Building and Environment 164 (2019) 106323

Contents lists available at ScienceDirect

Building and Environment

journal homepage: www.elsevier.com/locate/buildenv

The traveling mother: Navigating, visualizing and utilizing lactation spaces in U.S. airports

Joyce S. Lee[a], Aidan Ganzert[b,*], Christina Jackson[c]

[a] FAIA, LEED Fellow, Penn Urban Health Lab, University of Pennsylvania, USA
[b] Atlanta, GA, 30305, USA
[c] University of Pennsylvania School of Nursing, USA

ARTICLE INFO

Keywords:
Airports
Health promotion
Built environment
Transportation
Work-life balance
Lactation facilities
Equity
Breastfeeding
Diversity
Inclusion

ABSTRACT

Breastfeeding has well known health, economic and social benefits. As mothers continue to work, play, learn, travel and live their lives in all environments, the need for breastfeeding spaces continues to expand. However, a key detriment to engaging in safe and private breastfeeding is the lack of dedicated lactation spaces. While there have been regulatory strides to support nursing mothers, businesses and employers are not required to create a permanent and dedicated space for breastfeeding mothers. Little research has examined the essential building specifications of these spaces. Specifications that need to be addressed in lactation or wellness room spaces include size, location, privacy, and other amenities. Environments that have been overlooked for requiring a lactation space are airports. A total of 130 U S. airports, categorized by hub size and region, were analyzed for the following features: website source, photos, amenities description, and location/access. These characteristics can provide traveling mothers with information on amenities and room access, which can lead to awareness and eventually raise the quality of lactation spaces. This analysis found that 77% of original airport website sources have information on lactation room facilities. Across all Federal Aviation Administration (FAA) regions and hub sizes, photos were the least reported criterion at a rate of 37%. The three regions with the most information on lactation room facilities were Eastern (13%), Great Lakes (15%) and Southern (18%). Our findings concluded that while we find that many airports are addressing the issue of mothers and breastfeeding, airports could do more to provide quality accommodations.

1. Health, economic and social benefits of breastfeeding

The 2018 CDC Breastfeeding Report Card found that among American children born in 2015, 57.6% were breastfeeding at 6 months. At 12 months, this rate decreased to 35.9% [1]. Among all children born during 2010–2013, in national estimates of those that breastfed exclusively through 6 months, the lowest rates were at or below the poverty level at a rate of 14.7% [36]. The 2018 CDC Breastfeeding Report Card found that while most mothers begin lactation, the rate of breastfeeding in the U.S. falls drastically at the end of six months. At six months, 24.9% of children were exclusively breastfed compared to 46.9% at three months [1]. A variety of factors, such as time management and work life, are linked to this decline. Nevertheless, the American Academy of Pediatrics has called for breastfeeding to be considered a public health issue and not only a lifestyle choice [2].

Research has shown that breastfeeding offers many health benefits for infants and mothers [3,4]. More recent studies have shown that the economic benefits of breastfeeding are also apparent, as the practice is linked to human capital development. One *Lancet* study attributed the decision to not breastfeed with economic losses of about $302 billion annually, or 0.49% of world gross national income [5]. At the smaller scale of employer to employee, breastfeeding interventions have been shown to improve employee retention and reduce business costs [6]. One published study has attributed the health benefits of breastfeeding on women's health more generally, finding that optimal breastfeeding reduces maternal and infant death rates [7].

While not all women can medically breastfeed, it has been highly recommended by the World Health Organization to exclusively breastfeed for the first six months of life [8]. For working mothers, a lactation program endorsed or sponsored by their company could enable mothers to continue to breastfeed [9].

* Corresponding author.
E-mail address: info@IndigoJLD.com (J.S. Lee).

https://doi.org/10.1016/j.buildenv.2019.106323
Received 28 February 2019; Received in revised form 1 July 2019; Accepted 1 August 2019
Available online 09 August 2019
0360-1323/

2. Existing policies and design standards for lactation rooms

Currently, the United States does have some statutory guidance for women's right to breastfeeding spaces, although this guidance is neither comprehensive nor inclusive. The Fair Labor Standards Act of 1938 was amended in 2010 by the Affordable Care Act (ACA) to require employers with 50 employees or more to provide reasonable break times and a private space for nursing mothers to express milk while at work [10,11]. The U.S. Department of Health and Human Services (HHS) Office of Women's Health offered the desired rate of 1 room per every 200 employees or 100 female employees (HHS Office of Women's Health, 2018). However, more specific guidance regarding the specification of these spaces is lacking.

