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Towards socially sustainable healthcare facilities – the role of evidence-based design in regeneration of existing hospitals in Serbia

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Abstract

Social sustainability of existing healthcare (HC) facilities in future will depend on their ability to improve quality and design towards user-oriented performance. Evidence based design presents an adequate tool for analyzing existing and future design of HC facilities. Hospitals in Serbia are in a bad condition, and each year less people are choosing to be treated in public hospitals.

The purpose of this paper is to analyze current design problems by evaluating the social sustainability of existing hospital facilities in Serbia and suggest possible guidelines for further research in this area. The biggest healthcare facility in Serbia called Medical Military Academy (MMA) was selected as a case study. A group of key stakeholders consisted of patients, non-medical and medical staff from the MMA hospital were selected to collaborate. Both qualitative and quantitative methods were used. The methodological framework consists of: fundamental literature review, participant observation, extensive interviews, and surveys. Further analyses were conducted in form of quality assessment from the perspective of aforementioned stakeholders, based on specific set of criteria, divided in two main categories: comfort/distribution and safety/humanization. This evaluation is achieved through technical analyses and qualitative surveys using questionnaires. The preliminary findings identified several key problems in existing design of the hospital, regarding both global social sustainability and specific critical areas. This paper presents in-depth analyses and first assessment of existing hospital design of this kind done in Serbia. New model for evaluation social sustainability of HC infrastructure is established. Results of this research will contribute to improving healthcare infrastructure and could present the first step on the path to creating socially sustainable healthcare facilities in Serbia.

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1. Introduction

According to World Health Organization (WHO) health is not simply the absence of disease, and hospitals have great role in enabling physical, mental and social well-being ¹.

Main problems that initiated this research were overall unsustainability of Belgrade HC facilities, lack of strategies and knowledge base, and no research regarding social sustainability, which lead to significant problems during several attempts of hospital regeneration in Serbia ². Current studies are mainly oriented on evaluation of either economical or environmental aspects of sustainability, so this research will be focused on assessment of social sustainability of Belgrade HC facilities.

During the late XX century HC system in Serbia was at high level of sustainability concerning social security and human dignity, while treatments and health care were accessible for everyone ³. However, in this research we are focusing on current state of existing HC institutions. The out-dated HC infrastructure, inappropriate design, with its non-adaptable and non-maintainable buildings, poor performances and overall inadequate conditions resulted in dissatisfaction of not only the employees, but also the patients and their families. Hospitals in Belgrade are currently unsustainable in social terms, and are in desperate need for regeneration. What should firstly be done in order to create integral strategies for reconstructing HC institutions is to create an inquiry method (model) for HC evaluation, so the most important problems for achieving HC social sustainability could be estimated. The next chapters will portray an attempt to resolve such issues.

Patients well-being should present an imperative in the process of hospital regeneration, but the growth of discontent expressed by patients as well as working staff is crucial problem occurring nowadays ⁴. The physical facilities in which healthcare services are performed play an important role in the healing process. If designed properly, a healthcare interior environment can foster healing, efficient performance, effective actions, safe behavior and positive HC outcomes ⁵. It is proven that hospital design can influence clinical results and staff effectiveness in delivering care ⁴. Today, HC design is driven mostly by empirical research connecting hospital environment to HC outcomes, and it is going towards evidence-based design (EBD) ⁶. That is why the concept for renovation and reconstruction on the terms of EBD of these facilities becomes a popular sphere of research, which is expected to endow both key stakeholders and prevailing healthcare results ⁷.

Sustainability is a widely discussed topic, frequently complex to understand and implement into real projects, particularly when coping with a rather difficult and unique design of HC facilities ⁷. A sustainable structure is a structure that can be easily maintained and can be functional from the environmental, social and economic point of view, in order to comply with the diverse interests and needs of all the stakeholders ⁴. But, we can not refer to hospitals just as buildings; we have to take into consideration their crucial and sensitive nature – being the place of healing. Contemporary HC studies offer new approach in defining HC sustainability that is not bound to environmental issues only. Social sustainability has had significantly less attention in public dialogue, and academic research than economic or environmental aspects although HC institutions are making a focal point on patients' and staffs' contentment ⁸. In that sense the sustainability aspect of HC facilities in this research is concentrated mainly on user satisfaction. Although many research studies and evaluation models have tackled this topic from different aspects, significant limitations and problems are still present and we can not properly cope with satisfying actual needs of hospital users ⁹.

