



POLITECNICO DI TORINO
Repository ISTITUZIONALE

Health facilities humanisation: Design guidelines supported by statistical evidence

Original

Health facilities humanisation: Design guidelines supported by statistical evidence / Bosia, Daniela; Marino, Donatella; Peretti, Gabriella. - In: ANNALI DELL'ISTITUTO SUPERIORE DI SANITÀ. - ISSN 0021-2571. - ELETTRONICO. - 52:1(2016), pp. 33-39.

Availability:

This version is available at: 11583/2643839 since: 2016-06-14T19:17:09Z

Publisher:

Istituto Superiore di Sanita

Published

DOI:10.4415/ANN-16-01-08

Terms of use:

openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

ANNALI

dell'Istituto Superiore di Sanità
A SCIENCE JOURNAL FOR PUBLIC HEALTH

Publication

Annali dell'Istituto Superiore di Sanità is published quarterly and in special issues.

Annali dell'Istituto Superiore di Sanità is indexed in

- CAB
- CHEMABS
- EMBASE/Excerpta Medica
- FSTA
- MEDLINE
- SCIELO
- SCOPUS
- WEB OF SCIENCE

Annali Editorial Office

Publishing Unit Istituto Superiore di Sanità
Viale Regina Elena, 299 00161 Rome, Italy
Tel.: +39 06 49902945 Fax: +39 06 49902253
E-mail: annali@iss.it
www.iss.it/anna - www.annali-iss.eu

Papers to be presented for publication should be submitted online to www.annali-iss.eu.

Instructions to Authors are available online at www.iss.it/anna.

Publishing support

Il Pensiero Scientifico Editore, Rome
Via San Giovanni Valdarno 8, 00138 Rome, Italy
www.pensiero.it

Subscription information & terms

Il Pensiero Scientifico Editore
Tel.: +39 06 86282324 Fax: 06 86282250
E-mail: abbonamenti@pensiero.it

Year 2016

Italy individual subscription € 57,00 | Italy institutional subscription € 67,00.

Other countries € 67,00

Each quarterly issue € 21,00

Responsibility for the contents and opinions expressed on this journal rests solely with the author(s).

ISSN 0021-2571 (print), 2384-8553 (online)

Coden: AISSAW 52 (No. 1)

©Istituto Superiore di Sanità 2016.

Some rights reserved.



Reg. Stampa - Tribunale di Roma, n. 482 del 29 ottobre 1985 (cartaceo); n. 121 del 16 maggio 2014 (online)



Printed in March 2016 by Ti Printing s.r.l.
Via Case Rosse 23, 00131 Rome, Italy

ANNALI

dell'Istituto Superiore di Sanità
A SCIENCE JOURNAL FOR PUBLIC HEALTH

President of the Istituto Superiore di Sanità

Gualtiero Ricciardi

Responsible Director

Paola De Castro

Editor-in-chief

Enrico Alleva

Istituto Superiore di Sanità

Assistant Editor

Federica Napolitani Cheyne

Istituto Superiore di Sanità

Editorial Committee

Enrico Alleva, Luca Busani, Pietro Comba, Paola De Castro, Paola Fattibene,
Alessandro Giuliani, Giovanni Rezza, Emanuele Scafato, Stefano Vella

Istituto Superiore di Sanità

Editing and graphics

Maria Cristina Barbaro, Alessandra Fuglieni, Federica Napolitani Cheyne,
Ilaria Palazzesi, Laura Radiciotti

Istituto Superiore di Sanità

Editorial Advisory Board

Dino Amadori

Istituto Scientifico Romagnolo per lo Studio e la Cura dei Tumori, Meldola, Italy

Jacqueline N. Crawley

Laboratory of Behavioral Neuroscience, NIMH, NIH, Bethesda, USA

Jean-François Delfraissy

Agence Nationale de Recherches sur le sida et les hépatites virales, Paris, France

Chris Beyrer

Johns Hopkins Bloomberg School of Public Health, Baltimore, USA

Tony Fletcher

London School of Hygiene & Tropical Medicine, London, UK

Sui Huang

Institute for Systems Biology, Seattle, USA

Ana Marušić

Dept of Research in Biomedicine and Health, University of Split School of Medicine, Croatia

Stefania Maggi

CNR Aging Branch Institute of Neuroscience, Padova, Italy

Francesco M. Marincola

Infectious Disease and Immunogenetics Section, NIH, Bethesda, USA

Juana Martín de las Mulas González-Albo

Dpto de Anatomía y Anatomía Patológica Comparada, Facultad de Veterinaria, UCO, Córdoba, Spain

Patrick Smeesters

Université Catholique de Louvain, Louvain-La-Neuve, Belgium

David Vlahov

School of Nursing, University of California, San Francisco, CA, USA

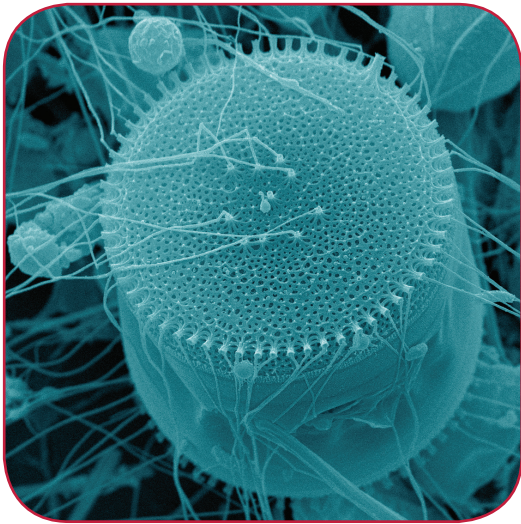
Bernard Zalc (Boris)