These statutory guidelines did not include granular room specifications as neatly addressed in the American Institute of Architects (AIA) Best Practice Guide. The AIA Best Practice Guide for lactation rooms was originally written in 2009, and the document was expanded to include three-dimensional renderings of the room space and multiunit options [12,13]. A minimum footprint of 7 feet by 7 feet (2100 × 2100 mm) was recommended, as it allowed for a 5-foot (1500 mm) radius circle with a 24-inch (600 mm) deep counter (Fig. 1) (Fig. 2). Other configurations, such as 10 feet by 5 feet (3000 × 1500 mm), could work in public facing facilities where more mothers were likely to be breastfeeding their babies and could bring strollers (Fig. 3). The AIA Best Practice Guide remains the seminal document on the subject, listing architectural guidance and design specifications, promoting a calm and relaxing environment for mothers. Amenities include a sink, lighting, acoustics and HVAC comfort, milk storage, adjustable chairs, table/counter, easy access electrical outlets, and accessories such as a trash receptacle, coat rack, full-length mirror, paper towel and soap dispenser, and privacy door hangers [12,13].

One study has noted that the best low-cost interventions regarding milk expression could be a simple hand expression of breastmilk [14]. Even if a mother expresses milk by hand, there are many facility and access-related needs for on-the-go mothers. With the AIA Best Practice Guide as the seminal standard for facilities, needs assessments could fill in contextual gaps, revealing the elements, amenities, and access that would be optimal for users in a particular setting [15].

Common building types where lactation rooms and support programs would benefit mothers “on-the-go” include transportation terminals such as airports, ferry facilities, public transportation hubs, train stations and bus terminals where the majority of the traveling public is in a transient mode.

Under the Federal Aviation Act (FAA) reauthorization signed in October 2018, medium and large hub airports must provide “(A) a lactation area in the sterile area of each passenger terminal building of the airport; and (B) a baby changing table in one men's and one women's restroom in each passenger terminal building of the airport.” The lactation area “(i) provides a location for members of the public to express breast milk that is shielded from view and free from intrusion from the public; (ii) has a door that can be locked; (iii) includes a place to sit, a table or other flat surface, a sink or sanitizing equipment, and an electrical outlet; (iv) is readily accessible to and usable by individuals with disabilities, including individuals who use wheelchairs; and (v) is not located in a restroom” [16].

However, the 2018 Federal Aviation Administration reauthorization act lacked specifications on physical space requirements and lactation room amenities.

While the policy was being implemented at the end of 2018, this study analyzes available websites in January 2019, identifying existing lactation facilities in U.S. airports. The data covered all 50 states analyzing the following user friendliness criteria: *Airport website*-when the lactation information originates from and can be found through the airport website; *Photos*-if there are photo(s) of the lactation room; *Amenities Description*-if there are description(s) of the room amenities; *Location/Access*-if the location and room access is described.

3. Existing barriers to lactation room facilities

Recognizing the widely reported maternal and pediatric health benefits, the surgeon general released the 2011 Call to Action to support breastfeeding. In the Call to Action, both embarrassment and employment were listed as two of the key barriers to breastfeeding [17]. Furthermore, citing busy schedules, working mothers were less likely to initiate breastfeeding. Even if mothers chose to breastfeed during maternity leave, upon returning to work employed mothers would practice breastfeeding for a shorter period of time than women who were not employed (US Public Health Service, 2011). For reasons described in depth below, the major barriers to breastfeeding are both physical environments and policy.

When examined, many breastfeeding environments exhibit a notable lack of regulation. One study noted the lack of legal protection given to students that would require a designated lactation space or time to express milk [18]. In a Call to Action in *Nursing for Women's Health*, student-mothers returning to school after childbirth faced barriers beyond the lack of legal protection and its related workplace policies; there was a lack of breastfeeding facilities as well as a lack of awareness of the importance of breastfeeding among mothers, healthcare providers and facility staff [19].

4. Gap in the literature: nontraditional workplace environments

While there have been many studies on the health, social and economic benefits of breastfeeding, few have advanced the field in terms of the built environment application of lactation or wellness rooms, particularly in nontraditional workplace environments such transportation centers.

One 2014 study examining airport environments found that only 8% of surveyed airports provided the minimum requirements for a lactation room, which is defined as a nonbathroom space with an electrical outlet, table and chair, yet 62% stated via a phone survey that they were breastfeeding-friendly [20]. Despite U.S. statutory guidance requiring most workplaces to provide reasonable unpaid break time and a private space for female employees to express their breast milk, much of the language is vague and open to interpretation, leading to less-than-desired public health outcomes, particularly in nontraditional workplace environments such as universities.

As noted in a *Journal of Human Lactation* article, community organization through student body announcements and stakeholder engagement as well as advocacy support were essential to a successful university lactation program [21]. Another study found that the most commonly perceived supporters of breastfeeding were identified as peer students, while opponents of breastfeeding are either misinformed, unaware of the benefits, or generally disapproving of the practice altogether [22].