The primordial responsibility for designers of HC development is to think of a venue where the feeling of human dignity could be conserved to its maximum. The design of hospitals should consider the needs and preferences of the patients and staff ⁴; therefore evidence based design (EBD) serves as an adequate tool for analyzing existing and guiding future design of HC facilities. EBD is defined by the Center for health design as the process of basing decisions about the built environment on credible research to achieve the best possible outcomes ¹⁰. It is important to diminish the psychological discontent of patients, the impression of anxiety and uneasiness caused by diseases. Respectability in healthcare is making it more lucrative, more prosperous, more accessible and more successful ¹¹. Evidence-based healthcare architecture defines therapeutic and protective atmosphere for patients and enhances family commitment ⁹. It also promotes efficient employees performance. Such type of design finally boosts the organization's clinical, economic, productivity and cultural contentment ¹². According to Luetzkendorf & David ¹³, sustainable buildings strive to achieve health, comfort and safety of users and neighbors. In order to evaluate quality of Belgrade HC infrastructure, from the social aspect of sustainability, we are focusing mainly on previous

statements, as well as on user perspective and experience. Therefore, main criteria used for assessment of Belgrade HC facilities are *comfort* and *safety* of the hospital. The research is done in collaborative nature with a wide range of participants using complex methodology explained in the next chapter. Expected results are providing a methodological model for evaluation of social sustainability of HC facilities, and gathering specific information about hospital in Belgrade regarding this topic.

2. Methodology

In the past decade, almost all HC design evaluation in well-developed countries has been assimilated with collaborative process¹⁴. Therefore this research has mainly collaborative and participatory character. In the frame of EBD and social aspect of HC sustainability methods used in this article are based on the theory of collaborative and participative planning. The main conceptual frames consist of the participative planning theory¹⁵ in which the participation is understood as a process of including all key stakeholders in the process of decision making¹⁶. Considering the sensitive nature of this research, and with the aim of gathering general as well as specific data and results, both qualitative (interviews and observation) and quantitative (surveys and questionnaires) research methods were used. The process of the research, regarding time frame, was divided into these steps:

- background research,
- choosing case study,
- choosing stakeholders,
- conducting interviews,
- defining criteria,
- conducting the survey, and
- analyzing results

The methodological framework started with aforementioned background research through extensive and fundamental literature review, research of previous empirical studies and strategies regarding hospital design, social sustainability and user satisfaction. Content analysis of these documents served as basic information for conducting interviews with stakeholders, and forming criteria.

HC facility called *Vojno Medicinska Akademija* - Medical Military Academy (MMA) was selected as a case study, because of its characteristics and significance to HC system in Belgrade. With the area of 21 hectares and 180.000 square meters, 3000 employees and capacity of 1200 beds, MMA is the biggest monoblock hospital in Serbia. Regarding achievements in treatments, education and magnitude this institution had international reputation³. In the period of its construction, MMA represented the power of state and HC system in Serbia, with its modern structure and technologies both from the functional and the architectural point of view². Today, based simply on user observation, we can argue that MMA has significant problems in the domain of design, indoor and outdoor spaces, and most importantly user satisfaction.

Choosing stakeholders (SH) for this research was rather easy. Based on the quota sampling† method, and with focus on the most relevant and most frequent users, SH were selected. Designers, investors or directors were not asked to participate. A group of key stakeholders consisted of patients and visitors, as well as medical and non-medical staff from the MMA hospital. SH also included expert engineers employed in MMA hospital. A total number of 130 people were participating,

Before conducting any interviews, participant observation technique was used for collecting data on naturally occurring behaviors of patients and staff in their usual context – the hospital. In-depth interviews were optimal for collecting data on individuals' personal perspectives, and experiences, particularly when sensitive topic like this one is being explored. They revealed important information about main problems and potentials of the hospital indoor and outdoor design, care conditions, physical and functional characteristics. Besides from background research and

† Quota sampling, sometimes considered a type of purposive sampling, is common. In quota sampling, we decide while designing the study how many people with which characteristics to include as participants. Characteristics might include age, place of residence, gender, class, profession, marital status, etc.

good practice examples, observation and interviews were main methods for creating specific set of criteria and indicators (C&I) for evaluating social sustainability. This C&I method is used by different governmental agencies and academic researchers to carry out sustainability monitoring and evaluating programs. Indicators are intended to be universally measurable built to respond to the SMART (Specific, Measurable, Attainable, Relevant and Time-sensitive) logic¹⁷.

Various indicators are used to specify each criterion, by establishing a clear connection, from the theoretical and conceptual sphere to the concrete one. So the indicators point out practical, measurable standards that could be used for similar research in different hospitals. Therefore they may differ, as well as the criteria, according to the typology of healthcare facility toward which the sustainability evaluation system is addressed⁸.

