychological needs of patients (Ulrich, 1992). In recent times, there has been a paradigm shift in healthcare from a biomedical focus on illness to wellness. This shift has been influenced by such concerns as providing quality care, personal control over the environment and process, resulting in a need for patient-centredness in healthcare systems (IOM, 2001). One of the highpoints for implementing patient-centered practice is the work environment of health institutions considered to be an influencing factor in the healing process of patients (Karnik, Printz, & Finkel, 2014; Ansmann, et al., 2014; Ulrich, Berry, Quan, & Parish, 2010) including mothers' postnatal experiences and recovery in hospitals.

The puerperium is a crucial period when new mothers require adequate rest for recovery and emo-

tional wellbeing. The quantity and quality of healthcare spaces may affect the delivery of healthcare; assisting a woman's birthing process and hindering the roles of the birth supporters during the postnatal phase (Stark, Remyse, & Zwelling, 2016; Harte, Sheehan, Stewart, & Foureur, 2016). According to Martell (2003), women's postnatal experiences and recovery are affected by the physical conditions of the unit environment, which includes equipment, beds, location, sounds, and postnatal unit layout.

A novel research in the field of evidence-based design (EBD) has established that well-designed healthcare spaces and environment contributed to improved recovery rates for patients and reduced hospital stays (Ulrich, 1984). Consequently, hospital layouts, including how care and facilities are organised, could impact on patients' recovery, assist healthcare providers to perform their duties effectively, reduce stress and enhance job satisfaction

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for the nursing staff (Ulrich, & Barach, 2006; Applebaum, Fowler, Fiedler, Osinubi, & Robson, 2010).

Past research into childbirth environments has concentrated on how the physical environments support women in labour and birth, but investigations about how postnatal facilities support new mothers for optimum postnatal care and wellbeing have been very limited. Several factors could impact on recovery and wellbeing including medical conditions of women, types of births - caesarean-section (CS) or normal births; hospital environment; noise, lighting, types of rooms and length of postnatal hospital stays. The short postnatal hospital stay including the busy and noisy situations in hospitals poses a methodological challenge regarding how to reach postnatal mothers with healthcare design and environment that support them in recovery, especially at critical times when they require adequate sleep and rest for nurturing their newborns. Research evidence indicates that noise detrimentally affects recovery in healthcare facilities (Loupa, 2020). A useful overview of the postnatal length of hospital stay (LOS) for uncomplicated births has been presented (Lawal, 2020).

Methodologically, healthcare research in the nursing, mental health, childbirth environment and EBD fields often utilises both quantitative and qualitative approaches for data collection. In the childbirth environment, events such as the labour and birth enabled researchers to study and gain an understanding of the design factors in the birth settings (Newburn & Singh, 2003; Foureur, et al., 2010; Jenkinson, Josey, & Kruske, 2014) due to the labour taking longer hours than in past decades (Aburas, Pati, Casanova, and Adams 2017). As a result, caregivers have the unique opportunity to ask birthing women to complete a short questionnaire, which may be followed with in-depth interviews about their birth experiences (Karlström, Nystedt, & Hildingsson 2015). However, such arrangement is hardly feasible and convenient for both women and caregivers in the postnatal environment, thus needing a suitable approach to address the challenge of access to the postnatal women.

Decades of an interdisciplinary research among healthcare practitioners, midwifery professionals and researchers including architects in the United Kingdom, Australia, Italy and New Zealand has been conducted on the connection between women's birth

environments and birth outcomes and their satisfaction (Newburn & Singh 2003; Lepori, 1994; Lepori et al., 2008). The Birth Unit Design Spatial Evaluation Tool (BUDSET), (Foureur, Leap, et al., 2010; Foureur et al., 2011; Forbes, Foureur, Leap, & Homer, 2008), which was developed in Australia, had four domains to measure specifically labour and birth outcomes. While the BUDSET was verified to be valid for evaluating birthing environments, recent research suggests it may not be appropriate for diverse groups and cultures (Menke, Jenkinson, Foureur, & Kildea, 2019). Some group of midwives' researchers intuitively used what they termed as the evidence-based design thinking (EBDT) approach that recognises EBDT's awareness of design and perspectives of space for childbearing women and their families (Folmer, Jangaard, & Buhl, 2019). Both the EBDT and BUDSET research did not focus on the postnatal environment, meaning that design factors influencing recovery experiences of women may have been receiving least attention in the research. Correspondingly, there is an even greater lack of evidence about how hospital environments support women's postnatal needs and wellbeing.

