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New Requirements for post-COVID-19 Hospital Inpatient Wards: Evidence, Design Recommendations and Assessment Tools

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Parole chiave: Reparto ospedaliero; Infrastrutture Sanitarie; Benessere; Camera Singola di Degenza; Comfort; Esperienza dell'Utente; post-COVID-19

Abstract

Background. *The evolution of hospital infrastructures highlights the need of its physical space to respond to new technological, societal and epidemiological transformations such as those following the COVID-19 pandemic experience. Although the new emerged needs of user-centeredness, comfort and wellbeing within specific functional areas, there is still a lack of measurable indications for addressing these challenges in-patient wards.*
Study Design. *The objective of this study is therefore to provide specific guidelines for the design of the in-patient ward, through measurable criteria and indicators based on evidence from the scientific literature, and to develop an assessment tool for its evaluation.*
Methods. *A five-step process has been followed: (i) performing a literature review about hospital wards and wellbeing strategies, (ii) conducting a best practice analysis and comparison of a selection of international contemporary healthcare facilities, (iii) defining some dimensional requirements from the comparison, (iv) developing an assessment tool based on extracted criteria, (v) testing the tool on an existing project.*
Results. *Amongst the criteria, several aspects have been highlighted ranging from qualitative indicators, as the clarity of wayfinding or the level of privacy, to quantitative values, as the percentage of single inpatient rooms or the distance between rooms and nursing stations. The assessment tool is composed by 20 indicators, associated to thematic areas and referred to three environmental units of the inpatient ward. Two types of scoring system are proposed.*
Conclusions. *Starting from those considerations and tool wider applications, the future design of hospital wards could follow guidelines addressing user-centeredness, comfort and wellbeing.*

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Introduction

Healthcare infrastructures research in the post-COVID-19 era

Healthcare Design research is growing worldwide and several empirical studies have been conducted to understand the relationships between the built environment and patient or staff wellbeing. Such research field is referred to the approach of Evidence-Based Design (EBD), as the capacity of designing a facility explicitly informed by the most recent scientific research to contribute in obtaining the best possible outcomes. In practice, such aspects are still widely neglected, privileging the functionality and affordability of design solutions, with lack of measurable indicators to verify the project quality, as the ability to achieve the design objectives and support clinical governance for the improvement of the healthcare service quality, promoting users' health and wellbeing (1,2). The research gap in this field is currently identified as limited analysis and guidance on social aspects of the hospital design, sometimes referred to as "humanization" aspects or "social quality" (3). Additionally, arises the lack of comprehensive research and practical indications focusing on critical elements related to both patients and staff as well as a lack of measurement tools for specific areas of the hospital (4).

In particular, the post-COVID-19 era has witnessed significant transformations in healthcare infrastructures worldwide. The pandemic highlighted the need for resilient and adaptable healthcare systems to respond effectively to global health crises. These new functional and organizational needs are the result of an intense period of challenges of critical support services, interrupted supply chains, staff shortages and communications' difficulties within the pandemic.

The demand for COVID-19 beds in acute care departments globally surged, forcing healthcare settings to adopt contingency capacity strategies, including adaptations of spaces to medical care, bypassing staffing constraints, and contrasting supply shortages in a way that could increase capacities without significant impact on medical care delivery (5). The pandemic poses a challenge to the physical and mental wellbeing of doctors and medical staff worldwide and several studies explored these characteristics (6-8).

Today, after this acute period, in a new-normal era, new needs are emerging from the patient perspectives in terms of user centeredness, comfort and wellbeing.

In particular, there is a need for more research on designing hospitals that prioritize the patient experience. This includes factors like wayfinding, privacy, comfort, noise reduction, and the creation of a calming and healing environment (9, 10).

Hospital design should also address the well-being of healthcare professionals, understanding how the physical environment affects staff productivity, job satisfaction, and overall well-being. Designing spaces that promote collaboration, reduce stress, and enhance efficiency can contribute to a positive work environment (11).

Finally, hospitals need to be adaptable and flexible to accommodate changes in healthcare delivery and advancements in medical technology. Research support is needed on designing spaces that can easily adapt to future needs, such as modular designs, flexible room configurations, and scalable infrastructures (12). These concepts are broadly discussed in collective research papers, education and research centers, institutions and companies in the healthcare infrastructure supply chain such as the Joint Research Partnership on Healthcare Infrastructure (JRP) or the Technical Brief of the World Health Organization (WHO) about the Hospital of the Future in the European Region (2, 13, 14).

Research gap and objectives

Addressing these research gaps would provide valuable insights into the design of hospitals that go beyond clinical aspects and create environments that optimize patients', staff's or caregivers' well-being. The issue of improving the performance of building complexes in use therefore arises with intensity, together with the growth of EBD which 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" (15).

The multiplicity of punctual and specific cases does not allow the formulation of standardized design solutions; however, it is possible to identify some general intervention strategies that can be applied in diverse cases. The specific purpose of this paper is to develop an assessment tool for evaluating inpatient ward design and implementation phases of a healthcare facility, with specific regards to recent indicators in the post-COVID-19 era.