Centre de Recherche de l'Institut du Cerveau et de la Moelle épinière, UPMC, Paris, France

Graphic design of the cover: Massimo Delle Femmine, Istituto Superiore di Sanità

The photograph on the cover is a coloured scanning electron micrograph (SEM) showing a single diatom. The diatoms are a group of eukaryotic photosynthetic, single-celled algae, and are one of the most common types of phytoplankton.

The photograph is provided by Lucia Bertuccini and Fabiana Superti (Department of Technology and Health, Istituto Superiore di Sanità, Rome, Italy).



ANNALI

dell'Istituto Superiore di Sanità

Vol. 52, No. 1 2016

Contents

COMMENTARIES

- 1 The priority of Antonino D'Antona in describing rhabdomyolysis with acute kidney injury, following the Messina earthquake (December 28, 1908)
Natale Gaspare De Santo, Carmela Bisaccia and Luca Salvatore De Santo
- 4 Hypochondria, or, the awareness of death that goes against the cure
Leonardo Caffo
- 6 Asbestos contamination in feldspar extraction sites: a failure of prevention?
Fulvio Cavariani
- 9 For an alliance between science, ethics and politics in promoting paediatric trials
Carlo Petrini, Ippolita Rana and Enrico Alleva

MONOGRAPHIC SECTION

Social health: the challenges for healthcare facilities' design
Edited by *Stefano Capolongo*

- 11 Preface
Social aspects and well-being for improving healing processes' effectiveness
Stefano Capolongo
- 15 Social sustainability in healthcare facilities: a rating tool for analysing and improving social aspects in environments of care
Stefano Capolongo, Marco Gola, Michela di Noia, Maria Nickolova, Dario Nachiero, Andrea Rebecchi, Gaetano Settimo, Gail Vittori and Maddalena Buffoli
- 24 A study of human behavior simulation in architectural design for healthcare facilities
Daive Schaumann, Nirit Putievsky Pilosof, Kartikeya Date and Yehuda E. Kalay
- 33 Health facilities humanisation: design guidelines supported by statistical evidence
Daniela Bosia, Donatella Marino and Gabriella Peretti

- 40** Humanisation and soft qualities in emergency rooms
Maddalena Buffoli, Eva Bellini, Marta Dell'Ovo, Marco Gola, Dario Nachiero, Andrea Rebecchi and Stefano Capolongo
- 48** Architectures for paediatric palliative care: how to improve quality of life and environmental well-being
Marco Gola, Paolo Carlo Francalanza, Giulio Galloni, Bianca Pagella and Stefano Capolongo
- 56** Water use and water saving in Italian hospitals. A preliminary investigation
Daniela D'Alessandro, Pierpaolo Tedesco, Andrea Rebecchi and Stefano Capolongo
- 63** Open building and flexibility in healthcare: strategies for shaping spaces for social aspects
Stefano Capolongo, Maddalena Buffoli, Dario Nachiero, Chiara Tognolo, Eleonora Zanchi and Marco Gola
- 70** The implementation of a Community Health Centre-based primary care model in Italy. The experience of the *Casa della Salute* in the Emilia-Romagna Region
Anna Odone, Elisa Saccani, Valentina Chiesa, Antonio Brambilla, Ettore Brianti, Massimo Fabi, Clara Curcetti, Andrea Donatini, Antonio Balestrino, Marco Lombardi, Giuseppina Rossi, Elena Saccenti and Carlo Signorelli
- 78** Addressing decisions about new hospitals' siting: a multidimensional evaluation approach
Alessandra Oppio, Maddalena Buffoli, Marta Dell'Ovo and Stefano Capolongo
- 88** Healthcare for all in emerging countries: a preliminary investigation of facilities in Kolkata, India
Andrea Rebecchi, Marco Gola, Mrudula Kulkarni, Emanuele Lettieri, Ingrid Paoletti and Stefano Capolongo
- ORIGINAL ARTICLES AND REVIEWS**
- 98** Risk factors for dysmenorrhea among young adult female university students
Ana Pejčić and Slobodan Janković
- 104** Emerging trends in consuming behaviours for non-controlled substances by Italian urban youth: a cross sectional study
Roberta Pacifici, Iliara Palmi, Paolo Vian, Alessandra Andreotti, Claudia Mortali, Paolo Berretta, Luisa Mastrobattista and Simona Pichini
- 114** Health services and health literacy: from the rationale to the many facets of a fundamental concept. A literature review
Guglielmo Bonaccorsi, Chiara Lorini, Alberto Baldasseroni, Barbara Rita Porchia and Leonardo Capecchi
- 119** The right to food, food donation and microbiological problems of food safety: an experience in the territory of Florence
Guglielmo Bonaccorsi, Chiara Lorini, Francesca Pieralli, Luca Pieri, Antonino Sala, Tommaso Tanini, Marco Nasali, Beatrice Dall'Olio and Francesca Santomauro
- 123** Technology-based intervention for healthy lifestyle promotion in Italian adolescents
Federica Fraticelli, Daniela Marchetti, Francesco Polcini, Angelika Anna Mohn, Francesco Chiarelli, Mario Fulcheri and Ester Vitacolonna