In these nontraditional workplace environments, what defines an ideal lactation space in terms of accessibility remains unclear. Another survey examining the association between different dimensions of support and duration of exclusive breastfeeding found that employers have the ability to strengthen the technical support and workplace environment to encourage breastfeeding continuation in working mothers [23].

One study examining conference center lactation facilities concluded that policy changes were necessary in order for all women to be supported in this nontraditional workplace space as they are in traditional office settings [24]. Another study affirmed that a dedicated lactation facility should be mandated by the government to employers with the reasoning that this built intervention significantly increases exclusive breastfeeding rates [25]. However, some studies have shown that physical space alone can be limited when implementing a lactation program. As a nontraditional workplace environment example, some universities have undertaken their own lactation support programs, self-assimilating their own best practices. The 2001 launch of the

Lactation Support Program at Virginia Tech was an initiative to support employee breastfeeding. While the program created dedicated lactation facilities that were comfortable, these lactation spaces were not accompanied by an educative rollout plan. As a result, the study noted a loss in feedback and conversation on gender equity [26].

In creating an educational conversation about breastfeeding, some explored the impact of breastfeeding-friendly support on working mothers. One administered survey grouped results according to educational demographics, employment characteristics and breastfeeding policy [27]. The findings of this study suggested that the desire for a clean and comfortable space is not unique to any particular demographic, and a lack of "breastfeeding knowledge" was associated with discontinuation [27]. The study reported that "Young age, lower education, shift work, long work hours, lack of awareness or use of breast pumping breaks, and self-reported insufficient breastfeeding knowledge were all associated with discontinuing breastfeeding after returning to work" [27]. Examining another nontraditional workplace environment – conference centers – one study concluded that there are limited resources accessible to parents with disabilities [28]. All of these studies suggested employers should provide encouragement and educational-based support for working mothers to continue breastfeeding after returning to work.

When looking for models for breastfeeding facilities in nontraditional spaces, one can start by examining successful programs elsewhere. These models of successful lactation implementation could be taken and modified for nontraditional spaces. Again, it was evident that both policy and space are two of the bare requirements needed to create a moderately successful lactation program. The specifications of these two features may determine the level of impact on the mother in terms of breastfeeding duration.

5. Current state of lactation rooms in nontraditional workplace environments

Addressing the availability of lactation rooms, built environment specifications and policy implementation in nontraditional workplace settings, the Society for College and University Planning (SCUP) and the University of Pennsylvania collaborated on a nationwide survey of U.S. colleges and universities. The survey found that most schools reported that several entities, including human resources and student affairs offices, were involved in the planning of their lactation spaces [29]. The survey also evaluated the types of physical amenities, such as a sink or coat hanger, available in their current lactation spaces. The rate of these physical amenities varies from feature to feature at differing rates of 90%–2% [29]. Ultimately, respondents reported expansion defined as additional rooms, policies and building support for their programs, indicating room for growth and improvement [29].

Aside from the survey of college and university campus facilities, there are no known surveys examining the visual communication of lactation spaces and the description of amenities and access on the web, particularly of high-traffic transportation centers such as airports.

6. Methodology

We used the airport classification schema of the Federal Aviation Administration (FAA) for "Hub Size" and "Region" for all United States (U.S.) airports analyzed [30]. At least one airport in each of the 50 states was analyzed. In many states, there were multiple airports.

According to the U.S. Federal Aviation Administration, an airport was defined as any area of land or water used or intended for landing or takeoff of aircraft including appurtenant areas used or intended for airport buildings, facilities, as well as rights of way together with the buildings and facilities [31]. The Federal Aviation Administration described large hubs as airports handling 1% or more, medium hubs as handling 0.25%–1%, and small hubs as handling 0.05%–0.25% of all annual passenger boardings in the United States. Non-hubs fell below the 0.05% threshold [31]. Hub sizes were identified and selected from the Federal Aviation Administration's list of Commercial Service Airports based on Calendar Year 2017 Enplanements. As of January 2019, this was the most current data available [32]. Our sampling covered 60 of the 61 large and medium hub airports as defined in the Federal Aviation Administration classifications [32]. Puerto Rico's airport is listed within the 61 large airports, but falls outside of the 50 US states so it was not included in our sample. The remaining 70 samples were randomly chosen from small to non-hub airports. Therefore, we added 60 (large and medium hubs) and 70 (small and non-hubs) to arrive at the sampling of 130.

If the airport did not publish lactation room information, then the team looked for the most detailed websites, such as news articles or third-party sites. The results were represented as percent (%) of n = 130 airports in the evaluation.

The criteria are based on human-centered design concepts. Human-centered design concepts are a framework that develops solutions to problems by involving the human perspective in all steps of the problem-solving process. The concepts are further informed by the mother's point of view, such as ease of navigation, travel experience and amenities inside the room for convenience.