Methods

Research Methodology

Within an EBD approach both scientific literature and best practices have been explored (16). The

research plan followed a five-step process: (i) detailed literature review about hospital wards and wellbeing strategies, (ii) best practice analysis and comparison of international contemporary healthcare facilities, (iii) definition of architectural paradigms and dimensional requirements from the comparison, (iv) development of an assessment tool based on criteria emerged from the literature, (v) tool application to an existing project (Figure 1).

Literature Review

The review has been conducted according to the following steps: identifying the research question, identifying relevant studies, selecting studies, charting the data, and collating, summarizing, and reporting the results. The pandemic disrupted healthcare operations and accelerated the processes of innovation and transformation. The search strategy was determined iteratively by applying different key words related to innovation and wellbeing in healthcare infrastructure or hospital wards. Only studies and reviews that attempted to examine the "hospital ward" or "healthcare infrastructure" and the "innovation" or "wellbeing" were included (Table 1).

Reviews published before 2000 were excluded. Only articles about the following subjects were considered: Nursing, Social Sciences, Health Professions, Environment, Psychology, Decision Sciences, Arts&Humanities, Multidisciplinary, Neuroscience, Energy, Materials Science, Immunology and Microbiology. All adult hospital environments were considered. In addition, grey literature for key technical sector and journals (e.g. Academy of Architecture for health, Progettare per la Sanità) have been referred. Articles about specialistic wards such as maternity settings, psychiatric wards or nursing management were excluded. All the selected papers had a relevant connection with hospital design, physical environment, health and ward solutions, in particular after COVID-19. Including "Hospital ward" in this phase narrowed the search. Using the "keywords" search in Scopus, several articles have been collected and stored. Titles, abstracts and keywords of the selected articles have been critically read and processed according to some exclusion criteria (Figure 2).

Towards this clustering process, 17 articles have been included in the analysis (Table 2). After detailed screening the papers have been grouped and associated to 3 thematic areas also linked with the thematic working group of JRP HI. From this selected list, a series of criteria and indicators have been extrapolated. Some of those have been approached by multiple scientific journals and have therefore appeared from

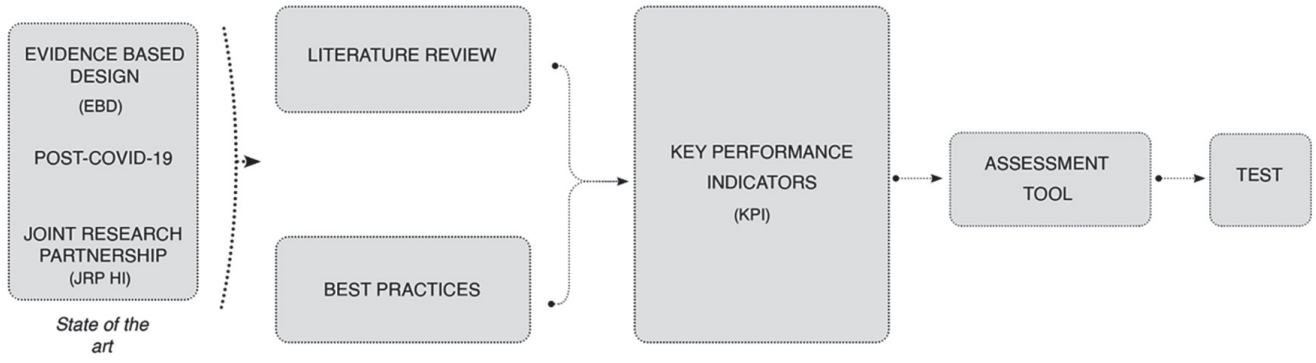


Figure 1. Flowchart of the research methodology.

Table 1. Searching rules and selecting criteria for the literature review.

Search string	Selection Criteria	Outcomes
"HEALTHCARE FACILITY" OR "HOSPITAL WARD" AND "INNOVATION" OR "WELLBEING"	• Focus on healthcare facility • Relation to physical environment, health and wellbeing • English language • Published after 2000	17 references about the criteria and strategies of patient centered design (full list in Table 2)