Brief Notes

- 128** Health risks related to illegal and on-line sale of drugs and food supplements: results of a survey on marketed products in Italy from 2011 to 2013
Maria Cristina Gaudiano, Livia Manna, Monica Bartolomei, Andrea Luca Rodomonte, Paola Bertocchi, Eleonora Antoniella, Laura Romanini, Stefano Alimonti, Leandro Rufini and Luisa Valvo

133 **Book Reviews, Notes and Comments**

Edited by *Federica Napolitani Cheyne*

139 **Publications from International Organizations on Public Health**

Edited by *Anna Maria Rossi*

Health facilities humanisation: design guidelines supported by statistical evidence

Daniela Bosia, Donatella Marino and Gabriella Peretti

Dipartimento di Architettura e Design (DAD), Politecnico di Torino, Turin, Italy

Abstract

Background. Healthcare building humanisation is currently a widely debated issue and the development of patient centered and evidence based design is growing worldwide. Many international health organizations and researchers understand the importance of Patient Centred Design and leading architects incorporate it into the design process. In Italy this design approach is still at an early stage. The article refers to research commissioned by the Italian Health Ministry and carried out by R. Del Nord (Università degli Studi di Firenze) and G. Peretti (Politecnico di Torino) with their collaborators. The scope of the research was the definition of design guidelines for healthcare facilities humanisation.

Method. The methodology framework adopted is the well established need and performance approach in architectural design. The article deals with the results of statistical investigations for the definition and ranking of users' needs and the consistent expression of their requirements. The investigations were carried out with the cooperation of psychologists of the Università degli Studi di Torino and researchers of the Università degli Studi di Cagliari. The proposed evaluation system allows ranking of health facilities according to the level of humanisation achieved.

Results. The statistical investigation evidence collected allowed the definition of humanisation design guidelines for health-care facilities and for the assessment of their specific level of humanisation.

Key words

- humanisation
- healing architecture
- environmental and psycho-emotional wellbeing
- design guidelines
- care facilities

INTRODUCTION

The humanisation of hospitals and socio-medical structures is paramount for the psycho-sensorial comfort of patients and consequently for the clinical success of therapies. Humanisation is a complex concept related to several features of the healthcare system, as many researches have evidenced: doctor/patient and staff/patient communication; organization of the hospital and quality of the physical environment; nursing staff and caregivers' attitudes [1].

The relationship between health personnel, patients and their relatives, access to information, design of spaces and equipment, light and sound, are all specifically important in shaping the positive and patient-supportive, in a holistic sense, environmental system. The understanding of psychological and physical needs of the users (patients, medical staff, relatives, caregivers, technical personnel) is the key to humane design of health structures. All the major international guidelines for hospital design currently acknowledge humanisation of health facilities as a basic factor on medical out-

comes, as well as the innovation of the environmental quality of space organization and hospital design [2, 3].

C. Robert Horsburgh, in his article "Healing by design" published in 1995 in the *New England Journal of Medicine*, stresses the importance of healing architecture and the evidence-based link between hospital design and medicine and states, "medical care cannot be separated from the buildings in which it is delivered" [4].

It is now an established fact that the quality of space and context in health buildings affects the outcomes of medical care and that architectural design of the health facilities is an essential element of the healing process.

There is a vast amount of literature on the subject and, of specific interest, are the studies about the connection between physical spaces and issues like [5, 6]:

- patient safety overall referred to nosocomial infections, medical mistakes and accidental falls;
- pain, sleep, depression, hospitalization quality;
- wayfinding, privacy, communication, social support and patient and family satisfaction;

- accidents in the workplace, stress, working efficiency and all staff satisfaction.

A study to verify the amount of information available in scientific literature about this issue, as that carried out in 2004 at the Texas A&M University and at the Georgia Institute of Technology listed many articles which proved with quantitative parameters the influence of hospital space design on clinical outcomes of patients and comfort of their relatives, medical and para-medical staff. Two aspects were of specific interest:

- a. the analysis of the influence of the hospital environment on stress levels, with negative effects on nervous, endocrine and immune system;
- b. the studies documenting the healing potentials of environmental factors such as light, colour, sights, art, sounds, music and the restorative environment.

There is general agreement on the effects of natural light, both on the visual system and on the nervous and endocrine system, which influence the production of circadian hormones. Experimental studies highlighted a strong link between natural light and clinical profiles of the patients: 22% less painkillers are necessary for surgery patients hosted in naturally well-lit rooms; cardiology patients have a shorter recovery time and a lower death-risk rate when hosted in a naturally well-lit environment [7-9].