The postnatal hospital environment could play an important role in improving the postnatal phase for new mothers if healthcare facilities were "designed" and organised to support a woman's recovery process and wellbeing prior to going home. In order to address this knowledge gap, this study investigated the ideal restorative features and settings for optimum quality postnatal care and recovery that could foster a sense of wellbeing for new mothers. This methodological study adopted a mixed methods design and addressed two questions: what are the perceptions of design factors influencing women's recovery experience and wellbeing during postnatal hospital stays and what were the ways in which the design factors and the postnatal spaces affected women's recovery experiences and wellbeing during hospital stays? An online survey questionnaire complemented with qualitative focus group discussions were taken to the research. This study reported insights about physical environments that could enhance optimum postnatal recovery, potentially leading to improved care and women's wellbeing experiences in hospitals.

2. Methodology

The methodological study into hospital restorative spaces for postnatal recovery experiences of women, represented the processes used for engaging women during the postnatal phase. It provides an opportunity to understand what women and their caregivers think about the hospital environment as a place for postnatal caregiving, including whether there could be architectural features that may be important to facilitate recovery and wellbeing experiences of women as well as efficient care provision.

2.1 The approach - Mixed methods design

A mixed methods design allows for both explanatory and interpretative research to be conducted in one single study, with many benefits particularly given the multi-dimensional factors that

influence health Morgan (1998). The study used an explanatory sequential mixed methods design comprising a two-phase design. Phase one study focused on the quantitative strand to generate information about the perceptions of design factors influencing women's recovery experience and wellbeing during postnatal hospital stays, while the phase two study focused on the qualitative aspect utilising focus groups in interactions on how the postnatal spaces/features affected women's recovery experiences and wellbeing. A two-phase explanatory sequential mixed methods design was best suited in this study especially when the results of the phase one survey were not so clear cut thus making explanation difficult (Polit & Beck, 2017). Some authors in the childbirth environment field have also found mixed methods approaches useful to evaluate birthing environments (Grigg, Tracy, Schmied, Daellenbach, & Kensington, 2015). Figure 1 illustrates the two-phase explanatory sequential mixed methods design.

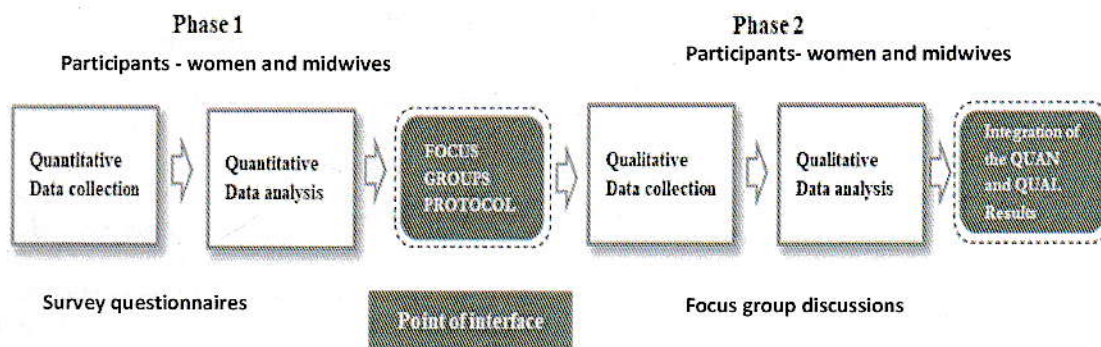


Figure 1: Mixed methods sequential explanatory design procedures adapted from Ivankova & Stick (2007) and Lawal, 2020.