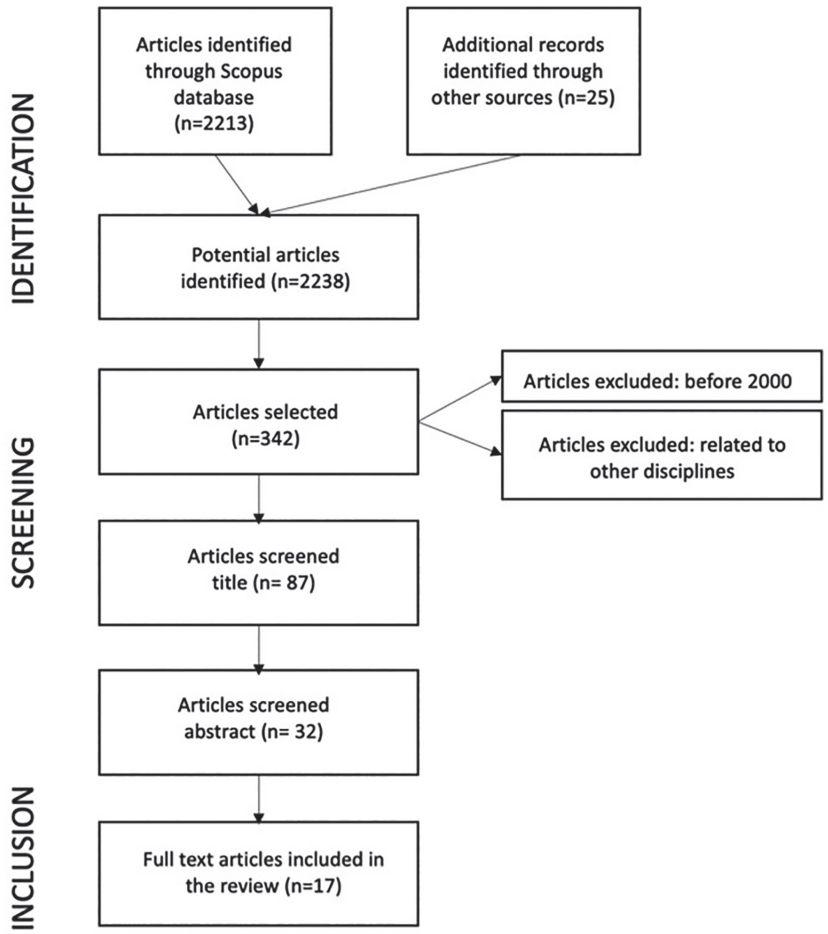


Figure 2. Prisma flow diagram of literature search.

multiple perspectives. Each aspect has been further investigated and verified through snowballing on additional references.

Best Practice Analysis

To complement literature analysis, a best practices investigation was conducted, focusing on the inpatient units within five contemporary hospitals selected for their recent development or renowned characteristics in technical or design aspects, as well as availability of information . The five selected case studies were:

Hospital 1. Haraldsplass Hospital | 2012 Bergen, Norway | C.F. Møller Architects
Hospital 2. The General Hospital of Thessaloniki | 2023 Greece | Renzo Piano Building Workshop
Hospital 3. Martini Hospital | 2007 Groningen, Netherlands | Seed Architects
Hospital 4. New North Zealand Hospital | 2013 |Hillerød, Denmark | Herzog & de Meuron
Hospital 5. D.M. Broggi Hospital | 2010 | Barcelona | PINEARQ

The overarching goal of this analysis was to identify and understand the architectural paradigms and innovative design solutions employed in these crucial healthcare spaces. To achieve this, each of the selected hospitals underwent a detailed case description, including representations of the functional programs that guided their design and layout. A significant portion of the analysis was dedicated to evaluating the typical floor plans of the inpatient wards, which served as the foundation for patient care. These floor plans were critically examined for their layout and distribution typology (17). Detailed measurements were taken of the inpatient areas, service spaces, and circulation zones within each hospital. This data-driven approach allowed for a quantitative assessment of spatial efficiency and functionality. Moreover, the study explored the location of nurses' stations in relation to patient rooms. This aspect of the analysis delved into the impact of layout and proximity on patient care, nurse-patient interaction, and overall staff efficiency. By thoroughly examining and comparing these critical elements, including the representation of functional programs in each case, these best practices analysis aimed to provide valuable in-sights into innovative design approaches in contemporary healthcare architecture. It sought to inform future design endeavors, ultimately contributing to the creation of patient-centered, efficient, and functional inpatient units in healthcare facilities.

Criteria and KPI definition

The result of this rigorous process is the extraction and compilation of a set of criteria extracted from two primary sources of knowledge: a deep dive into scientific literature and a careful examination of best practices in modern healthcare architecture. These criteria, drawn from the specific research and real-world examples, form the foundation for evaluating healthcare facilities, with a special emphasis on inpatient units. A comprehensive set of Key Performance Indicators (KPIs) has been developed and linked to these criteria. Usually employed for facility management or organizational issues, such approach can be