Websites were assessed based on four criteria on a Pass/Fail grading system (Pass = 1; Fail = 0):

Airport website: with the absence of a website of an original or significant source graded as a Fail. 2) Photos: with no photos as a Fail; 3) Amenities Description: with no description of or details about room amenities or furniture as a Fail; and 4) Location/Access: with no mention of a map, room location, or direction of access graded as a Fail. The four criteria also lend themselves to objective assessment, as airport websites vary greatly in design and detail. Lactation pods, movable units with privacy door(s), and lactation rooms were evaluated using the same criteria in this study even though movable pods are considered less permanent than a room with walls.

The percentages for each criterion were taken from total airports. For example, 27 of the airports with information on their website were large-hub airports. This was presented as a percentage out of the total airports (27 out of 130); thus 21% of airports with lactation information on their website were large airports. We applied the same method to the regional categories as well, so that we are able to show the percentage of airports out of the total organized by hub.

7. Results

7.1. Presentation of Findings: Lactation Facilities in Airport

This study provides two (2) separate tables representing the data in terms of FAA hub size classification (Table 1) and geographic location designated by FAA Regions (Table 2) respectively. The numbers represent percentages of airports that exhibit a characteristic in airports defined by FAA hub size or geography. All percentages fall within +/−1%.

A list with the associated airport code (Table 3) meeting all four criteria is provided and sorted by state.

Representing 18% of our airports, 23 of the 130 airports selected met all of the above criteria. Representing 11% of our airports, 14 out of

Table 1
Airports (n = 130) by FAA hub size classification.

Hub	Airport Website	Photo(s)	Amenities Description	Location/ Access
Large	21%	13%	13%	20%
Medium	20%	7%	15%	22%
Small	24%	8%	12%	25%
Non-Hub	12%	8%	12%	12%
Grand Total	77%	37%	52%	78%

Table 2
Airports (n = 130) by FAA region.

Region	Airport Website	Photo(s)	Amenities Description	Location/ Access
Alaskan	0%	0%	1%	1%
Central	2%	2%	2%	5%
Eastern	13%	7%	8%	13%
Great Lakes	15%	9%	13%	13%
New England	4%	1%	1%	3%
Northwest Mountain	5%	4%	3%	6%
Southern	18%	8%	13%	18%
Southwest	9%	2%	5%	10%
Western-Pacific	10%	5%	7%	9%
Grand Total	77%	37%	52%	78%

Table 3
Airports receiving all "Pass" in all Four Criteria.

State	Airport	IATA Airport Code
AZ	Phoenix Sky Harbor International Airport	PHX
CA	Norman Y. Mineta San José International Airport	SJC
CA	John Wayne Airport (formerly Orange County Airport)	SNA
CO	Denver International Airport	DEN
DC	Ronald Reagan Washington International Airport	DCA
FL	Fort Lauderdale–Hollywood International Airport	FLL
GA	Hartsfield–Jackson Atlanta International Airport	ATL
MI	Detroit Metro Airport	DTW
NV	McCarran International Airport	LAS
NY	Syracuse Hancock International Airport	SYR
NC	Charlotte/Douglas International Airport	CLT
NC	Piedmont Triad International Airport	GSO
NC	Raleigh-Durham International Airport	RDU
OR	Portland International Airport	PDX
PA	Lehigh Valley International Airport (formerly Allentown–Bethlehem–Easton Int. Airport)	ABE
PA	Harrisburg International Airport	MDT
PA	Pittsburgh International Airport	PIT
SD	Sioux Falls Regional Airport (Joe Foss Field)	FSD
TX	William P Hobby Airport	HOU
WA	Seattle–Tacoma International Airport	SEA
WI	Dane County Regional Airport (Truax Field)	MSN
WI	La Crosse Regional Airport	LSE
WI	General Mitchell International Milwaukee Airport	MKE

the 130 airports met none of our criteria.

8. Discussion

Nursing mothers can only plan ahead using the information they receive prior to arriving at the airport. Websites offer availability of text, maps and photos. Information could also be accessed at any time for mothers planning to travel. The criteria were selected for their level of detail and thoroughness of information communicated. While there were insufficient studies to demonstrate scientific correlation, thorough web information represented transparent conditions of lactation rooms in the airport. Public information on the internet is considered the most direct way of communication. Websites could be accessed at any time and do not restrict mothers on any particular schedule from receiving answers to inquiries. This level of transparency is democratizing and eliminates the "have and have-nots" constraints.

We were encouraged to find that 77% of the websites on airport lactation rooms come from original airport website sources identified as either the airport website or an official airport social media page. This evidenced the airport operators' goals to provide services for traveling mothers. While information was available at varying degrees of detail, open access on the internet provides transparency regarding lactation accommodations.

In this study, photos were the least reported criterion, shown at a rate of 37% across all airport hub sizes and all FAA regions. Among those with photos at the websites, images ranged from a single generic photo to multiple color photos showing the room entrance as well as the interior. For mothers interested in a preview of the rooms, a picture is worth a thousand words. Photos could convey a sense of the room interior, particularly for mothers from different countries with language and cultural barriers.

