Innovation and Technology in One New Hospital in Montreal: A Lived Experience of Healthcare Professionals

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Abstract. In the context of a technological innovation in one new university hospital center (CHU) in Montreal, Canada, the purpose of this study explores the lived experience of the healthcare professionals in this work environment, how the hospital design and some technology attributes facilitate their work and affect their well-being. It is conducted from august to November 2018 in two care units. The analysis includes a phenomenological interpretation of the lived experiences of these professionals following their narratives, observing their environmental behavior. Related to the hospital's size, a linear layout of the care unit, some technological elements in the care units facilitate the healthcare professional's work while others hinder it. The introduction of new technologies and continuous innovation in the hospital work environment must be adapted to the physical context of the hospital in terms of spatial organization and layout of the care unit.

Keywords: Healthcare facilities design · Technology and innovation · Healthcare professionals · Lived experience

1 Introduction

The latest trends in the design of hospital structures show a significant evolution focused on attention to human aspects and the study of the various elements that impact the psychology of the individual who lives in the particular environment of a hospital. The patient-oriented hospital, where humanization means centrality of the person; takes into consideration the requirements of health professionals. Healthcare professionals are constantly confronted with stress in their working environment in hospitals [5]. In a healthcare environment such as a hospital, we cannot ignore the stress experienced by the patient and his or her family, due to their vulnerability and fear of illness and suffering [19, 22]. However, it is important to pay attention to the staff who provide care to these patients [18, 23]. That is why we need to understand the interaction of these professionals with their environment in the contemporary hospital.

T. Ahram et al. (Eds.): IHIET 2020, AISC 1152, pp. 389–395, 2020.
https://doi.org/10.1007/978-3-030-44267-5_58

2 A Hospital Is a Stressful Environment for Healthcare Professionals

The healthcare professionals as well as the patient, are confronted to various situations in their work environment in hospitals. They face patient suffering, sometimes also impotence, therapeutic uncertainty and intense workload [5]. Stress causes health problems for the healthcare professionals since it compromises their well-being [14]. Research related to environmental psychology and ergonomics has been conducted in healthcare facilities, with the objective of providing evidence to reduce patient stress, promote healing and well-being [3, 7, 22], the health and well-being of caregivers and their effectiveness [2, 4, 17, 24]. The problem of wayfinding can be a stress factor for patients, visitors and staff [2, 4, 17, 24]. Another attribute of the physical environment that has been proven to reduce stress is a direct contact or through views with nature [8]. Alimoglu and Donmez [1] demonstrated that healthcare professionals who receive 3 h or more of daylight do not have burnout syndrome and are more satisfied with their work environment.

2.1 A Contemporary Hospital - Towards a Less Stressful and Person-Centered Environment

The development of medicine and medical sciences has made it possible to think of the hospital not as voting booth, but as a large facility in the city [15]. Related to the development of medical technologies, social and political development, hospital design has changed significantly over the past century [13]. The hospital has undertaken a transformation in order to mark in the architecture and organization of the space the will to meet the demands of comfort and safety of patients and their families, but also to work for the comfort of the caregiver [16].

Evidence Based Design: Agrowing body of empirical studies shows that the physical environment contributes to improving the quality of care [6, 27] and plays a significant role in the acceptability of treatments and patients' recovery.

The Healing Environment: It is based on the principle that improved clinical outcomes depend on the ability of the healthcare facility environment to contribute to reducing patient stress and promoting patient recovery [21]. Healthcare environments must promote well-being if they are designed to promote: (a) control of the physical-social environment, (b) access to social support, and (c) access to positive distractions. For the access to support it Includes both emotional support and concrete help from those around [21]. Social support allows people to be less stressed and healthier, while those who are socially isolated are more stressed and less healthy [9].

The access to positive distractions reduces the harmful effect of stress [9, 21]. Low or high levels of environmental stimulation can have negative effects on the well-being and health of individuals [9, 22, 27]. Nature has been proven to be a positive distraction factor for patients and staff [22, 26].