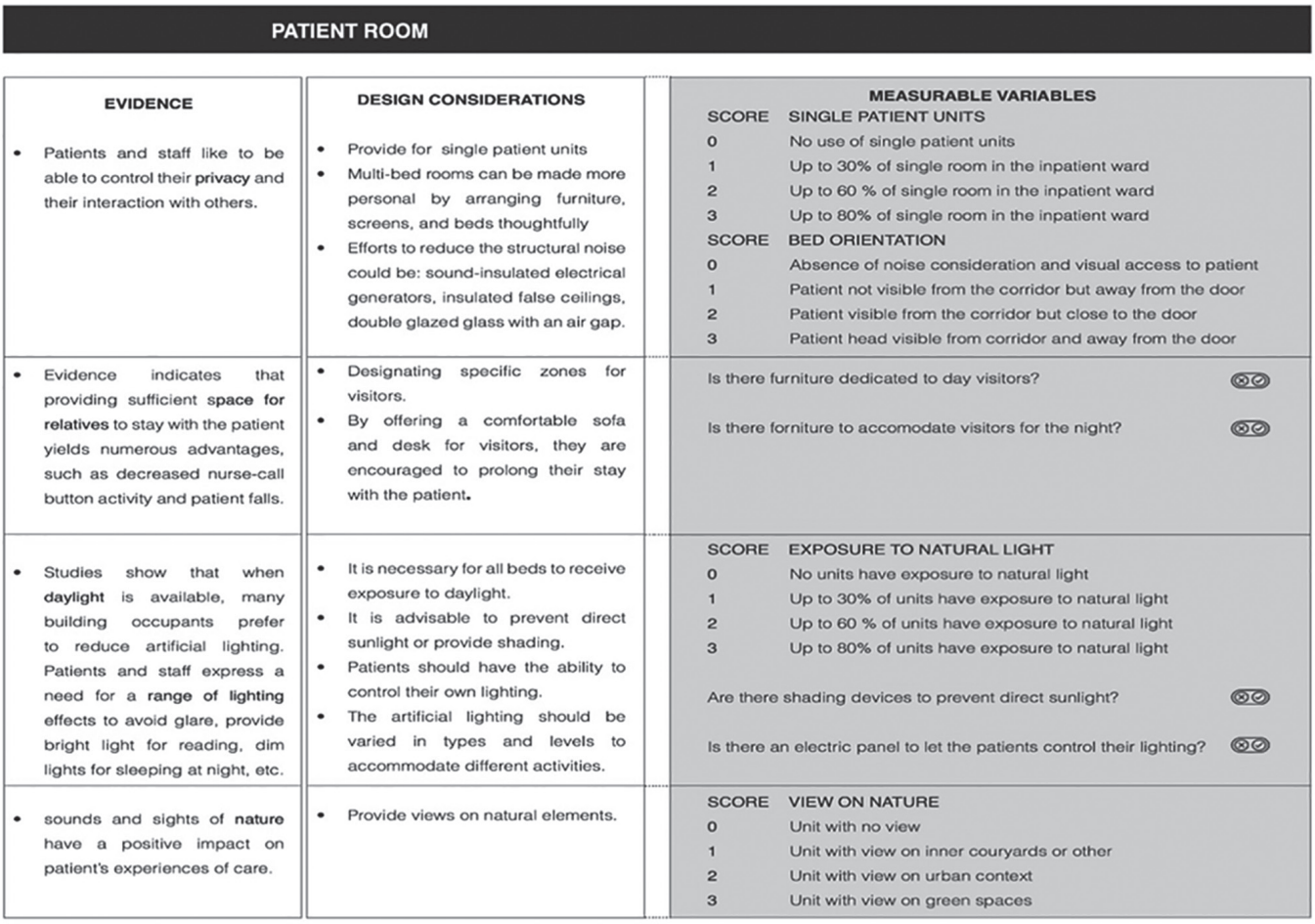
Table 2. Full list of the 17 selected papers included in the analysis.

Year	Authors	Title	Ref. Fig. 4
2007	Joseph, A., & Rashid, M.	The architecture of safety: Hospital design	I
2013	Ander, E. E., Thomson, L.J., & Blair, K.	Using Museum Objects to Improve Wellbeing in Mental Health Service Users and Neurological Rehabilitation Clients	R
2014	Lu, Y., Ossmann, M.M., & Leaf, D.E.	Patient Visibility and ICU Mortality: A Conceptual Replication.	B
2016	Trau, D., Keenan, K. A., & Goforth, M.	Nature Contacts: Employee Wellness in Healthcare	Q
2017	Clark, T., & Combs, S.	A Study of Hospital Inpatient Unit Design Factors Impacting Direct Patient Care Time, Documentation Time, and Patient Safety.	A
2017	Brand, S. L., Thompson Coon, J., Fleming, L. E., Carroll, L., Bethel, A., & Wyatt, K.	Whole-system approaches to improving the health and wellbeing of healthcare workers: A systematic review	F
2017	Aalto, L., Lappalainen, S., Salonen, H., & Reijula, K.	Usability evaluation (IEQ survey) in hospital buildings	O
2017	Giménez, M. C., Geerdinck, L.M., Versteylen, et al.	Patient room lighting influences on sleep, appraisal and mood in hospitalized people	P
2018	Lenaghan, P. A., Cirrincione, N.M., & Henrich, S.	Preventing Emergency Department Violence through Design	D
2019	Cusack, L., Wiechula, R., Schultz, T., Dollard, J., & Maben, J.	Anticipated advantages and disadvantages of a move to 100% single-room hospital in Australia: A case study	H
2020	Bygstad, B., & Øvrelid, E.	Architectural alignment of process innovation and digital infrastructure in a high-tech hospital.	G
2021	Mahmood, F.J., & Tayib, A.Y.	Healing environment correlated with patients' psychological comfort: Post-occupancy evaluation of general hospitals.	S
2022	Alsawaf, E. S., & Albadry, A.M.	Principles for the Sustainable Design of Hospital Buildings	E
2022	Simonsen, T., Sturge, J., & Duff, C.	Healing Architecture in Healthcare: A Scoping Review	N
2023	Lindahl, J., Thulesius, H., Wijk, H., Edvardsson, D., & Elmqvist, C.	The Perceived Support From Light and Color Before and After an Evidence-Based Design Intervention in an Emergency Department Environment: A Quasi-Experimental Study	C
2023	Rossi, A., Brojan Heyman, N., Ortiz Rossi, M., Wolf, S., & White, T.	Exploring the Association Between the Healthcare Design Elements and Physician Well-Being: A Scoping Review	L
2023	Mead, M., & Ibrahim, A.M.	Strategies to evaluate the quality of hospital design with clinical data	M