2.2 Study sample and design

2.2.1 Survey questionnaires on design factors for postnatal recovery

An on-line questionnaire survey was used to investigate the design factors in the postnatal environment. The survey questionnaires had four categories including perceptions of postnatal room design features, interior environment, sensory environment and social comfort features. The link for the online survey questionnaire was sent to the postnatal women who gave birth in different hospitals in New Zealand between July 2016 and November 2017 retrospectively to the time of this

study through Women's Health Services. 229 postnatal women accessed and filled in the survey questionnaire.

The second category of participants comprised midwives who work in the hospitals. A different link to the survey questionnaire was sent through the WHS, with 58 midwives completing the survey questionnaire. Both groups' survey questionnaires were similar with the exception of a few aspects of particular relevance to each group. Ethical approval for the study was obtained from the Human Ethics Committee of Victoria University of Wellington including consents from the focus group participants. Table 1 shows the demographic information for the survey

participants. More than one-third (35%) of the participants' births occurred within the past 1-6

months. 88.2 percent ($n = 187$) of participants were first time mothers.

Table 1: Survey Demographic characteristic

Women (n=212)	Frequency, n	Percentage, %
Age		
<20	0	-
20-24	7	3.3
25-29	37	17.5
30-34	80	37.7
35-39	73	34.4
40+	13	6.1
Most recent birth		
Less than 1 month	8	3.8
1-3 months ago	31	14.6
4-6 months	37	17.5
7 months – 1 year	57	26.9
>1year	78	36.8
Parity level		
Once	187	88.2
Twice	17	8
Three times	5	2.4
Four and above	1	0.5
Level of education		
Secondary school	16	7.5
University	106	50
Postgraduate	77	36.3
Technical/Vocational degree	9	4.2
Other	4	1.9
Place of birth		
Hospital	207	97.6
Home	5	2.4

2.2.2 Focus groups' recruitment and data collection

Focus groups are one of the popular methods used to generate knowledge to strengthen the results of quantitative surveys in which statistical associations require clarification and elaboration (Powell & Single, 1996). In order to provide more exploration of the findings on design factors survey responses, focus groups were used. A semi-structured questionnaire protocol was devised to guide the interactions. The focus group participants were already familiar with the study and were willing to volunteer additional information.

A total of sixty participants (41 women and 19 midwives) signed up to continue with the research about postnatal recovery and wellbeing in the phase two study. However, only 14 participants were available for the focus group discussions because

many of them were unable to fit into the booked times that did not suit everyone's needs and conveniences. Although a common practice would be six to ten focus group members, Morgan strongly argued using smaller groups which should produce better and more structured outcomes than with many participants but less structured discussions (Morgan, 1996).

Table 2 indicates that each focus group was composed of three to four members: an all women group ($n = 3$) represented in the first and last focus groups; and an all-midwives group ($n = 4$) in the second focus group, and the remainder was a blend of women and a midwife. The focus group interviews were audio-recorded and transcribed verbatim. The mixed methods approach allows for the integration of both findings, the survey data and the focus groups, by drawing inferences from both qualitative and quantitative approaches (Teddlie and Tashakkori 2006).

The first focus groups discussion commenced by the middle of 2018. Three large sites, comprising one designated space for the Women's Health Services of a Public hospital and two other units in a

public university were used for the focus groups discussions. The duration of focus groups discussion ranged from 80 minutes to 95 minutes.

Table 2: Distribution of the focus group participants by attendance

	Group 1	Group 2	Group 3	Group 4	Total (by status)
Women	3	0	3	3	9
Midwives	0	4	1	0	5
Total (by group)	3	4	4	3	14

Each focus group discussion began with questions: "what is your general feeling about the postnatal hospital environment when you were there"? and "tell me about your positive experiences you have had with the postnatal hospital environment where you were attended or worked"? These initial sets of questions were asked of participants to set the mood for the discussions.