Questionnaires and surveys were used for gathering quantitative data and concrete information. The survey was conducted during the period of six weeks, from January to March in 2016. Questionnaire consisted of mainly closed-ended questions based on established C&I network, in order to evaluate the social sustainability of chosen hospital from the user perspective, was given to selected SH. Number of 100 patients with visitors, and 30 members of hospital staff participated, which represent a sample of more than 10 % of all users from the MMA. After this period the results were collected and processed.

3. Results

The results of the research are seen in defining key problems which are necessary to overcome in order for the HC institutions to be socially sustainable. Apart from the key priorities which were similar for all SH groups, over 20 different indicators for evaluation were identified. These results are the consequences of the different local and specific conditions in which every hospital is situated.

Interviews were semi constructed with the aim of gathering specific data. These are some of the questions that guided the interviewing process: What is your overall satisfaction with MMA hospital? Which are the main problems and potential of this hospital?

Interviewed patients are mainly satisfied with comfort, regarding accessibility of the hospital and the connection to the city transport systems. Noise, hygiene, treatments and esthetics of the MMA hospital were listed as advantages especially in comparison to other healthcare facilities in Belgrade and wider in Serbia. However, complex floor plan, poor signalization system and lack of staff lead to disorientation of both patients and visitors, so wayfinding emerged as a significant problem. Although rooms for patients have windows offering daylight and a view, because of the air-condition system these windows do not open, so the lack of fresh air is causing great dissatisfaction among users. Another important issue was no access to open green space in the hospital complex and no recreational places for patients or visitors.

During the interviews with hospital staff the main potential they were focused on is that this type of large-scale monoblock hospital can offer every type of treatment in one building. However, lack of daylight in horizontal communication and long hallways, offices mostly without natural light, lack of oxygen and temperature differences between indoor and outdoor spaces are affecting work efficiency of the staff. Interviews also revealed that there is no specific strategy or plan in case of climate impacts, so the overall resilience of this hospital is rather questionable.

Based on observation, analysis, interviews and background research, a specific set of C&I was established, and divided into two main categories: comfort/distribution and safety/humanization. The first criteria – comfort was described by several indicators such as: connection, accessibility, noise, temperature, natural lightning, air quality, room privacy and equipment, hygiene, support places, wayfinding system, space flexibility, green outdoor spaces, harmony and esthetics, etc. Safety and humanization criteria are defined by security, health promotion and well-being, frequency of hospital-acquired infections, control of disease spreading, and plans and strategies for evacuation against fire and adaptation to climate changes.

The questionnaire (Fig 1) was consisted of 17 questions based on criteria aforementioned, and stakeholders were asked to evaluate their satisfaction with grades from 1 to 5 (1 being the least satisfied, and 5 being the most satisfied with) for every question¹⁸. The results of the evaluation conducted via this questionnaire are shown in Table 1 and 2.

Questionnaire for evaluation of hospital social sustainability

The oral consent script has been read and consent given?
 yes

Would you mind telling me if you are:
 patient / family or friend of a patient
 member of staff (doctor/nurse/expert)

Please answer to following questions: **(mark your level of satisfaction by choosing grades from 1 to 5, 1-completely unsatisfied, 2 – unsatisfied, 3-satisfied, 4-very satisfied, 5- completely satisfied)*

How are you satisfied with accessibility of the hospital? 1 2 3 4 5

Fig.1. Part of the questionnaire used in this research.

Table 1. The results of evaluation of patients’ satisfaction with selected criteria.

Criteria	Indicator	grade 1-%	grade 2-%	grade 3-%	grade 4-%	grade 5-%	average grade
comfort (distribution)	connection	0	3	12	45	40	4.22
	accessibility	3	12	19	24	42	4.02
	noise	0	8	18	48	26	3.92
	temperature	19	33	29	13	6	2.54
	natural lightning	22	40	25	10	3	2.32
	air quality	31	41	28	0	0	1.97
	hygiene	0	6	15	40	39	4.12
	privacy	2	16	29	38	15	3.48
	wayfinding	44	28	20	8	0	1.92
	space flexibility	11	23	35	17	14	3.00
	green outdoor spaces	0	2	33	35	30	3.93
	harmony and esthetics	0	0	9	41	50	4.41
safety (humanization)	security	0	4	11	41	44	4.25
	health promotion	0	10	17	46	27	3.90
	disease control	0	5	17	39	39	4.12
	evacuation plan	17	22	40	14	7	2.58
	adaptation strategies	17	25	45	8	5	2.59

The results of this questionnaire are presenting individual grades and average grade for each criterion from the perspective of patients and staff. They clearly show main problems of the hospital sustainability in Belgrade, and specific problems that are concerning social sustainability of MMA. Overall, participants are satisfied with certain elements, such as accessibility, connections, harmony, aesthetics, hygiene, security, open green spaces, health promotion etc. However, there are numerous criteria with grades bellow average. Patients from MMA find wayfinding systems as most unsatisfying criteria, while they agree with employees on the lack of natural lightning inside the hospital and no clear plans and strategies for evacuation and adaptation to climate change. Both patients and staff have stated that they are least satisfied with air quality, considering there is no fresh air inside the hospital due to air-conditioning system.