very effective also to evaluate indoor elements linked to healthcare infrastructures and users' wellbeing (18, 19). These KPIs cover a wide range of metrics, from measurable data-driven aspects to more qualitative evaluations, ensuring a well-rounded evaluation of healthcare environments that goes beyond mere numbers. The framework has been carefully tailored to uncover both the direct and the indirect effects of the identified criteria and KPIs on hospital users, with a strong focus on the patient experience. This approach acknowledges the significant impact that architectural design, layout, and functionality can have on the physical and emotional well-being of patients throughout their healthcare journey.

Evaluation Checklist Development

This phase has been developed as a process that includes insights from both scientific literature, best practice analysis and especially the KPI definition which deals with a specific area of the hospital: the inpatient ward. At this point a tool was crafted in the form of a checklist (20), comprising dimensional requirements and qualitative recommendations that would guide the design of various environmental units within the inpatient ward. These units include critical spaces such as circulation areas, waiting zones, patient rooms, and outdoor green areas, each deserving its own dedicated sheet for in-depth exploration. In particular, Figure 3 presents a framework for the specific inpatient area where is possible to observe the relation between evidence, extracted from research, and the practical design considerations that would shape the healthcare environment. The figure is an example of the assessment tool used and this checklist includes two types of assessments: a scoring system that ranges from 0 to 3, providing a nuanced evaluation, and binary items to



PATIENT ROOM

EVIDENCE	DESIGN CONSIDERATIONS	MEASURABLE VARIABLES
• Patients and staff like to be able to control their **privacy** and their interaction with others.	• Provide for single patient units • Multi-bed rooms can be made more personal by arranging furniture, screens, and beds thoughtfully • Efforts to reduce the structural noise could be: sound-insulated electrical generators, insulated false ceilings, double glazed glass with an air gap.	SCORE SINGLE PATIENT UNITS 0 No use of single patient units 1 Up to 30% of single room in the inpatient ward 2 Up to 60 % of single room in the inpatient ward 3 Up to 80% of single room in the inpatient ward SCORE BED ORIENTATION 0 Absence of noise consideration and visual access to patient 1 Patient not visible from the corridor but away from the door 2 Patient visible from the corridor but close to the door 3 Patient head visible from corridor and away from the door
• Evidence indicates that providing sufficient **space for relatives** to stay with the patient yields numerous advantages, such as decreased nurse-call button activity and patient falls.	• Designating specific zones for visitors. • By offering a comfortable sofa and desk for visitors, they are encouraged to prolong their stay with the patient.	Is there furniture dedicated to day visitors? ⊗⊘ Is there forniture to accomodate visitors for the night? ⊗⊘
• Studies show that when **daylight** is available, many building occupants prefer to reduce artificial lighting. Patients and staff express a need for a **range of lighting** effects to avoid glare, provide bright light for reading, dim lights for sleeping at night, etc.	• It is necessary for all beds to receive exposure to daylight. • It is advisable to prevent direct sunlight or provide shading. • Patients should have the ability to control their own lighting. • The artificial lighting should be varied in types and levels to accommodate different activities.	SCORE EXPOSURE TO NATURAL LIGHT 0 No units have exposure to natural light 1 Up to 30% of units have exposure to natural light 2 Up to 60 % of units have exposure to natural light 3 Up to 80% of units have exposure to natural light Are there shading devices to prevent direct sunlight? ⊗⊘ Is there an electric panel to let the patients control their lighting? ⊗⊘
• sounds and sights of **nature** have a positive impact on patient's experiences of care.	• Provide views on natural elements.	SCORE VIEW ON NATURE 0 Unit with no view 1 Unit with view on inner couryards or other 2 Unit with view on urban context 3 Unit with view on green spaces

Figure 3. Environmental unit dedicated sheet as an example of the assessment tool.

indicate the presence or absence of certain elements.

The ultimate test of the developed tool consists of an application to an existing hospital project. Specifically, it was employed to evaluate a design of inpatient ward floor plan located in southern Italy.

Results

Thematic requirements for the inpatient ward

Among the papers considered five focus on Functional Layout criteria, one concerns the Digital and Technological five papers gave information about Safe and Healthy, four provide considerations about Comfortable and Welcoming also in relation to experienced based design and one is related to Sustainability (Figure 4). The analysis of the selected articles revealed several aspects that focuses on the following thematic areas, leaving the Digital and Sustainability ones to future investigations.

Functional layout: Overall building circulation planning is used to determine the space allocation and to manage the floor plans, such as floor configuration, vertical circulation, and horizontal circulation.

The planning of a patient room is the start of a hospital's internal plan. It will determine the column positions of a hospital's main structure and appearance. Usually, the nurses' station will be located with a clear view of the patient rooms and adjacent to elevators in order to be aware of patient flows and to provide efficient assistance within the shortest time. The space required for medical treatment and services should be taken into consideration when planning the floor layout and circulation to provide a comfortable and safe healthcare environment (21, 22).