2.3 Data Analysis

Quantitative data were analysed using statistical analysis SPSS version 24 utilising Independent samples T-tests to compare the means responses of postnatal women and midwives, whereas qualitative data from the focus groups were examined using constant comparative (Strauss, 1987). Each item of focus group data was analysed, one at a time, taking the deductive approach to interpret and deduce "what is going on" in the data (Strauss & Corbin, 1998) and inductively by the empirical data in the focus groups to facilitate structure for the analysis (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008). Direct quotations from the transcripts have been selected below to illustrate how the informants (women in particular) felt in the postnatal environment and how their feelings translated to the environmental indicators of restoration and wellbeing. Ultimately the feelings, perceptions and

behaviours suggest implications for the design of postnatal hospital environments, especially in large, tertiary hospitals.

3. Results and Discussion

3.1 Survey questionnaires

3.1.1 Independent samples T-test analyses

Independent samples *t* - tests analyses were conducted on the survey data to compare the results of the women and midwives based on the survey questionnaire. Analyses covered postnatal room design features, interior environment, sensory environment and social comfort features. Differences among the mean scores were tested by independent samples *t*- tests for each feature. All four analyses conducted for the postnatal room design features indicated significant differences in the mean scores between women and midwives: A single room for recovery, $F(260) = 135.20$, $p < 0.001$; access to the outdoors, $F(260) = 19.9$, $p < 0.002$; room colours, $F(260) = 1.34$, $p = 0.012$; and room quietness, $F(260) = 3.38$, $p = 0.07$. Table 3 shows the preference ratings by participants for each of the features.

Table 3: Participants Ratings (Independent Samples *t*-tests) of Postnatal Room Design Features

Characteristics	Women (n=212)		Midwives (n=50)		T-value	p-value (Two-tailed)
	M	SD	M	SD		
Quietness in rooms	4.75	.613	4.60	.606	1.61	0.07
Natural daylight	4.47	.611	4.52	.580	-0.56	0.58

Views to nature	3.94	.733	4.04	.605	-0.865	0.39
Having a single room	4.88	.365	4.20	.969	4.90	0.001
Room access to the outdoors	3.74	1.13	4.14	.700	-3.213	0.002
Room colours	3.16	.722	3.44	.705	-2.518	0.012

By contrast, two features comprising views to nature and natural daylight show no significant effect. Views to nature, $F(260) = 2.87, p = 0.39$. The difference on the perception of views to nature represents a very small effect size, (Cohen's $d = 0.15$). While for natural daylight, $F(260) = 0.30, p = 0.58$. Rooms with natural daylight received higher ratings from both the women ($M = 4.47, SD = 0.61$) and midwives ($M = 4.52, SD = 0.58$). The difference on perception of natural daylight represents a very small effect size, (Cohen $d = .08$). This means that the respondents appreciate the value of natural daylight in the postnatal rooms and correspondingly may contribute to the wellbeing of women during recovery. It is also important for staff in creating a more conducive work environment.

For the ratings of interior features, analyses show significant differences including the following: Door closed for privacy, $F(260) = 2.18, p = 0.002$; decorations in the room, $F(260) = 0.95, p = <0.001$; bright colours, $F(260) = 0.66, p = <0.001$; and clinical-looking postnatal space, F

(260) = 5.18, $p = 0.001$. Others are room cleanliness, equal variances are not assumed based on the result of Levene's test of equality, therefore the Welch t' test portion of result was used. ($F(260) = 5.94, p = 0.09$). Another factor that showed no significant difference was room restfulness, $F(260) = 10.66, p < 0.001$. There was no significant difference in the mean scores for women ($M = 4.89, SD = 0.37$) and midwives ($M = 4.78, SD = 0.51; t(61.70) = 1.47, p = 0.08$, two-tailed). Conversely, one analysis showed no significant difference among the mean scores for furniture made of natural materials, $F(260) = 0.18, p = 0.67$ difference in the mean scores for women ($M = 2.90, SD = 1.06$) and midwives ($M = 2.76, SD = 0.96; t(260) = 0.83, p = 0.41$). Average responses suggest that postnatal women and midwives seem not to support the use of natural materials for furniture in interior postnatal spaces, with midwives rating it lower than women. Table 4 gives the arithmetic means and standard deviations and p-values based on the ratings for each of the interior environment features.