The Restorative Environment: The restorative environment approach focuses on the process of attentional recovery (direct or voluntary or intentional, and involuntary or

indirect). The mental fatigue can be negative and represented by irritability, difficulty concentrating, difficulty solving problems, errors and larger accidents [9, 11].

3 Context Setting and Aims of the Research

In recent years, new university hospitals (CHU) have been built in Quebec as a result of the development of medical technologies and with the objective of improving the quality of care. In Montreal, in the 3 recently built university hospitals, new design approaches are integrated, and the physical environment is planned to reduce stress for users and ensure their well-being including the patient-centered design approach. In this context, although attention is focused on users seeking care services, we have less knowledge of how this physical environment is experienced by health professionals [12, 18, 23]. This research examines the issues related to the daily stress of professionals providing care in hospitals, an environment that is becoming increasingly complex. Goals include understanding how the professionals live in their work environment, how the design of contemporary hospitals and some technology attributes facilitate their work and affect their well-being. We delimited our study to the case of the care unit in one of the three newly built CHU in Montreal, in which several innovative and technological elements have been introduced to enable this hospital to provide advanced care such as logistical, medical, human and in collaboration with the health network innovations. These include a new smart computer system to ensure continuity in the replenishment of medical equipment and supplies in the utility rooms of care units, telecommunications infrastructure, the on-call system used in patient rooms and all clinical environments, a pneumatic transport contributing to the functioning of the hospital, and healthcare professional's work, etc. Located in downtown of Montreal, the new CHU is composed of several buildings, including the hospitalization pavilion "D" where are located the care units (8th to 20th floor). This CHU, opened in September 2017, and includes now around 3 741 nurses, 956 physicians, 74 pharmacists, 74 dentists and 2 089 other health professionals such as physiotherapists, nutritionists, etc.

4 Methodology

This exploratory research is conducted in a constructivist approach. It is limited to 2 hospitalization units in one of the major contemporary CHU in Montreal, because of the large size of these hospital. Data collection was conducted throughout the day (3 shifts), every day of the week, including weekends during 3 months from august to November 2018, and we proceeded in stages. First, we observed the physical setting and analyzed this existing environment. Second, we observed health professionals in their work environment to understand their spatial behavior in their work environment in relation to the environmental attributes that existed during the various shifts. During these observations of the spatial behavior of healthcare professionals, we observed, among others, the displacement of these professionals and quantified these movements of 6 healthcare professionals observed in the two care units. In the third step, after

observing the variety of health professionals working in each of the two care units studied, we interviewed 44 participants (physicians, pharmacists, physiotherapists, occupational therapists, nutritionists, nurses and beneficiary attendants) among these professionals. These interviews were completed by the mental map, where we asked these professionals to draw the attributes of the environment, they felt important in the care unit and/or this hospital. The selection of these care units was based on the receptivity of the study by the head-unit managers who welcomed our study and agreed to collaborate in this study by informing the professionals affiliated in their care unit of the extent of our study and its steps. Analysis method are based on a comparative and interpretive approach, for a thorough description of the essence of the lived experience of health professionals. We conducted a phenomenological analysis to reveal the hidden meanings of the description of the experience lived by health professionals at the new CHU [10]. We essentially followed an inductive and synthetic approach. However, we highlighted categories of themes that were subsequently compared with existing data in the scientific literature [12, 20, 25].

5 Results and Discussion

The results of this research identified attributes of the hospital environment that negatively or positively affect the well-being at work, and the work of health professionals. For the shape and volume of the hospital, even if the majority of professionals evaluated the size of the spaces and the connections between the various pavilions as unfavorable elements to facilitate their work and well-being, they consider the hospital as a reference in terms of design and architecture in the greater Montreal area. The hospital with its curtain walls and the height and volume of the building have a symbolism of modernity and renewal with the hospital's architecture in Montreal for most of these professionals. They generally consider their working environment relatively functional but with negative elements in the spaces dedicated to healthcare professionals. The existence of a ceiling lift in patients' rooms and a wheeled lift inside the care unit is a facilitator of professional work and ensures the safety of professionals in terms of workplace accidents, particularly for low back pain.