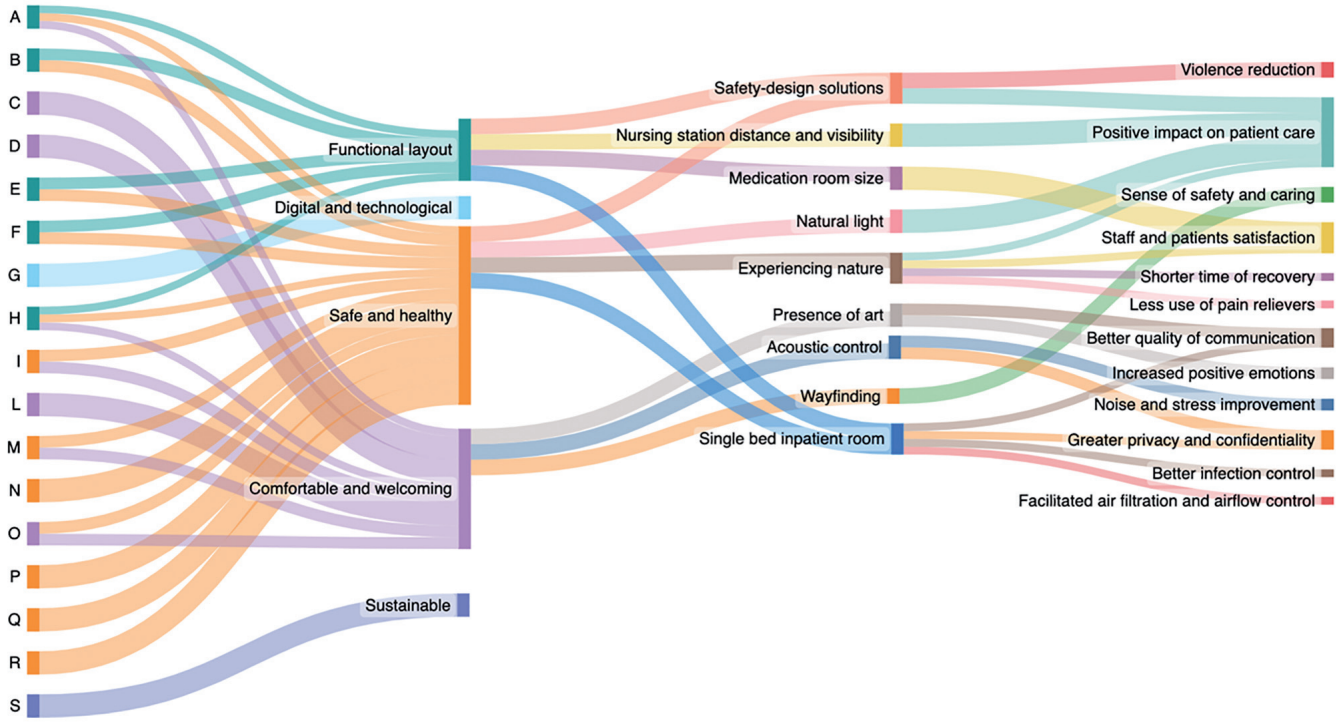


Figure 4. Flow chart of research methodology. Letters stand for the list of articles considered. (Full list in Table 2).

Safe and healthy: The criteria that emerged from the literature are related to safety and health and concern both patients and hospital staff (23). Natural light is with no doubt an aspect of notable relevance since its absence has a negative impact on fatigue (60%) and stress (65%) (24). Large windows and south facing units are the design recommendation to take into account for inpatient units design, focusing on patients wellbeing (25). Experiencing nature is another element which appears in several reviews, starting from seminal Ulrich's studies (26,27). Having contact with nature employees are less stressed and report better health. Sounds and sights of nature have a positive impact on patients experience of care; moreover experiencing nature reduces time of recovery and use of pain relievers (28).

Another relevant indicator on which depends patient safety is the nurse station location: more precisely, distance and visibility. In fact a study reports that between severely ill patient it has been calculated 82% of mortality with low visibility rooms and 64% mortality with high visibility rooms (29). Shorter distance between patient unit and nurse station have a positive impact both on the staff work condition and the patient care (30). Finally, in the paper considered, nurses' ratings were correlated with average distance between the patient room and the closest medication station(s) to accurately test the hypothesis that the nurses would feel that shorter walking distances would support the three patient care goal (21).

Comfortable and welcoming: Since one of the keywords of the research was wellbeing, this thematic area is particularly relevant for this study and it may also be referred as "humanization" (31,32). In particular the review highlighted that neglecting acoustic control compromises patients privacy, while excessive noises causes tiredness and stress to physicians; providing alcoves between units could provide space for consultation and at the same time reduce the spread of noise (21). Quality of sleep is also a relevant factor: patient room lighting influences on sleep, appraisal and mood in hospitalized people; a controlled clinical trial among 196 cardiology ward patients showed how a patient room lighting intervention affects sleep, appraisal and mood across hospitalization (33). In healthcare settings, arts can also support the care process and help to de-institutionalize clinical

environments. Importantly, art practice can empower people to take a leading role in improving their health and wellbeing. It has been pointed out that the presence of art elements have the following impacts on hospital users: increased positive emotions, enhanced vitality and tactile stimulation, improved social skills and sense of identity and it is a significant predictor of physicians health (34). Even colors can possibly affect the brain's activity and create a sense of wellbeing and originality within architecture even if direct and robust relationships are still questioned (35). In the end, clear signage or wayfinding create a sense of safety and caring, other than less need for staff to guide patients and visitors (36). This is why circulation routes should be clear, simple and logical and wayfinding should be as straightforward as possible. A summary of the most important KPIs with relevant impacts and sources is reported below (Table 3).