Table 4: Participants Ratings (Independent Samples t-tests) of interior environment features

Characteristics	Women (n=212)		Midwives (n=50)		T-value	p-value (Two-tailed)
	M	SD	M	SD		
Cleanliness of room	4.93	.267	4.98	.141	-1.70	0.09
A restful room	4.89	.368	4.78	.507	1.78	0.08
Furniture made of natural materials	2.90	1.06	2.76	.960	0.83	0.41
Closing of Door/privacy	4.43	.837	4.00	.948	3.18	0.002
Decoration in a room (natural art and images)	2.96	1.05	3.56	1.07	-3.61	0.001
Clinical room	2.34	1.17	1.84	.866	3.44	0.001
Bright colours	2.19	.914	2.86	1.03	-4.56	0.001

Furthermore, Independent samples t -tests were conducted to compare sensory environment features mean scores for women and midwives. Five analyses in particular, showed a consistent pattern in terms of their means scores and significant levels. These are: adequate daylighting, $F(260) = 23.8, p <$

0.001, difference in the mean scores for women ($M = 4.42, SD = 0.73$) and midwives ($M = 4.78, SD = 0.47$). Temperature control, $F(260) = 11.7, p < 0.001$, difference in the mean scores for women ($M = 4.25, SD = 0.87$) and midwives ($M = 4.66, SD = 0.52$). Noise control, $F(260) = 13.6, p < 0.001$. Mean scores for women ($M = 4.06, SD = 0.99$) and

midwives ($M = 4.68$, $SD = 0.47$, $t(163.34) = -6.54$, $p < 0.001$, two-tailed). Adjusting lighting and operable windows, $F(260) = 12.8$, $p < 0.001$. Mean scores for women ($M = 4.03$, $SD = 1.00$) and midwives ($M = 4.76$, $SD = 0.56$). For Natural things in the room, $F(260) = 1.58$, $p = 0.21$. Initial analysis shows there was a small difference in the mean scores for women ($M = 2.53$, $SD = 1.04$) and midwives ($M = 2.88$, $SD = 1.00$, $t(260) = -2.13$, $p = 0.03$, two-tailed). However, further analysis revealed there was a significant difference regarding the magnitude of the difference in means (mean difference = -0.35 , 95% CI: -0.67 , -0.03). The difference in natural things in the room represents a small-to-medium effect size (Cohen's $d = 0.3$).

Similarly, for room quietness, Difference in the mean scores for women ($M = 4.75$, $SD = 0.62$) and midwives ($M = 4.86$, $SD = 0.35$; $t(130.51) = -1.76$, $p = 0.08$, two-tailed). As can be seen, room quietness received higher mean score by midwives compared to women (4.86 vs. 4.75). The result shows that midwives are more likely interested in the tranquility of postnatal spaces than women, suggesting that the auditory and sensory contents of the space may affect the quality of the patient experience, in particular a woman's postnatal experience in a healthcare facility (Watts, Khan, & Pheasant, 2016). An overview of the results on sensory environment features is provided in Table 5.

Table 5: Participants Ratings (Independent Samples t-tests) of sensory environment features

Characteristics	Women (n=212)		Midwives (n=50)		T -value	p -value (Two-tailed)
	M	SD	M	SD		
Clean environment	4.92	.326	4.90	.364	0.29	0.77
A quiet room	4.75	.617	4.86	.351	-1.76	0.08
Air quality/Room freshness	4.74	.509	4.70	.580	0.49	0.62
Adequate daylighting	4.42	.734	4.78	.465	-4.29	0.001
Temperature	4.25	.865	4.66	.519	-4.34	0.001
Noise control	4.06	.991	4.68	.471	-6.54	0.001
Adjusting lighting & operable windows	4.03	1.01	4.76	.555	-6.94	0.001
Natural objects in the room	2.53	1.04	2.88	1.00	-2.13	0.034