The proper use of colours can contribute to patients' wellbeing. Possible access to external gardens, according to author R. Ulrich, influences recovery outcomes. Access to external green sectors is appreciated by all users for the positive distraction effect, and for the emotional recovery from clinical stress-inducing conditions. The green sectors are called "healing gardens", places where healing and cognitive-emotional recovery processes are enhanced [10-12].

Various health institutions and hospital structures in the world deal with patient-centred organization models:

- Planetree, Institute for Family-Centred Care, Philadelphia, Pennsylvania, and Centre for Health Design, California, USA; both with a mission of transforming hospital spaces into therapeutic spaces (healing environment) therefore enhancing clinical results through the use of evidence-based design;
- Maggie's Cancer Caring Centres, UK, founded by the writer Maggie Keswick Jencks who, as a previous cancer patient, initiated a new approach to cancer illness treatment which lead to a new kind of support and care structure for cancer patients;
- King's Fund EHE (Enhancing the Healing Environment), UK, which encourages and supports multi-disciplinary groups, including designers, physicians/hospital workers and patients, to work together with the aim of enhancing the environment where therapy is provided;
- Netherland Board for Healthcare Institutions (NBHI), which supports the activity of the Health Ministry for the research and for the promotion of quality enhancing guidelines of hospital structures.

So it is now an established understanding that humanizing health facilities through the design of spaces is well rooted in the culture of users and decision-makers. What is now needed is systematic scientific evidence to

define a methodological approach for a consistent architectural design process

A research was carried out by the Research Centre TESIS (Università degli Studi di Firenze) under the responsibility of R. Del Nord and by the DINSE Department (Politecnico di Torino) under the responsibility of G. Peretti.

The scope of the research program was to develop "Design guidelines for the humanisation of health-care spaces". The program was commissioned by the Italian Ministry of Health [13].

The guidelines have been drafted in a clear, easy-to-read framework and can be used either for the design of refurbishments of existing structures, or for the design of new structures, and to assist decision-makers to evaluate, control and monitor the quality of projects.

METHOD AND RESULTS

Humanisation of health care facilities

The guidelines are based on the performance design approach and supported by quantitative statistical investigations. The study has been organised in the following stages:

- a. humanisation meaning and state of the art;
- b. definition of methodology;
- c. analysis of user needs and requirements;
- d. statistical investigation and guidelines.

The meaning of humanisation in healthcare facilities, its features as well as operational implications at building/urban/territorial scale, have been defined.

A literature review of the most advanced scientific papers on the subject has been carried out and results obtained by Institutions and researchers have been outlined [14, 15].

A number of significant case studies related to specific environmental features have been analysed, for each specific stress factor: stimulation, coherence, affordance, control, restorative environment [16].

The second part of the study identified and drafted the performance-based requirement specifications.

The features of all users – physicians, hospital nurses, patients and their relatives – have been analysed in oncology, internal medicine departments and territorial medical facilities. In the third part users needs and the requirement specifications are organised for the main areas of each healthcare facility: patient room, waiting room, ambulatory, meeting room, reception, personnel work-station, living room, corridor and entrance, and external spaces. [17] The last part includes statistical investigation and guidelines: in this section the study reports the statistical investigations interviews processing and the final result of the research project, "Design guidelines".

Statistical investigations

To support the definition of the performance design approach framework, a set of direct and indirect investigations on statistically meaningful samples has been carried out, which was also used to rank the derived requirements.

The analysis to validate the information framework and the list of requirements was the task of a special

multidisciplinary working group of researchers with different qualifications: architects, sociologists, medical staff, psychologists. Physicians, nurses, hospital staff, patients and their relatives were interviewed.

The methodology points were:

- field inquiry questionnaires;
- statistical data processing;
- graphic modelling of spatial structures and contexts;
- functional and environmental performance requirements of users and technologies of the health structures.

The interviewees were selected from socio-medical centres in Piedmont, Tuscany, Sardinia and the study was carried out with different techniques: sessions of direct observation in various hospital divisions, semi-structured interviews and surveys on patients, their families and medical personnel.

Specific objectives included:

- mobility of patients and their relatives inside health care facilities;
- professional profiles of employees in different services;
- activities and services provided by various medical professionals and their organizations;
- features, furniture and equipment necessary to carry out different activities and relevance of various aspects of physical spaces;
- interactions between users;
- problems of carrying out activities due to physical and mental conditions of patients and their families,
- problems of carrying out activities due to working conditions of medical staff's physical, mental, psychological and emotional workload;
- particularly significant aspects related to job satisfaction.

The first analysis was carried out with two psycho-oncologists from the Università degli Studi di Torino (R. Torta and L. Varetto) through imaging techniques that allowed the interviewees to express their opinion about the significance of the environmental physical features. For instance, for the day hospital environment, some room types (open, closed, with external view, with view to the medical staff) were proposed to the interviewees asking them to show preferences. Forty-five patients (between 18 and 65 years old) of the Onco-haematology Centre of San Giovanni Battista Hospital in Turin were interviewed. The patients were in follow up status with a value above 80 of Karnofsky Performance Status test. The scope of these direct investigations was to define the behavioural models of the users and identify their needs.

Another quantitative analysis was carried out, using a self-report survey tool, to investigate the needs of users and to allow a quantitative and comparative assessment of their identified needs.

