



# The use of simulated visual impairment to identify hospital design elements that contribute to wayfinding difficulties

J.B. Rousek, M.S. Hallbeck\*

*Innovative Design and Ergonomic Analysis Laboratory, Industrial and Management Systems Engineering, University of Nebraska-Lincoln, W348B Nebraska Hall, Lincoln, NE 68588-0518, USA*

## ARTICLE INFO

### Article history:

Received 20 April 2010

Received in revised form

28 March 2011

Accepted 17 May 2011

Available online 20 June 2011

### Keywords:

Wayfinding

Healthcare

Visual impairment

Vision simulation

Design elements

Architecture

## ABSTRACT

Many public facility layouts have been developed with little consideration of the visually impaired, producing difficult and unpleasant wayfinding experiences. Not all wayfinding elements can be applied universally to all environments; several wayfinding elements are specific to the type of industry being considered. No known research has been conducted within healthcare systems to find wayfinding limitations among visually impaired users during the navigation process. The purpose of this study was to analyze the current issues in a wayfinding task for the visually impaired and normally sighted to identify wayfinding design deficits. Normally-sighted participants ( $m = 25$ ,  $f = 25$ ) wore one of five different vision simulator goggles to simulate a specific visual impairment (diabetic retinopathy, glaucoma, cataracts, macular degeneration, and hemianopsia) and were then given directions how to get to specific series of departments within a hospital campus. Participants then navigated a second time (using a different, but similar series of paths) without the vision simulator goggles (normal vision) so comparisons could be made. During participant wayfinding, behaviors such as stopping, looking around, touching walls, becoming lost and/or confused were recorded by location of each instance on a map. Questionnaires asking about the surrounding environment were completed after each condition. The results of this study identified several design elements involving signage, paths/target sites, lighting and flooring that created wayfinding issues for both experimental conditions. The effects of the wayfinding issues on participants ranged from tripping to becoming lost in the surrounding environment. Enhancing wayfinding for the most highly visually impacted individuals may also improve wayfinding for those with normal vision via universal design. The hospital design flaws identified by this study provide key areas and elements (not previously investigated) for further research studies to analyze more comprehensively and ultimately provide sound design recommendations to enhance effective wayfinding.

*Relevance to the industry:* This paper offers information relevant to a growing healthcare sector facing an aging population with growing needs. Applying organizational, architectural and design principles from this paper can lead to improved patient satisfaction, safety and patient flow within the hospital setting for the visually impaired and others without visual impairment.

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## 1. Introduction

### 1.1. What is wayfinding?

Hospitals, along with many other public facilities, can become a maze of disconnected, disorienting spaces due to the complexity of their functions and programs. Many hospitals and healthcare facilities have been expanded, added on to and reorganized because of mergers, integration, and strategy changes. Add complex medical

terminology and high patient and visitor stress levels and it is clear that hospitals are particularly difficult to navigate (Cooper, 2010); to combat this problem, healthcare facilities are starting to implement wayfinding systems. Wayfinding requires the proper encoding, processing and retrieval of spatial and environmental information (Fortin et al., 2008). Proper wayfinding systems have an immensely positive impact on staff, patient and visitor behaviors and perceptions and ultimately affect patient satisfaction, staff morale and an organization's bottom line (Cooper, 2010). Rather than creating healthcare wayfinding environments one piece at a time, teams of engineers, architects, organizational psychologists and human-computing specialists need to work with healthcare personnel (e.g. physicians and nurses) to integrate knowledge from

\* Corresponding author. Tel.: +1 402 472 2394; fax: +1 402 472 1384.  
E-mail address: [hallbeck@unl.edu](mailto:hallbeck@unl.edu) (M.S. Hallbeck).