Among the two analyses in which there were no significant differences, for hygienic and clean environment, $F(260) = 0.33$, $p = 0.57$. No difference was found in the mean scores for women ($M = 4.92$, $SD = 0.33$) and midwives ($M = 4.90$, $SD = 0.36$; $t(260) = 0.29$, $p = 0.77$, two-tailed). As expected, mean scores were generally higher for hygiene and clean environment for both the postnatal women and midwives (mean score of 4.92 vs 4.90) respectively. This is an interesting result that echoes a similar study (Mourshed & Zhao, 2012) suggesting the importance of hygiene in healthcare settings. Regarding air quality and room freshness, $F(260) = 1.18$, $p = 0.28$, difference in the mean scores for women ($M = 4.74$, $SD = 0.51$) and midwives ($M = 4.70$, $SD = 0.58$; $t(260) = 0.49$, $p = 0.62$, two-tailed). The higher mean scores recorded for air quality and room freshness for both women and midwives (4.74

vs 4.70) suggest the importance of ambience; smells and pleasantness of the postnatal environments.

3.2 Focus groups discussions

As noted previously, the focus groups informants were postnatal women and midwives who have participated in the Phase one online surveys. The midwives are between the age of 25 and 65 years. The majority of the midwives (76%) had more than 15 years of experience and had worked in postnatal hospital facilities. The postnatal women are between the age of 25 and 40 and three of them have postgraduate qualifications and two have Bachelors degree.

Analysis of the focus groups yielded three main themes: recovery experiences in spatial units, elusive restfulness and mutual role integration. The sub-themes included "single bedrooms for emotional support", "privacy and valuing dignity",

and “mixed sensory stimulation”. For elusive restfulness comprised “adapting to familiar noise” and “modifying and sensing the place”. While mutual role integration had sub-themes including ‘it feels like a hospital’, “humanising the space” and “space inhibition for family experience”.

3.2.1 Recovery experiences in spatial units

This reflected the types of room occupancy as experienced by women and how they impacted on recovery experiences and wellbeing. Women informants described the postnatal period as a very vulnerable and private time, which involved emotional, physical and psychological occurrences that needed a quiet time and a comfortable environment to be with partners and family members.

Discussing the issue of recovery experience in the postnatal units, regarding a single bedroom for emotional support, the majority of women participants expressed powerful emotions and feelings as they recounted a variety of experiences in single and double-bed occupancy rooms.

Postnatal woman: “It was a very vulnerable time for me. It was a very vulnerable time for all three of us: me, my partner, and my baby. Also it’s a very private time...If we have our own space, where we could [start] bonding together as a three; me, my partner and my baby that was so important”.

Postnatal woman: “As a new parent, imagine sharing a room with another parent, maybe when you just finally get your baby to sleep and you want to [have] some sleep and the next baby starts to cry, all of you are now awake. So you just don’t get any sleep at all...I had to tell them – can I get a private room. That experience is something I wouldn’t recommend. If possible they should scrap that [double-rooms]”.

Some participants were anxious about birth pain, which, according to them, could interfere with

the ease to use toilets in a shared room. They explained that birth pain was normal irrespective of modes of birth of a woman. One participant noted:

Postnatal woman: “No matter the process, how even the birth was, there is a process, you’ll still feel the pain of birth. No matter what, it might not be as intense as some other women but you still feel the pain especially the first 3 days it’s very crucial”.

However, some participants identified a few benefits with shared rooms regardless of their perceived inadequacies with noise and visitors. This also included sharing of toilets if the occupants were not more than two in a double room.

Midwife: “...There are some advantages to having 4 in a room. I am fairly new midwife. And the one four bedder room is my day’s job. And it was quite communal. To know each other and often on occasion they would chat. They share something the others do hear and so there are some advantages to that. It’s probably more advantageous to the single room. Of course there could be visitors there, noise and the other things”.

Postnatal woman: “Having just two people sharing one bathroom was good. The shower – it was an open shower – so you’re just open to the thing. So it was good.

Mixed sensory stimulation refers to the extent to which access to daylight can be achieved within the postnatal hospital’s layout. Women used expressions “to see the sky,” and “to see the outside” to describe experiences of limited, or lack of, views to the outside and lack of natural lighting in the spaces. A feeling expressed was that shared or multi-

bed rooms deprived women of daylighting which could have negative behavioural consequences.