The investigation covered 418 interviews (interviewees between 19 and 87 years old) and focus groups of patients, nurses and physicians in hospitals of two northern Italian towns (Turin and Novara) and in Sardinia (Cagliari). The tool was developed by M. Bonaiuto with his assistants P. Caddeo and R. Truffa of Università degli Studi di Cagliari.

The quantitative analysis assessed the relative weight of the different identified needs, and their qualitative and quantitative influence on the users' perception of medical facilities. The study was specifically aimed at assessing the priority ranking in the users' perception of the humanisation requirements related to the quality of each specific space.

The investigation also focused on expressing the differences among various types of structures and the users involved. This taxonomy allows comparison of the results of the users' experience with data currently identified in literature and design studies [18, 19].

The requirements analysed in detail through interviews and focus groups of selected experts and users were, in the case of ambulatory facilities, the following [20, 21]:

- psychologically supportive space;
- colour of furniture and surfaces;
- home like design;
- microclimate conditions and multimedia control devices;
- personal property safekeeping;
- safety of space usage;
- clear space identity;
- artificial lighting;
- day lighting;
- patient clinical data recovery;
- hand washing facilities;
- caregiver attendance facilities;
- healing capability;
- sight and noise privacy;
- outside view.

It is important (above 7.5 in a range from 0 to 9), for patients and their relatives, in internal medicine department, to use ambulatory spaces in an autonomous way with fittings that allow movement, with acoustic and visual privacy during their conversations with healthcare staff and during therapy procedures, spaces suitable for conversations and psychological assistance with facilities to clean their hands and safely lock away their personal property. Patients in the oncology department consider the last two requirements as most important, while other requirements are deemed to have a lower priority (between 7 and 7.5 in the range from 0 to 9).

The colour of fittings and furniture and the presence of restorative spaces is less important for both departments. Outside view seems to be less important for ambulatories in the internal medicine department, despite one score above the middle of the range (*Figure 1*).

For physicians and nurses views and restorative spaces have a lower value. Home like design ranks low in the internal medicine department but has a higher value in the oncology department. Acoustic comfort, visual privacy and space flexibility conditions rank high for both departments. Space availability for psychological assistance is essential (above 8 in the range from 0 to 9) for the oncology department, while, for the internal medicine department artificial lighting conditions are deemed to be significant to allow ambulatory activities (*Figure 2*).

Compared to patient room data, as a general rule, the values for usability, security, restorative spaces and colour of fittings and furniture are higher, and there is

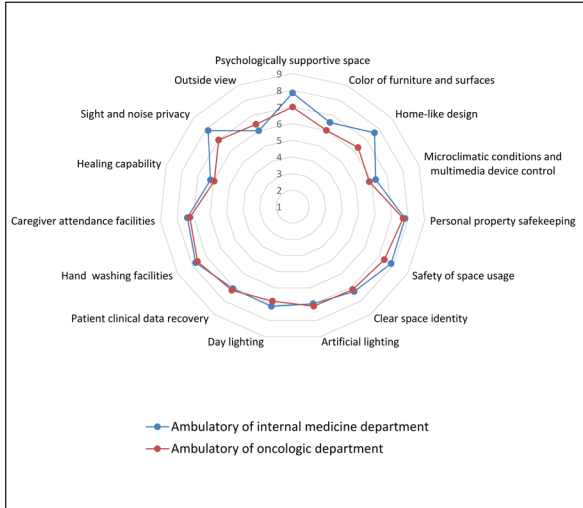


Figure 1
Evaluation of ambulatory requirements by patients and their relatives.

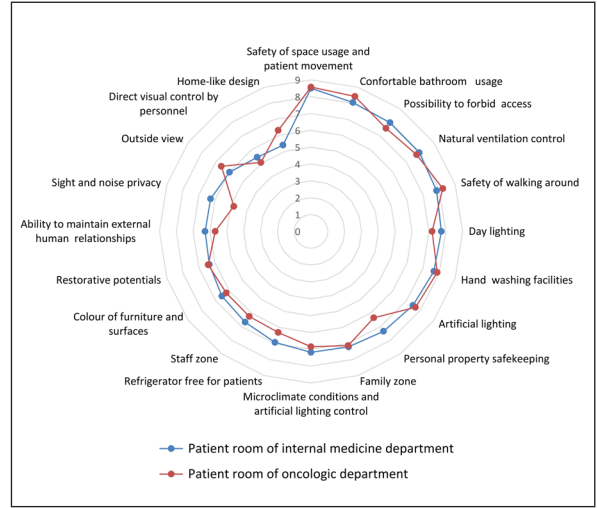


Figure 3
Evaluation of patient room requirements by patients and their relatives.