Dimensional requirements for the inpatient ward

The analysis also focused on the inpatient units key dimensional ratios within five contemporary hospitals. It led to the definition of some dimensional requirements which represent the first step for an overall ward project (Table 4).

Table 3. Indicators and respective impacts on hospital users.

Thematic table	Criteria	KPI	Impacts	Source
Functional layout	Safety and Security	% visibility entry zone	Violence reduction Positive impact on Patient care	(37,38)
Comfortable & Welcoming	Wayfinding (or clear signage)	yes/no	Sense of safety and caring	(36)
Safe & Healthy	Natural light	% of rooms with exposure to natural light	Positive impact on patient care	(25)
Safe & Healthy	Access/view on nature	% sqm outdoor	Staff and patients satisfaction Sense of safety and caring Shorter recovery Less use of painkillers	(28,39)
Comfortable & Welcoming	Presence of art	yes/no	Increased positive emotions	(34)
Functional layout	Acoustics control	Distance unit-nurse station n of alcoves along corridors	Greater privacy and confidentiality Less tiredness and stress	(21)
	Inpatient room	% of single bedrooms	Greater privacy and confidentiality Better quality of communication Better infection control	(40)
	Nursing station	Distance (m) room-station Visibility (% according to degrees)	Positive impact on patient care	(21,29)
	Medication room size	sqm med room/bed	Positive impact on patient care	(21)

Table 4. Comparison of best practice and dimensional relations between functional areas.

International best practices	Inpatient Area (room)	Circulation area	Service/Staff Area	Other
Hospital 1	50%	21%	13%	16%
Hospital 2	28%	27%	20%	25%
Hospital 3	44%	24%	15%	17%
Hospital 4	61%	22%	11%	6%
Hospital 5	53%	20%	15%	12%
Average	45%	24%	15%	16%

Tool application

The checklist has been tested on a floor plan of inpatient ward of a recent hospital project in Southern Italy. Considering both sheets, score and binary items, the results shows that the recent design achieves 80% of the requirements and recommendations provided. Indeed, considering only the in-patient ward, the project is found to have a good level in terms of spatial quality for the users. In particular, with respect to contact with nature, exposure to natural light and adequate number of nursing stations are guaranteed. Patients recover from surgical treatment more quickly and take fewer pain relievers when they can see a view through the window, rather than merely having bare walls (39). On the other hand, it does not meet the requirements with regard to environmental control (sound and light) and the percentage of single rooms. In fact, it turned out that the best condition is to offer 80% single rooms and 20% double rooms, considering the advantages of the first ones with respect to patient privacy, infection control and communication's quality. The full application is available in Annex 2.

Discussion

Assessment Tool development

The study provides a tool for evaluation and design of inpatient care units. The list of parameters are divided into two sections: dimensional requirements and qualitative recommendations for each environmental units, translated into indicators in the tool (Annex 1).

The section Dimensional Requirements (synthesis of the best practices analysis) and the guidelines that follow represent the first step for the overall project design of the area considered (17, 41, 42). On the other hand, the checklist serve both for a preliminary assessment and during project development to evaluate the quality of progress. The importance of evaluation is emphasized as it is an essential step in order to have a starting point for implementing what is most needed (20, 43). This type of tool could facilitate and direct all the entities involved in the realization and construction of hospital complexes: public clients, private clients, architecture studios, technical offices of construction companies and the entire network of companies involved in the health sector (2, 44).

It can be said that measuring quality of hospital design is quite difficult for several reasons: evaluating the impact of hospital design on clinical outcomes requires data from both design and clinical care (30). Architects and clinician researchers could share data and expertise to evaluate hospital design and clinical outcomes. The assessment tool takes the form of a checklist that addresses a number of quantitative and qualitative aspects of ward design (Figure 5). The criteria addressed have emerged from the scientific literature, and can be classified according to the three