Postnatal woman: "Even if to look out of window...But if we were

spending a couple of days in that spot, which either you're totally curtained

in or you're absolutely public. To get any sense of daylight,

you have to be absolutely public. That would drive you crazy if you

are going to spend more than half a day".

3.2.2 Elusive restfulness

The conceptualisation of elusive restfulness represents the extent to which the busy postnatal hospital environment impacted on rest and sleep for women and their wellbeing. This category had two subcategories, namely: adapting or being sensitive to familiar noise and modifying/sensing the place, which is divided into material and technology, and behavioural as likely intervention approaches.

Adapting or being sensitive to familiar noise was largely due to persistent noise from other persons in the rooms - both other women and babies - who made noise while sleeping. This situation contributed to anxiety and fear for other women who stayed awake. Some participants used the language that their body became "wired" against sleep partly because of hormonal changes in the body or they had the mentality of a hospital being a busy place and they would not expect it to be restful.

Postnatal woman: " And also they make a lot of noise when they're sleeping.

You are like so attuned to this little noise maker in your room. You're like

Oh are they okay, are they okay? You can be tired but your body can be

kind of wired".

Furthermore, modifying/sensing the place was blamed on the defective acoustic design of the postnatal environment which made it feel unrelaxing

and uncomfortable. Most women said they found it difficult to have peaceful conversations with their partners and to rest, especially in shared rooms, without other women overhearing their conversations. The walls and doors were considered to be the weak points allowing distracting external noise into the postnatal environment.

Interventions to promote a peaceful and comfortable environment including appropriate materials to reduce negative noise impact were explicitly mentioned especially for shared rooms. Most of the participants agreed that sound proofed walls, acoustic doors, and solid materials for partitions (for curtain units) had potentials to reduce negative impact of noise.

Postnatal woman: "Different to other walls where you need acoustics and

you have the normal doors. And you have normal walls. The noise is so

much high, really you need soundproof walls. And you need soundproof doors".

A participant spoke about using visual technique of assessing rooms as opposed to using bells to indicate to medical staff and significant others whenever women are resting or sleeping. The nursing station could monitor rooms through light sensors on the doors to detect whether a woman is sleeping or not. This could allow women increased opportunity for rest.

Midwife: "In my head, I was imagining there is a little button that you can

push the light outside the room, so let see if this person is sleeping. Just a sign

you can put on the wall because they do, every woman if they are going to do

that, and is not all that common. I think, not difficult and useful".

3.2.3 Mutual role integration

Mutual role integration demonstrates the value of supportive environments for women's wellness situations. However, there were concerns about the hospital being a biomedical setting that may hinder

the recovery process of new mothers. Although it offered the assurance of back up medical support for the safety of new mothers' and newborns' health, it also undermined their attainment of wellbeing. Caregivers in this study agreed that hospital settings can impact on the wellbeing of women.

Midwife: "It lends themselves to patients. Like behaving like a patient, I think.

In your room, there might be/would be an armchair usually for most of the spaces

and bed. But the bed is at the centre of the room and that is where and so it lends

itself to women behaving as if they are sick. As if they need to be in bed.

Where else do you go, you can't sit in your armchair, or you can't lie in your bed".

Midwife: "If you are home, you're on the couch. You're not in your bed all the time. You would have some naps, of course. But you will be a lot more likely to be behaving like well person. My personal bias is that I can't ask well women who are having complications with pregnancies and labours shouldn't be in hospital".

4. Design Best Practices for Postnatal Environments

4.1 Women's inpatient/spatial units

Single-bed room, private space to allow parents-infants bonding

Consider providing all single-bed units in the postnatal ward to support postnatal recovery experiences of the new mothers, infants and family. The provision of a single room during the sensitive period post-birth allows the family to bond in

privacy while fostering woman-infant-parent bonding.