The level of amenity description (52%) at airport websites also tended to vary. Amenities descriptions ranged from detailed descriptions to lists to simply stating "amenities" without clarification. Some only mentioned a chair while others described the amenities cited in the AIA Best Practice document. More than three quarters of the websites, however, communicate location and access information (78%). Particularly for large airports, a long walking distance and difficulty finding the room could have added anxiety to traveling mothers. Some websites gave additional instructions as to whether rooms are beyond security checkpoints or specific travel directions. Due to security requirements, this level of detail was unique to airports and important to traveling mothers.

The FAA reauthorization act language on lactation spaces applies only to medium and large hubs. However, overall, we found that large-hub airports did not perform substantially better than medium or small hubs. The number of travelers may not be the sole determining factor in providing website information or lactation room amenities. However, large-hub airports, having the most resources and traffic, were well positioned to provide best-in-class lactation spaces as set by the AIA Best Practice Guide. Large hubs should meet the minimum standards set by the AIA Best Practice Guide and are encouraged to exceed those standards to make the space as user-friendly as possible. Airports could also have included airline operators in planning and implementation, as we found that airlines publish lactation-room access and information on their own websites. Airlines' promoting breastfeeding at affiliate airport sites is one way to demonstrate their Corporate Social Responsibility (CSR) initiatives.

Based on this sample of 130 airports, the three regions with the most web information are Eastern, Great Lakes and Southern. The team did not have sufficient records in the operating history of these airports to interpret this leadership pattern. In addition, some states and cities such as New York City and Philadelphia have passed local legislation on lactation accommodation and airports could provide best practice models [33-35].

This study could not locate any websites on lactation facilities in airports of the following states: West Virginia, Hawaii, and Rhode Island. Though some airports listed family restrooms as alternatives to lactation spaces, we did not count them as appropriate accommodations. As a result, there were several airports with negative results (Fail = 0) rated using all four criteria. At the other end of the spectrum, the team finds that 23 airports, or 18% of the 130 airports, meet all four criteria (Pass = 1) in this study.

9. Conclusions

While we found that many airports are addressing the issue of mothers and breastfeeding, we also confirmed that airports could do more to better communicate lactation accommodations. With a great variety of amenities description, improved quality could be measured by identifying lactation room best practices. Quality also includes the ease of wayfinding and the travel experience of the mother, in addition to the quality of the lactation room upon arrival. Additional components such as universal access as an equity consideration and the sustainability of lactation room or "wellness room" built design components are also design criteria that have been observed but which remain unexamined at length in an academic review.

Those mothers having juggled work, travel and breastfeeding understand the immense organization and effort needed to make

breastfeeding happen at all. If the mother decides on the complicated journey of air travel, part of the packing procedure *at home* will involve checking the airport's accommodations: decide on pumping in a lactation room or in a bathroom and leave enough time for it. She must also take pump accessories with her so they are easily retrievable in her packed baggage.

Lactation is a bodily function. It is usually too late to decide on finding a lactation room upon arrival at the airport, and the website is thus the most credible source of information a mother could use while packing. Bathrooms, as the last resort, are not recommended, but most harried mothers are in no position to complain when lactation rooms are not available. AIA Best Practice guidelines were originally conceived to encourage a dedicated lactation space for the traditional office workplace. We believe that most of the guidance could apply to a travel terminal but is open to additional criteria.

Sustainability continues to be a relevant discussion because of the large carbon footprint associated with formula production, in addition to the health impact. In this age of climate impact assessment, we recommend that buildings with lactation rooms track the total use by mothers annually and calculate the equivalent tonnage of waste and greenhouse gas emissions avoided. Reinforcing sustainable community development, solid waste reduction associated with diminishing formula purchase remains both a community and financial benefit [12]. Where green materials are used according to Leadership in Energy and Environment Design (LEED) standards, the Wharton Business School at the University of Pennsylvania informs lactation room users that the furniture is Greenguard-certified and free of chemical flame retardants. The floor, ceiling tiles and paint contain low or no volatile organic compounds, which is a key consideration in the environmental assessment of building materials [37].

All of these components remain crucial when addressing effective policies and the quality of the built environment to support the traveling mother.

Below are the takeaways from this study:

- Many airports, large and small, have begun to address the breastfeeding needs of traveling mothers.
- Hub sizes do not currently influence the amount of web information available to users.
- No particular region in the country outperformed its peers by a significant margin.
- Only 18% of the airports analyzed met all four criteria.
- In new terminal design, construction, renovation and remodeling, lactation room design could follow best practices by incorporating universal design, environmental health, equity, security and sustainability considerations.
- Providing space for all passengers and staff is a democratizing act, and providing images on a freely accessible website is the first step in promoting equitable space, diversity and inclusion.