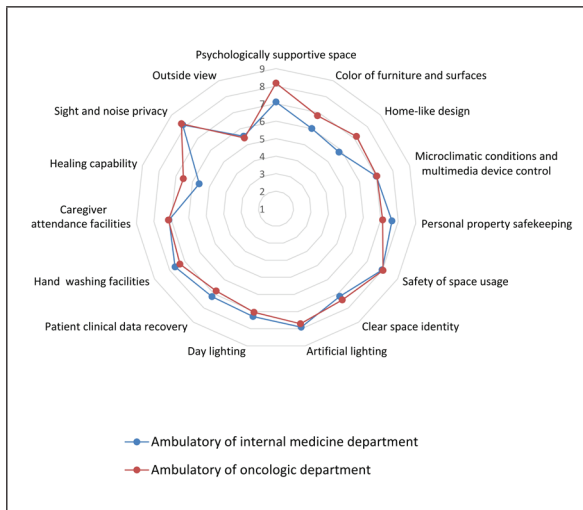


Figure 2
Evaluation of ambulatory requirements by physicians and nurses.

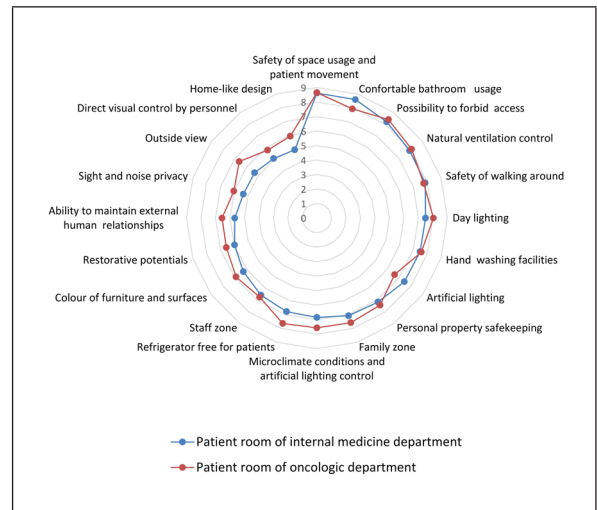


Figure 4
Evaluation of patient room requirements by physicians and nurses.

a wider shift in the assessment. Oncology and internal medicine departments' patients and their relatives consider important the mobility of patients and the possibility for them to move about in the room and to easily reach the bathroom (above 8 in the range from 0 to 9). For the oncology department, patients' privacy during visits and sanitary procedures rank high, whilst visible and acoustical separation from other patients in the room is less important for both departments. A pleasant environment, hand disinfection facilities, comfortable conditions for visiting relatives rank high for both departments (value 7 in the range from 0 to 9). The survey shows some differences between internal medicine and oncology departments users: for internal medicine patients, the safety of personal items is more important; whereas for oncology department patients the external view is more important. The home like design is less rel-

evant for internal medicine department patients, as well as the visual interaction with the staff workstation and the presence of multimedia equipment for recreation and communication with the outside world. Assessments and ranking expressed by physicians and nurses do not substantially diverge from the values expressed by patients, with the exception of visual and acoustic privacy (Figure 3 and Figure 4).

The general conclusion after this investigation is that image technique based inquiries are more reliable than interviews based only on questions not assisted by images, like pictures and renderings, because many hospital users are not able to perceive the relationship between some of these requirements and patient physical and mind comfort and the consequences on clinical outcomes.

Investigation results can be used to weigh require-



ments in the design guidelines of social and health-care facilities.

Guidelines

The guidelines for each of the space typologies considered are organised into three sections:

- scientific and cultural references
- functional features
- design recommendations

Scientific and cultural references

In this part, references and evidences to design recommendations are described through qualitative and quantitative data relating response to the psychological and physical comfort needs of the users to actual features of built spaces [22-24].

General assessment of users' needs is based on their relevance to: safety, usability, privacy, work ease, environment, acoustic and visual comfort [18], safe equipment operation for patient and operator. Other requirements are also considered, such as access to staff areas control, hands hygiene, artificial lighting, colour of furniture and fittings, healing environment and visual control of the patients by nursing staff.

Scientific literature on these issues stresses the importance of allowing patients to live in a somewhat private space; a meaningful feature for interactions with family, other patients and caregivers. Some studies also underline the positive role of visual interaction between the hospital room and other spaces. Such interaction can give the patient a good feedback that can be as important as the outside view [25]. There is evidence that privacy can reduce the need for medical treatment and has a feedback on patients' willingness to carry out clinical tests and submit to medical treatments. Hence privacy improves doctor/patient communication.

Functional characteristics

To develop the design guidelines codes and standards reviewed, local and national regulations have been summarised. Procedures and functional specifications needed for the qualification and official accreditation of healthcare facilities have been described [26].

The following issues and their relevance to architectural design of health care facilities have been described:

- classification of health care activities;
- spaces needed for each activity or medical procedure;
- relationship between health care activities;
- different structures of health care business;
- literature on standards and rules for health care facilities design;
- trends in health care facilities design;
- review of good practices in health care facilities design.

Design recommendations

Recommendations are collated in a worksheet where requirements are described and their relevance to space formal features: shape, site dimensions, internal envelope features, equipment, fittings and furniture needed to comply with humanisation performance requirements. Diagrammatic sketches assist the understanding. Images of optimal configurations are supplied to help architects to choose space design features. Pictures of good design practice are included.

Performance evaluation parameters to quantify the response to each requirement complete the worksheet (Figure 5).