- Single rooms are superior to multi-bed/open-bay rooms as enhancers for women's recovery experiences and wellbeing, largely for their role in the emotional, sensitive and vulnerable time as new mothers adjust to the reality of parenthood.
- Where it is impossible to have all single-bed rooms, consider a 2-person bedroom (with ensuite bathroom) but not open wards or multi-bed rooms with several beds.
- Make the door self-closing in the postnatal wards/room for privacy and fitted with soundproofing.
- Create a short, private dedicated corridor before arriving/entering a woman's room. However, this should not eliminate the normal courtesy requirement to "knock" before entering a postnatal room.

4.2 Interior ambience (restorative)

Attention to the space in terms of how relaxing and comfortable for sleep and rest it is, including its overall pleasantness. The following design principles are proposed.

Quiet, private and restorative space

- Acoustically insulated wall partitions rather than flexible or curtain partitions and sound-proofed doors are recommended for room separation to reduce noise levels and facilitate adequate sleep and restoration.
- Provide access to natural light to reach the bedside of the woman.
- Women's sense of wellbeing and recovery are linked to visual quality of the room (i.e. material finishes and furnishings, soothing colours), access to the outdoors and proximity to windows; these preferences hold the promise for enhancing visual stimulation, moods, relaxation and lower stress levels.

- Provide postnatal women with views outdoors through windows in the rooms for sensory stimulation, to provide a positive psychological effect and emotional wellbeing.
- Where possible, introduce images of nature and art for stress-reducing effect and relaxation, replenishing women emotionally while lying in bed as an indirect access to nature as a means of positive distraction.

Aesthetically pleasing interior space utilising appropriate colours makes a difference to maternal recovery experience and wellbeing.

Some aspects of colours have a positive impact on people's mood and relaxation. Consider applying warm and soothing colours that support recovery in the interiors of postnatal environments. The

provision of green colour symbolises healing, recovery and love (Biley, 1996) from which postnatal women could find harmony in the space.

4.3 Support social and family-centred spaces

Fostering togetherness of families and relations with other mothers can be achieved in two ways: 1) interior space; and 2) external/outdoor areas. The first aspect uses a single room concept, which has already been discussed above. The second involves creating an accessible outdoor space that the new mothers and families and possibly staff could go into and socialise. Outdoor space with a garden allows women to meditate, relax and possibly recall insightful moments while suspending other thoughts about catering for babies.

Table 6: Indications of architectural representations for a restorative postnatal hospital environment

	Women's inpatient units	Interior ambience (restorative)	Social support and family-centred spaces
Design feature	Single-bedroom, Private space, A short lobby, Sound-proof	Quiet, restorative space, Access to natural light (to reach the bedside), Visual quality of room (material & texture), Soothing colours, Outdoor views through window, Nature and Art in the room and as a positive distraction, Pleasing interior space (appropriate colours)	Interior and Exterior spaces. Single room concept; accessible outdoor spaces

<p>Examples, photos sourced directly from the Internet, 2023</p>			
<p>Caption/label</p>	<p>Physical elements of postnatal unit environment</p>	<p>A rich array of interior features/ambience for recovery experience</p>	<p>Interior and nature-filled outdoor areas</p>
<p>Characteristics</p>	<p>Types of room occupancy and situations, restoring physical and emotional wellness</p>	<p>The extent of fascination and pleasantness of spaces, comfortable for sleep and recovery experience</p>	<p>Compatibility between a biomedical and humanised settings, permitting personal responsibility for resuming daily living tasks.</p>

Overall, the findings for an ideal restorative postnatal hospital environment are conceptualised into architectural representations as shown in Table 6.

5. Conclusions

The use of mixed methods design in the study of postnatal hospital environments enabled opportunities for addressing the challenge of short postnatal hospital stay. A mixed methods design utilising both quantitative and qualitative techniques offered the opportunity to identify environmental

features that support women through labour and the postnatal phase, enabling the caregivers and users of the postnatal hospital facilities to contribute rich, diverse feelings about how the physical setting supported them in providing quality care, recovery and wellbeing goals of new mothers. Overall, the findings provide new empirical evidence for both the healthcare design and midwifery community regarding spaces and features that facilitate restoration and wellbeing experiences of women, especially during postnatal hospitalisation. The findings would also be beneficial in supporting the physical, emotional, and psychological wellbeing of women prior to going home.

6. References

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