While meeting all four criteria of this study suggests a degree of user friendliness for traveling mothers, it is not the equivalent of best practice. Well-designed accommodations often include a pleasurable access experience, an efficient layout with convenient amenities and accessories, and a room interior that offers mothers moments of tranquility. Starting with these human-centered criteria points to a foundation of quality design, effective communication, and a pathway to help traveling mothers navigate transportation terminals such as airports.

9.1. Limitation of this study

Congress passed the FAA reauthorization on 5 October 2018 and there have been ambiguities in its interpretation of lactation facility provisions. The type of amenities has not been fully standardized in lactation rooms needed in a multi-terminal building spanning great distances with varying levels of security checkpoints. While the subject websites were updated frequently, they were analyzed during a short period of time and represented a snapshot of early 2019. Future research, including convening stakeholders, is necessary. Furthermore, because photo quality was highly subjective, we cannot assume that many airports have professional photographers or equitable access to expensive digital media tools. Our study took this into account by simply measuring the existence of these images. The online text described the amenities in the room. For the purposes of this study, we trusted our sources. No site visits were conducted as part of this study. We also did not analyze the current Transportation Security Administration (TSA) security requirements in different areas of the airport.

Acknowledgments/Disclosures

The authors would like to thank Liz York, FAIA; Tong Niu, Yubei Huang, and Jingyi Sun from the University of Pennsylvania School of Design; Dr. Diane Spatz, Dare Henry-Moss, and Kathleen Benton from the Society for College and University Planning/University of Pennsylvania School of Nursing team; Jane Kaufman from the University of North Carolina; and Amy Spangler from Emory University. Funding: This work was completed without financial support from any entity.

Appendix

Fig. 1. Fig. 1Sample multiunit lactation room from Wellness Room Best Practice [13].

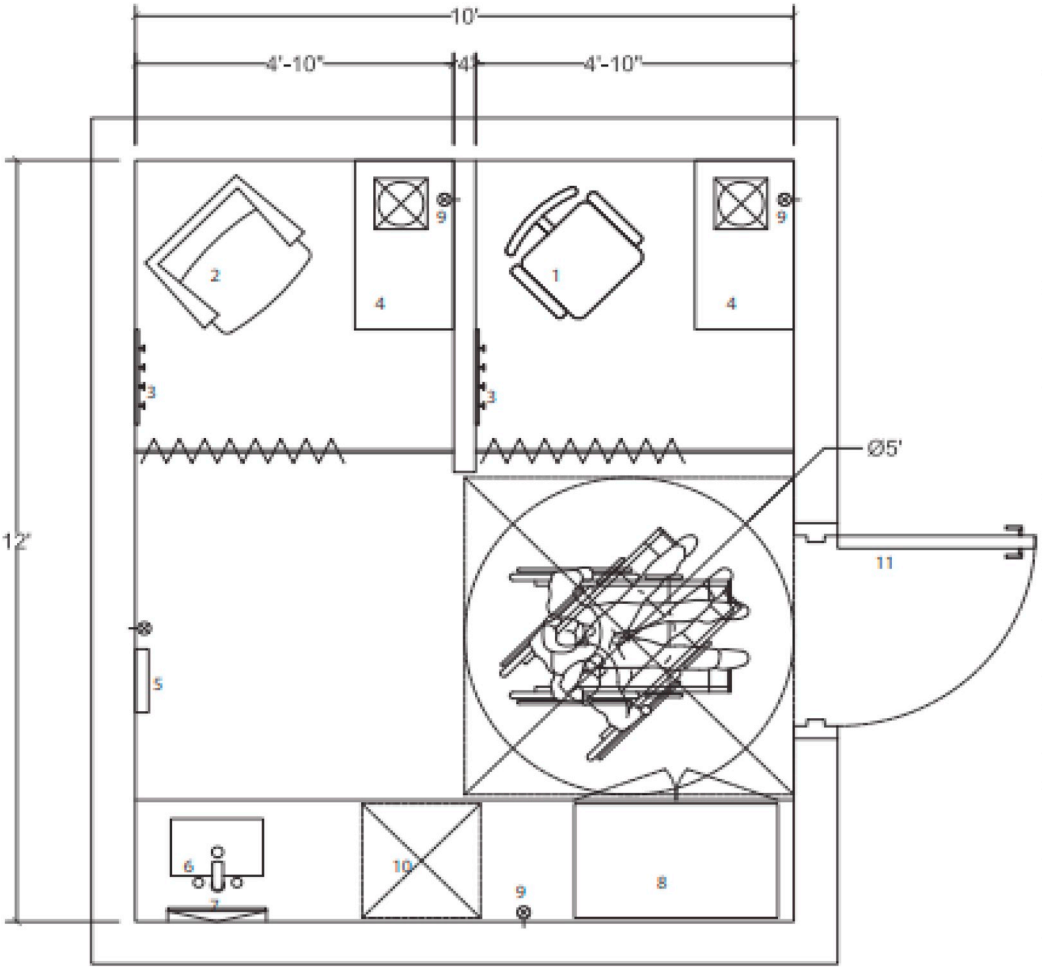

Fig. 2. Architectural plan of lactation room from AIA Wellness Room Best Practice [13].