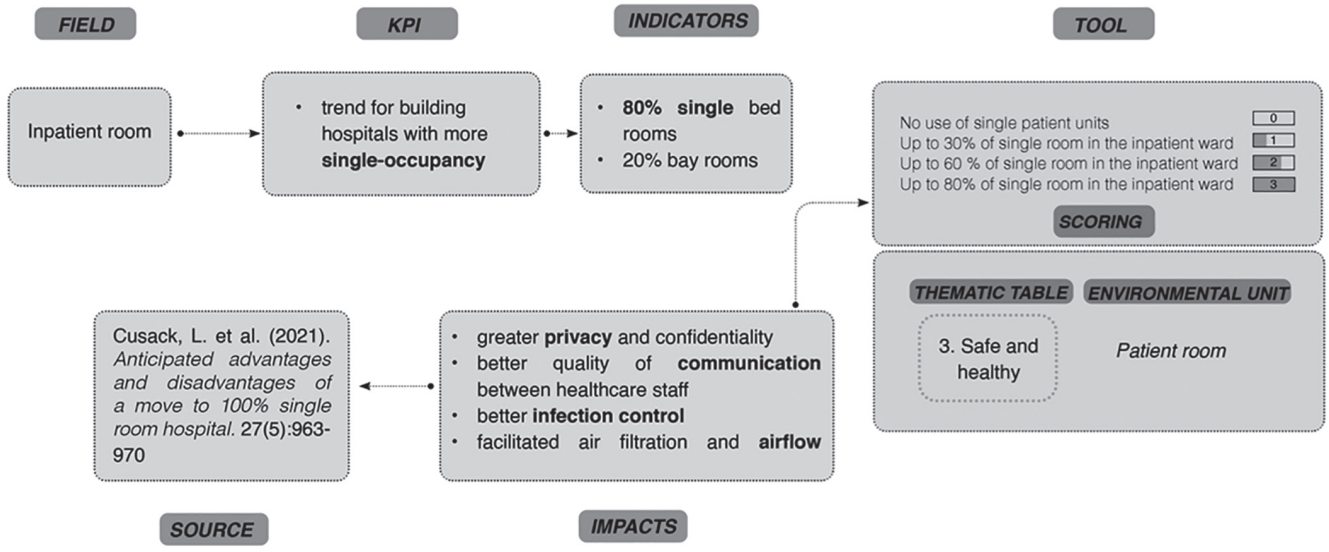


Figure 5. Process mapping of one of the indicators and its translation into the evaluation tool.

thematic areas and attributed to four environmental units of the ward. The resulting score is then associated with a performance level that assumes a certain level of implementation.

Conclusions

Research outlook, limitations and future developments

The study highlighted the possibility of utilizing specific criteria to support the analysis of healthcare infrastructures toward user-centeredness and wellbeing in a post-COVID-19 era. The challenge is to gradually shift from a fully clinical and functional perspective toward a more social oriented approach, taking the users' experience (both patient, staff and caregiver) at the center of the design. The evolution of healthcare infrastructures must embed the most advanced developments of technology and medicine, but at the same time, the different expectations of contemporary society, where the quality of space should not be lower than that of other social collective architectures. The study collected a set of effective design solutions from scientific literature and international best practices defining a method for the evaluation of inpatient units through a verification checklist involving both quantitative and qualitative indicators. The tool could be easily customized for healthcare technical offices, facility managers or health management to evaluate the actual design or ongoing renovations and relate them to the overall clinical governance.

The research does not presume to exhaustively resolve the problems concerning the design and evaluation of spaces supporting healthcare activities, but aimed to develop a simple tool for assessment of inpatient wards and eventually provide guidelines with respect to such specific area of the hospital. The research has been limited to 20 years of publications and only 5 best practices and the test of the developed checklist has been conducted on a single case. Therefore, further research are encouraged to enlarge the sample and increase the replicability of the study.

Acknowledges
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Riassunto

Nuovi requisiti per i reparti di degenza ospedaliera post-COVID-19: Evidenze, raccomandazioni per la progettazione e strumenti di valutazione

Introduzione. L'evoluzione delle infrastrutture ospedaliere mette in evidenza la necessità che lo spazio fisico risponda alle nuove trasformazioni tecnologiche, sociali ed epidemiologiche, come la pandemia da COVID-19. Infatti, sono emerse nuove esigenze di comfort e benessere all'interno di specifiche aree funzionali, ma mancano indicazioni misurabili per affrontare queste sfide nei reparti di degenza.

Disegno dello studio. L'obiettivo di questo studio è fornire indicazioni strategiche per la progettazione del reparto di degenza, attraverso criteri e indicatori misurabili basati sulle evidenze della letteratura scientifica, e di sviluppare uno strumento di valutazione per la sua valutazione.

Metodi. Lo studio è stato sviluppato in cinque fasi: (i) analisi della letteratura sui reparti ospedalieri e sulle strategie di benessere, (ii) analisi e confronto delle best practice di una selezione di strutture sanitarie internazionali contemporanee, (iii) definizione di alcuni requisiti, (iv) sviluppo di uno strumento di valutazione basato sui criteri emersi, e (v) test dello strumento su un progetto esistente.

Risultati. Tra i criteri sono stati evidenziati diversi aspetti sia di carattere qualitativo, come la chiarezza del percorso o il livello di privacy, a indicatori quantitativi, come la percentuale di camere di degenza singole o la distanza tra le camere e le postazioni infermieristiche. Lo strumento di valutazione è una checklist composta da 20 indicatori, associati a tre aree tematiche e riferiti a tre unità ambientali del reparto di degenza, quantificati tramite due sistemi di scoring.

Conclusioni. Partendo da queste considerazioni e da ulteriori applicazioni dello strumento, la futura progettazione dei reparti ospedalieri potrà essere implementata per intercettare le esigenze di user-centerdeness, comfort e wellbeing.

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