Related to the linear spatial organization of the care unit with decentralized workstations and the big size of this CHU, some technological elements introduced in the care units constitute a facilitating element of the healthcare professional's work, such as the pneumatic transport, the existence of screens - indicating patient's admission. However, other technological elements hinder the work of these professionals, such as the patient call system, which is not very effective in ensuring quick professionals' responses to patient requests and makes the workstations noisy and stressful. That is also the case of a single telemetry monitor in the care unit which does not facilitate the work of these professionals. In order to reduce stress in their work environment, the healthcare professionals, suggested a whole automated patient record to reduce lose of time searching for patient record and improve their productivity.

An obstacle in the intermediate care area is that health professionals do not have control over all semi-intensive care patients due to the layout of the healthcare unit. They find this spatial configuration of the workstation negative in terms of patient

control. They are always required to check the patient's condition and move between two rooms. However, the ratio of 2 patients only for nurse helps to provide quality patient care. In another part, some equipment and materials used by these professionals are not ergonomic, such as double lockers in clean utility rooms and the layout of workstations (computer workstations) in the main nursing workstation in the north unit, and the concentration of pneumatic transport, storage furniture and lockers behind these computer workstations.

Noise has emerged as a stressful element in this work environment [25] because of some technological elements such as, in the intermediate care area the alarms, which are constantly ringing, are particularly stressful, more for evening and night shift professionals. Participants indicated that compared to the old hospital of this CHU, the sound of each monitor did not go everywhere, and the ring tones of calls are better perceived. The assistant in the old hospital first responded to the patients and then notified the professional through the existing interface in the rooms. But, the noise reduction measures in the environment of the new CHU's care unit use a discreet patient call system insofar as professionals who work with patients or nurses are not alerted by means of an aloud communication system to avoid creating a noise nuisance, but this call system is not very effective because these professionals do not have visual and acoustic control of the environment and take more time to respond to patients' requests. This waiting time can be 7 to 8 min during periods when professionals are busy with another patient and these colleagues cannot meet the patient's request due to the relatively high patient ration contained in the spatial configuration of the care unit. This long waiting time makes ring tones a nuisance for healthcare professionals who are installed in or near nursing workstations. Patients in rooms located near the nursing workstations must feel this noise discomfort, but this study did not measure this element.

Innovations and changes in the practice of care is in permanent installation. Healthcare professionals, in particular, nurses and beneficiary attendants have difficulty keeping up with these permanent changes.

The perception of this work environment has resulted in a mental map as a work environment with ergonomics problems (7% of participants). It shows that the main workstation in the north care unit with functional and ergonomic problems around pneumatic transport, telemetry and computer workstations. With the storage space behind the professionals sitting at the posts, these professionals are disturbed by the professionals who pass behind them to use the storage and or technological equipment.

The adaptability to the physical, technological, social and organizational work environment is a key element of the health professionals' experience at the new university hospital and collegiality within work teams is one of the solutions for adapting to the work environment at the new university hospital.

6 Conclusion

This study contributes to creating a portrait of the actual lived experiences of the healthcare professionals and the methods used bring out issues related to the quality of care experienced by of these healthcare professionals related to the physical

environment and the technology/innovation. The introduction of new technologies and continuous innovation in the hospital work environment extends the period of adaptation of health professionals to their work environment. These innovation and technology must be adapted to the physical context of the hospital in terms of spatial organization and layout of the care unit. We limited our research in one CHU in which we explored only two care units despite its size and the large number of health professionals. The number of participants may be a limitation, but our sample is representative of the fact that a diverse range of types of professionals were recruited in the study. The results of this research can be verified in other care units of this new CHU to see if other results emerge regarding technological attributes and the physical environment from the lived experience of health professionals.

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