Research Brief

Using link analysis to explore the impact of the physical environment on pharmacist tasks

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Abstract

Background: National community pharmacy organizations have been redesigning pharmacies to better facilitate direct patient care. However, evidence suggests that changing the physical layout of a pharmacy prior to understanding how the environment impacts pharmacists' work may not achieve the desired benefits. This study describes an objective method to understanding how the physical layout of the pharmacy may affect how pharmacists perform tasks.

Method: Link analysis is a systems engineering method used to describe the influence of the physical environment on task completion. This study used a secondary data set of field notes collected from 9 h of direct observation in one mass-merchandise community pharmacy in the U.S. State, Wisconsin. A node is an individual location in the environment. A link is the movement between two nodes. Tasks were inventoried and task themes identified. The mean, minimum, and maximum number of links needed to complete each task were then determined and used to construct a link table. A link diagram is a graphical display showing the links in conjunction with the physical layout of the pharmacy.

Results: A total of 92 unique tasks were identified resulting in 221 links. Tasks were sorted into five themes: patient care activities, insurance issues, verifying prescriptions, filling prescriptions, and other. Insurance issues required the greatest number of links with a mean of 4.75. Verifying prescriptions and performing patient care were the most commonly performed tasks with 36 and 30 unique task occurrences, respectively.

Conclusion: Link analysis provides an objective method for identifying how a pharmacist interacts with the physical environment to complete tasks. This method provides designers with useful information to target interventions to improve the effectiveness of pharmacist work. Analysis beyond link analysis should be considered for large scale system redesign.
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Keywords: Community pharmacy; Pharmacist tasks; Systems engineering

Background

There has been a nationwide shift within U.S. national chain pharmacy organizations to retool themselves as an integral part of the health care system by involving pharmacists more in the health and wellness of patients. Chain community pharmacies have discontinued the sale of tobacco, added primary care clinics, and redesigned the pharmacy to facilitate pharmacists' interactions with patients.[1–4] However, studies have shown that simply physically remodeling pharmacies does not result in improved pharmacist–patient interaction and patient counseling.[5–7] Authors cited interacting system factors such as inadequate personnel training and lack of both pharmacist and patient readiness to increase patient counseling as contributing factors for their study results. Implementing and sustaining change require a deep and objective understanding of how current work is performed in a system redesign.[8]

Few studies have used objective methods for evaluating the work of the pharmacist. A time-and-motion study tracked the amount of time that pharmacists spent performing tasks.[9] However, this type of analysis did not address the factors that contribute to where a task is being performed or the order of subtasks required to complete it. Another study presented the results of redesigning two community pharmacies to increase patient counseling by pharmacists.[7] This study recorded the activities of pharmacy personnel but did not consider the steps needed to complete tasks which can result in pulling the pharmacist away from the intended patient counseling area.

Link analysis is a method used by human factors engineers to objectively identify how humans interact with the physical layout of a workplace, most commonly in manufacturing.[2] It also has been used to identify the steps required to conduct tasks on the user-interface of computer software.[3] More recently, a study found link analysis useful for analyzing the work of a nurse in a hospital unit.[4] The purpose of this study is describe how link analysis can be used to examine the impact of the community pharmacy physical environment on how pharmacists complete their tasks.

Methods

Secondary qualitative data was used for this study. The primary use of the data was to examine interruptions of pharmacists. Two pharmacists were observed in a mass-merchandise chain pharmacy in Madison, Wisconsin during the spring of 2014 over three observation periods. One pharmacist was observed twice while the other was observed once. Nine hours of observations were completed. This length of observation is consistent with a study using link analysis to track nurses' movement on a hospital floor.[10] With the exception of 1 h, the pharmacist being observed was the only pharmacist on duty. There were three technicians working with the pharmacist during the observations. Two researchers took field notes simultaneously by hand while at the pharmacy and then typed up their findings within 24 h of completing the observations. After typing the notes, the researchers met to discuss their notes in order to clarify discrepancies about their observations.

Data analysis

A link analysis was performed to describe the pharmacists' movements and the steps necessary to complete a task. A link is the pathway between two locations in the physical layout of the pharmacy. Each location in the pharmacy is called a node and each node can be a source (point of origin) or target (destination). A link is the movement between a source node and target node (Fig. 1).

Open-ended content analysis was performed to inventory all of the different tasks that were completed by the pharmacist. Each task was coded into themes. A sketch of the pharmacy's physical layout was made while conducting the observations. The researchers documented all areas in the pharmacy, including the location of the pharmacy counters, computer terminals, registers, and fax machines.

A link table provides a list of all links for each task theme being performed. For example, a pharmacist was verifying prescriptions at verification counter (source) when a patient arrived at the pick-up counter. The pharmacist moved to the pick-up counter (target) to assist the patient. This movement is the link. For the next link, the pick-
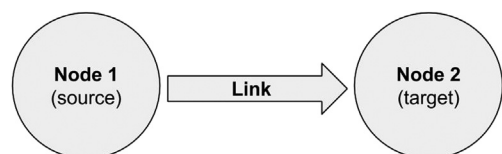

Fig. 1. Link analysis components.