Fig. 3. Computer-generated rendering from AIA Wellness Room Best Practice [13].

Fig. 4. Sample of bilingual signage – door hanger for privacy.

References

[1] CDC National Center for Chronic Disease Prevention and Health Promotion, Breastfeeding Report Card, United States 2018, (2018) Retrieved from Centers for Disease Control and Prevention https://www.cdc.gov/breastfeeding/pdf/2018breastfeedingreportcard.pdf.

[2] American Academy of Pediatrics, Breastfeeding and the use of human milk, Sect. Breastfeed. Pediatr. 129 (3) (Mar 2012) e827–e841, https://doi.org/10.1542/peds.2011-3552.

[3] S. Ip, M. Chung, G. Raman, P. Chew, N. Magula, D. DeVine, T. Trikalinous, J. Lau, Breastfeeding and Maternal and Infant Health Outcomes in Developed Countries, Agency for Healthcare Research and Quality. Report No.: AHRQ Publication No. 07-E007, Rockville, MD, 2007.

[4] C. Feltner, R. Weber, A. Stuebe, C. Grodensky, C. Orr, M. Viswanathan, Breastfeeding Programs and Policies, Breastfeeding Uptake, and Maternal Health Outcomes in Developed Countries. Comparative Effectiveness Review No. 210, Agency for Healthcare Research and Quality, Rockville, MD, July 2018 (Prepared by the RTI International-University of North Carolina at Chapel Hill Evidence-based Practice Center under Contract No. 290-2015-00011-I.) AHRQ Publication No. 18-EHC014-EF.

[5] N. Rollins, N. Bhandari, N. Hajeebhoy, S. Horton, C. Lutter, J. Martines, Why invest, and what it will take to improve breastfeeding practices? Lancet (Jan 2016) 491–504, https://doi.org/10.1016/S0140-6736(15)01044-2.

[6] L. Murtagh, A. Moulton, Working mothers, breastfeeding, and the Law, Am. J. Public Health (Feb 2011) 217–223, https://doi.org/10.2105/AJPH.2009.185280.

[7] M.C. Bartick, E.B. Schwarz, B.D. Green, B.J. Jegier, A.G. Reinhold, T.T. Colaizy, A.M. Stuebe, Suboptimal breastfeeding in the United States: maternal and pediatric health outcomes and costs, Matern. Child Nutr. 13 (1) (Sept 2016), https://doi.org/10.1111/mcn.12366.

[8] World Health Organization (WHO), Breastfeeding, Retrieved from, Aug 2018. https://www.who.int/nutrition/topics/exclusive_breastfeeding/en/.

[9] J. Ortiz, K. McGilligan, P. Kelly, Duration of breast milk expression among working mothers enrolled in an employer-sponsored lactation program, Pediatr. Nurs. 30 (Issue 2) (2004) 111–119.

[10] U.S. Department of Labor, Fact sheet #73: break Time for nursing mothers under the FLSA, Retrieved from United States Department of Labor: Wage and Hour Division, 2018, April. https://www.dol.gov/whd/regs/compliance/whdfs73.htm.

[11] Office of the Legislative Counsel, Compilation of patient protection and the Affordable Care Act, Retrieved from US House of Representatives, 2010, May 1. http://housedocs.house.gov/energycommerce/ppacacon.pdf.

[12] L. York, J. Lee, Recommendations for Designing Lactation/wellness Rooms. AIA Best Practice, American Institute of Architects, 2016 2019.

[13] L. York, J. Lee, Recommendations for Designing Lactation/wellness Rooms. AIA Best Practice, American Institute of Architects, 2019.

[14] G. Becker, H. Smith, F. Cooney, Methods of milk expression for lactating women,