Table 2. The results of evaluation of staff satisfaction with selected criteria.

Criteria	Indicator	grade 1-%	grade 2-%	grade 3-%	grade 4-%	grade 5-%	average grade
comfort (distribution)	connection	0	0	2	12	16	4.80
	accessibility	0	0	0	7	23	4.77
	noise	0	2	8	14	6	3.80
	temperature	8	15	6	1	0	2.00
	natural lightning	5	14	7	3	1	2.37
	air quality	10	17	3	0	0	1.77
	hygiene	0	0	4	14	12	4.27
	privacy	0	2	8	12	8	3.87
	wayfinding	0	0	3	21	6	4.10
	space flexibility	0	7	12	10	1	3.17
	green outdoor spaces	0	0	0	12	18	4.60
	harmony and esthetics	0	0	4	8	18	4.47
safety (humanization)	security	0	0	7	15	8	4.03
	health promotion	0	0	2	7	21	4.63
	disease control	0	2	7	12	9	3.93
	evacuation plan	2	9	14	5	0	2.73
	adaptation strategies	5	13	11	1	0	2.27

4. Discussion

In the text, special attention was brought to the representation of the methodological process of the research, which clearly implies how and in which manner, the final results were obtained. Also, many methods were applied, so it may very well be said that the chosen basic unit of analysis was adequate concerning the starting research question, and that a clear connection between the research question and hypothesis was presented. Research process presented could serve as a new model for evaluating hospital design quality. Using both qualitative and quantitative methods enabled gathering locally specific information, but also providing general conclusions. Presented methodology identifies both social sustainability level and specific critical areas, presenting good knowledge base for developing possible strategic solutions to improve overall HC sustainability. This kind of research produced findings that are applicable beyond the immediate boundaries of the study. The methodological problem regarding this research was of multiple nature. Firstly, it is quite certain that there were challenges while posing the research questions. Secondly, how to determine relevant criteria, that are at the same time specific for the selected hospital and participants, and could be universally used in similar researches in different regions. Thirdly, how to interpret the obtained results and rank them. For the needs of responding to the general research question, as well as the ones derived from the recognized methodological issues, numerous scientific methods and tools were used.

Finally, the question remains, which SH were selected and are their assessments of an objective or subjective nature? Despite the numerous advantages of using the collaboration methods, certain shortages of this method can influence the adequacy and accuracy of presented results. Participative process is conducted in a public sphere, through dialogue and surveys¹⁶. It connects different participants in realizing common problems, goals and visions. However, the significance of social sustainability is not the same for different groups of people. In different societies there are different levels of articulation, availability and preparation of the relevant people regarding commitment, as well as the degree of inequality concerning social sensitivity¹⁹.

5. Conclusions

This research is based on current paradigms in design and reconstruction of HC facilities, and growing problem with sustainability of Belgrade HC infrastructure. Evidence-based design has been associated with significant improvement in healthcare facilities outcomes. Main goal of the research was to identify the role of EBD in the hospital regeneration process through evaluation of current HC design, from the perspective of users. Assessment of HC design was focused mainly on social aspects of sustainability and regarding its sensitive nature numerous methods had to be used in order to gather relevant results. Examples from different European studies guided in similar conditions, along with extensive interviews with hospital users resulted in established set of criteria and indicators for evaluating social sustainability of hospitals. These C&I base is a combination of world practice and locally specific circumstances, so it can be used in different researches, but it also revealed significant problems regarding Belgrade HC design sustainability. Results are not only showing average satisfaction grade, but are presenting individual responses of participants. In addition to defining these facts and conclusions, it was also envisioned to provide them in order to establish the bases for further research on the social nature of hospitals on a strategic level of planning.

However, social sustainability of HC institutions in Serbia has never been researched or evaluated, nor taken into consideration while reconstructing HC facilities, so this was quite a pioneer step. Considering overall state of healthcare facilities in Serbia, regarding the significant discontent of hospital users, the possibility for improving sustainability of HC facilities is of key importance for adequate and efficient providing of HC protection, so we consider this kind of research urgent and necessary.

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