The assessment method developed allows quantification of the supplied performance level, with a specific score (sufficient, good, excellent) for each space and each requirement. The final comprehensive score is the result of the combined weights of each requirement and space.

The method can be used by decision-makers to evalu-

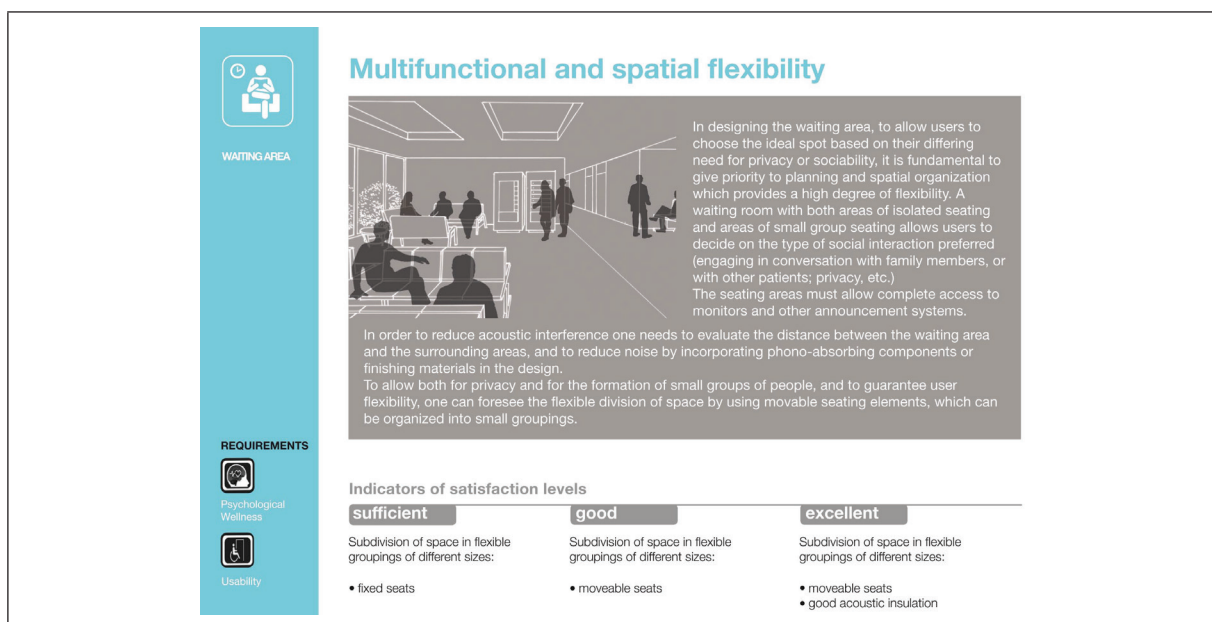


Figure 5

Example of requirement of multifunctional and spatial flexibility in the waiting room: design recommendations and evaluation parameters.

ate projects or by architects to compare their design options and to improve the performance of the facilities. The parameters can be applied to evaluate existing and new health care facilities [27-29]. The evaluation method is supported by software to process all the data and yield comprehensive results.

As an example, the requirements assessed for a waiting room are: reception for different users, multifunctional and space flexibility, surroundings visual control, daylighting, safekeeping of personal items, safe usability, healing potential, water dispenser availability, artificial lighting, finishing, fittings and furniture, colour and external space views.

For privacy, design solutions should consider total or partial privacy levels. For flexibility, design should solve

patient comfort, staff working conditions and patients' disease severity. For visual privacy, design must solve the often conflicting patient and staff requirements.

The assessment method proposed allows choice of optimal trade-offs between conflicting demands: the essence of the complex design process.

Conflict of interest statement

There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of this study.

Submitted on invitation.

Accepted on 18 December 2015.