Cochrane Syst. Rev. (Sept 2016), https://doi.org/10.1002/14651858.CD006170.pub5.
[15] D. Henry-Moss, S. Abbuhl, L. Bellini, D.L. Spatz, Lactation space experiences and preferences among health Care workers in an academic medical center, Breastfeed. Med. 13 (9) (2018) 607–613, https://doi.org/10.1089/bfm.2018.0101.
[16] 115th Congress, FAA Reauthorization Act of 2018, Retrieved from U.S. Congress, 2018. https://www.congress.gov/115/bills/hr302/BILLS-115hr302enr.pdf.
[17] U.S. Department of Health and Human Services, Fact sheet: the surgeon general's call to action to support breastfeeding, Retrieved from Surgeon General, 2011. https://www.surgeongeneral.gov/library/calls/breastfeeding/factsheet.html.
[18] M.W. Bostick, S.A. Albrecht, N. Baghdadi, C. Haley, D.L. Spatz, Do American colleges and universities support the lactation needs of students? Breastfeed. Med. 11 (7) (2016), https://doi.org/10.1089/bfm.2016.0022.
[19] S. Albrecht, J. Wang, D. Spatz, A call to action to address barriers to breastfeeding and lactation faced by student-mothers, Nurs. Women's Health (2017) 431–437, https://doi.org/10.1016/j.nwh.2017.10.006.
[20] M. Haight, J. Ortiz, Airports in the United States: are they really breastfeeding friendly? Breastfeed. Med. Off. J. Acad. Breastfeed. Med. 9 (10) (2014) 515–519, https://doi.org/10.1089/bfm.2014.0112.
[21] L. Dinour, N. Beharie, Lessons learned from a student-led breastfeeding support initiative at a US urban public university, J. Hum. Lactation 31 (Feb 2015) 3, https://doi.org/10.1177/0890334415571636.
[22] L. Dinour, G. Pope, Y. Bai, Breast milk pumping beliefs, supports, and barriers on a university campus, J. Hum. Lactation 31 (1) (Nov 2014), https://doi.org/10.1177/0890334414557522.
[23] Y. Bai, S.M. Wunderlich, Lactation accommodation in the workplace and duration of exclusive breastfeeding, J. Midwifery Women's Health (Dec 2013) 690–696, https://doi.org/10.1111/jmwh.12072.
[24] D. Spatz, K. Koo, National survey of convention centers' lactation facilities, J. Hum. Lactation (Jul 2016) 735–739, https://doi.org/10.1177/0890334416653740.
[25] R.W. Basrowi, A.B. Sulistomo, N.P. Adi, Y. Vandenpla, Benefits of a dedicated breastfeeding facility and support program for exclusive breastfeeding among workers in Indonesia, Pediatr. Gastroenterol. Hepatolgy Nutr. (Jun 2015) 94–99.
[26] J. Porter, R. Oliver, Rethinking lactation space: working mothers, working bodies, and the politics of inclusion, Space Cult. 19 (1) (Oct 2015), https://doi.org/10.1177/1206331215596488.
[27] S.-Y. Tsai, Impact of a breastfeeding-friendly workplace on an employed mother's intention to continue breastfeeding after returning to work, Breastfeed. Med. 8 (Issue 2) (Apr 2013) 210–216, https://doi.org/10.1089/bfm.2012.0119.
[28] R. Calisi, W.G. Science, Opinion: how to tackle the childcare–conference conundrum, Proc. Natl. Acad. Sci. (Mar 2018) 2845–2849, https://doi.org/10.1073/pnas.1803153115.
[29] Society for College and University Planning, and University of Pennsylvania, An exploration of lactation policy and lactation facilities across US Higher Education Campuses (wellness rooms), Retrieved from Society for College and University Planning (SCUP), 2018. https://www.scup.org/page/resources/wellness-study?path=lactation_research.
[30] Federal Aviation Administration, Airports Regional & District/Development Offices, Retrieved from Federal Aviation Administration, 2018. https://www.faa.gov/about/office_org/headquarters_offices/arp/regional_offices/.
[31] Federal Aviation Administration, Airport categories, Retrieved from Federal Aviation Administration, 2018. https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/.
[32] Federal Aviation Administration, Passenger boarding (enplanement) and all-cargo data for U.S. Airports, Retrieved from Federal Aviation Administration, 2018. https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/cy17-commercial-service-enplanements.pdf.
[33] City of New York, Local Law 185, Retrieved from the city of New York, office of the city clerk, 2018. https://www1.nyc.gov/assets/cchr/downloads/pdf/amendments/Local%20Law%20185.pdf.
[34] City of New York, Local Law 186. Retrieved from the city of New York, office of the city clerk, https://www1.nyc.gov/assets/cchr/downloads/pdf/amendments/Local%20Law%20186.pdf, (2018).
[35] City of Philadelphia, BILL NO. 130922. Retrieved from City Council Chief Clerk's Office, https://www.duanemorris.com/site/static/Philadelphia_Bill_No_13092201_As_Amended.pdf, (2014).
[36] Centers for Disease Control and Prevention (CDC), Morbidity and mortality weekly report (MMWR) 66 (Jul 2017), pp. 723–727 Retrieved from https://www.cdc.gov/mmwr/volumes/66/wr/mm6627a3.htm#T1_down 27.
[37] University of Pennsylvania Wharton School of Business, MBA mama blog, Retrieved from, 2016. https://medium.com/mba-mama-blog/wharton-lactation-suites-open-for-business-33672ba75999.