REFERENCES

- Ulrich RS. Effects of health facility interior design on wellness: Theory and recent scientific research. *J Health Care Design* 1991;3:97-109.
- Ulrich RS. Effects of healthcare environmental design on medical outcomes. In: *Design & Health – The therapeutic benefits of design. Proceedings of the 2nd Annual International Congress on Design and Health* Stockholm: Karolinska Institute; 2000.
- Sadler BL, Dubose JR, Malone EB, Zimring CM. *The business case for building better hospital through evidence based design. Evidence-based design resources for healthcare executives*. Center for Health Design – Georgia Institute of Technology, College of Architecture; 2008. (White Paper Series 1/5).
- Horsburgh CR. Healing by design. *New Engl J Med* 1995;333:735-40. DOI: 10.1056/NEJM199509143331117
- Ulrich RS, Zimring CM, Zhu X, Dubose J, Seo HB, Choi YS, Quan X, Joseph A. *A review of the research literature on evidence based healthcare design. Evidence-based design resources for healthcare executives*. Center for Health Design – Georgia Institute of Technology, College of Architecture; 2008. (White Paper Series 5/5).
- Devlin AS, Arneill AB. Health care environments and patient outcomes: A review of the literature. *Environ & Behav* 2003; 35:5665-94. DOI: 10.1177/0013916503255102.
- Capolongo S, Bellini E, Nachiero D, Rebecchi A, Buffoli M. Soft qualities in healthcare Method and tools for soft qualities design in hospitals' built environments. *Ann Ig* 2014;26(4):391-9. doi: 10.7416/ai.2014.1998
- Buffoli M, Capolongo S, Cattaneo M, Signorelli C. Project, natural lighting and comfort indoor. *Ann Ig* 2007;19(5):429-41. [Italian].
- Beauchemin KM, Hays P. Sunny hospital rooms expedite recovery from severe and refractory depressions. *J Affect Disorder* 1996;40(1-2):49-51. DOI: 10.1016/0165-0327(96)00040-7 8882914
- Sherman SA, Varni JW, Ulrich RS, Malcarne VL. Post-occupancy evaluation of healing gardens in a pediatric cancer center. *Landscape Urban Plann* 2005;73(2-3):167-83. DOI: 10.1016/j.landurbplan.2004.11.013
- D'Alessandro D, Buffoli M, Capasso L, Fara GM, Rebecchi A, Capolongo S. Green areas and public health: improving wellbeing and physical activity in the urban context. *Epidemiol Prev* 2015;39(5):8-13.
- Ulrich RS. Effects of gardens on health outcomes. Theory and research. In: Marcus CC, Barnes M (Eds.). *Healing gardens: therapeutic benefits and design recommendations*. New York: John Wiley; 1999.
- Del Nord R, Peretti, G. *L'umanizzazione degli spazi di cura Ministero della Salute*. Firenze: Tesis; 2011.
- Ulrich RS. Effects of viewing art on health outcomes. In: Frampton SB (Ed.). *Putting Patients First. 2nd ed. Best practices in patient-centered care*. San Francisco: Jossey-Bass; 2009. p. 129-49.
- Devlin AS, Arneill AB. Health care environments and patient outcomes. A review of the literature. *Environ & Behav* 2003;35(5):665-94. DOI: 10.1177/0013916503255102
- Del Nord R. *Lo stress ambientale nel progetto dell'ospedale pediatrico. Orientamenti progettuali e suggestioni architettoniche*. [Environmental stress prevention in children's hospital design]. Technical guidelines and architectural suggestions]. Milano: Motta Architettura; 2006. p. 1-364.
- Arneill AB, Devlin AS. Perceived quality of care: The influence of the waiting room environment. *J Environ Psychol* 2002;22(4):345-60. DOI:10.1006/jevp.2002.0274
- Capolongo S, Buffoli M, Oppio A, Nachiero D, Barletta MG. Healthy indoor environments: how to assess health performances of construction projects. *Environ Engin Manag J* 2013;12(S11):209-12.
- Buffoli M, Bellini E, Bellagarda A, di Noia M, Nickolova M, Capolongo S. Listening to people to cure people: The LpCp – tool, an instrument to evaluate hospital humanisation. *Ann Ig* 2014;26(5):447-55. DOI: 10.7416/ai.2014.2004
- Larson, E. A causal link between handwashing and risk of infection? Examination of the evidence. *Infect Control* 1988;9(1):28-36. DOI: 10.1086/645729
- Capolongo S, Buffoli M, Oppio A, Rizzitiello S. Measuring hygiene and health performance of buildings: a multidimensional approach. *Ann Ig* 2013;25(2):151-7. DOI: 10.7416/ai.2013.1917
- Thi PLN, Briancon S, Empereur F, Guillemin F. Factors determining inpatient satisfaction with care. *Social Sci & Med* 2002;54(4):493-504. DOI: 10.1016/S0277-9536(01)00045-4
- Krueckeberg HF, Hubbert A. Attribute correlates of hospital outpatient satisfaction *J Ambulat Care Mark* 1995;6(1):11-43. DOI: 10.1300/J273 v06n01_02
- Raanaas RK, Patil GG, Hartig T. Health benefits of a view of nature through the window. A quasi-experimental study of patients in a residential rehabilitation center. *Clin Rehabil* 2011;26(1):21-32. DOI: 10.1177/0269215511412800
- Del Nord R. The multidisciplinary approach in the design

- of a humanized hospital. In: *Healthcare elsewhere*. TESIS Inter-University Research Center Systems and Technologies for social and Healthcare Facilities. Durban, 3-07 August 2014. p. 11-6.
26. Del Nord R (a cura di). *L'ospedale del futuro. Modelli per una nuova sanità*. Padova: Il Prato; 2008. p. 5-159.
27. Bengtsson A, Grahn P. Outdoor environments in health-care settings. A quality evaluation tool for use in designing healthcare. *Urban forest & Urban greening gardens* 2014;13(4):878-91. DOI:10.1016/j.ufug.2014.09.007
28. Heath Y, Gifford R. Post-occupancy evaluation of therapeutic gardens in a multi-level care facility for the aged. *Activities, Adaptation & Aging* 2001;25(2):21-43.
29. Capolongo S, Bottero MC, Lettieri E, Buffoli M, Bellagarda A, Birocchi M, et al. Healthcare sustainability challenge. In: Capolongo S, Bottero MC, Buffoli M, Lettieri E (Eds). *Improving sustainability during hospital design and operation. A multidisciplinary evaluation tool*. Cham: Springer; 2015. p. 1-10. DOI: 10.1007/978-3-319-14036-0_1

