Agency for Healthcare Research and Quality

Evidence Report/Technology Assessment

Number 74

The Effect of Health Care Working Conditions on Patient Safety

Summary

Overview

Do the working conditions of health care personnel contribute to the incidence of medical errors? This question is often raised during public discussion of ways to improve patient safety. How much do issues of nurse staffing and doctors' hours, for example, contribute to the estimated 44,000 to 98,000 deaths per year in hospitals due to medical errors?

The objective of this report is to identify and summarize evidence from the scientific literature on the effects of health care working conditions on patient safety. The report also identifies relevant information from industries outside of heath care.

Working conditions were classified into five categories: workforce staffing, workflow design, personal/social factors, physical environment, and organizational factors. The classification system for working conditions was derived from existing literature and advice from an expert panel. It is consistent with human factors research in multiple disciplines and industries such as aviation and nuclear power. Workforce staffing refers to job assignments and includes four principal aspects of job duties: the volume of work assigned to individuals, the professional skills required for particular job assignments, the duration of experience in a particular job category, and work schedules. Workflow design focuses on the job activities of health care workers, including interactions among workers and the nature and scope of the work as tasks are completed. Personal/social factors refer to individual and group factors such as stress, job satisfaction, and professionalism. Physical environment includes aspects of the health care workplace such as light, aesthetics, and sound. Organizational factors are structural and process aspects of the organization as a whole, such as use of teams, division of labor, and shared beliefs.

The researchers developed an analytic framework to define how working conditions are related to patient safety. Antecedent conditions, which are external factors such as personal characteristics of workers and fixed structural characteristics of the system (e.g., geographic location, regulations, and legislation), can affect the impact of working conditions on patient safety. Working conditions are viewed either as resources that improve work quality or as demands that impede work quality. Working conditions potentially affect patient safety, which leads to patient outcomes.

The researchers also developed a model of patient safety to help frame the key questions and provide a way to synthesize data reported in studies. The model is drawn from injury analysis and incorporates elements of both processes and outcomes. It is based on the relationships between medical errors (defined as the failure of a planned action to be completed as intended, or the use of a wrong plan) and adverse outcomes (injuries caused by health care rather than underlying disease).

Reporting the Evidence

The key questions derive directly from the analytic framework. Each key question applies to all five categories of working conditions; specific working conditions are inserted into the key questions for each of the five categories. The key questions permitted the research team to classify the entire body of evidence for each category and to derive a judgment about the strength of evidence regarding the contribution of the

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service

working condition categories to overall patient safety. The six key questions are:

1. Do working conditions affect patient outcomes that are related to patient safety?
2. Do working conditions affect the rate of medical errors?
3. Do working conditions affect the rate of recognition of medical errors after they occur?
4. Do working conditions affect the probability that adverse events will occur following detected or undetected medical errors?
5. Does the complexity of the plan of care influence whether working conditions affect patient outcomes that are related to patient safety?
6. Do working conditions affect measures of service quality in industries other than health care?

The populations of interest for this report include health care workers, patients, and workers in industries other than health care. The outcomes considered are defined in the analytic framework and model of patient safety and hence the key questions. They include patient outcomes, medical errors, and adverse events.

Methodology

To identify relevant literature the researchers searched five databases: MEDLINE® (with HealthSTAR), CINAHL®, PsycINFO, EBSCO, and the Campbell Collaboration. The Campbell Collaboration is an international effort modeled on the Cochrane Collaboration. The Campbell Collaboration prepares, maintains, and disseminates systematic reviews of the effectiveness of social and educational policies and practices. Its Social, Psychological, Educational and Criminological Trials Register (C2-SPECTR) is a registry of randomized and possibly randomized trials in education, social work and welfare, and criminal justice. The researchers searched MEDLINE (1980 to 2002) and CINAHL (1982 to 2002) to capture the health care literature, and they searched PsycINFO (1984 to 2002) and EBSCO (1980 to 2002) to capture literature outside of health care. The searches were limited to the years 1980 to 2002 because most contemporary quality management and accreditation systems have been implemented since 1980. Searches were performed separately for each of the five categories of working conditions (workforce staffing, workflow design, personal/social factors, physical environment, and organizational factors). Search strategies were developed by the lead investigator for each working condition category, using MeSH® terms where possible. Searches were limited to human studies and those in the English language or with English abstracts. The searches resulted in a total of 23,179 citations.

The lead investigator for each working condition category applied a set of inclusion/ exclusion criteria to the titles/abstracts in their area. To assess the interobserver reliability of this process, dual reviews were performed on random samples of citations. Full-text papers were retrieved for studies judged to be possibly relevant and assessed again for relevance using the same inclusion/exclusion criteria.

Studies were then abstracted using data-abstraction guidelines, and quality ratings were applied. The researchers rated design suitability and quality of study execution. They constructed evidence tables, and a second investigator reviewed the studies to verify the accuracy of the summary information and quality ratings.

Findings

After the investigators had reviewed all citations for possible relevance, over 1,000 papers were retrieved and read; of these, 912 papers were excluded from further review. Of the excluded papers, 730 were health care related and 182 focused on industries outside of health care. The bibliography includes the excluded studies.

A total of 115 studies were found to have evidence relevant for answering the key questions and were included in evidence tables. In some cases, additional studies were found to provide evidence that was indirectly related to key questions. The volume of available evidence varied considerably among the categories of working conditions, which reflects extensive variability in the amount of research conducted in these domains.

With the exception of Key Question 4 (regarding impact on the probability of adverse events), valid evidence was found for all key questions. The largest amount of available evidence applied to Key Question 1, and there was sufficient evidence to conclude that several different specific working conditions affect outcomes that are related to patient safety. There also was sufficient evidence to conclude that some working conditions affect rates of medical errors (Key Question 2).

The results of studies of factory and office workers are generally consistent with similar studies performed in health care settings (Key Question 6). These findings suggest that studies of working conditions in other industries are relevant to health care and can be used to expand the fund of knowledge about working conditions in health care.

The systematic literature review provided sufficient evidence to make specific recommendations about strategies for improving patient safety. These recommendations can be summarized as follows:

- Strategies to increase staffing levels of licensed and unlicensed nurses in both acute-care hospitals and nursing homes will likely lead to improved patient outcomes.
- Preventable complications are lower when complex technical procedures are performed by physicians who conduct them frequently (i.e., high-volume physicians).
- Duration of experience of the health professional is associated with better patient outcomes for some types of clinical care.

- Systems to reduce interruptions and distractions will likely reduce the incidence of medical errors.
- Systems to improve information exchange, transfer of responsibility, and continuity of care between hospital and nonhospital settings ("hand offs") decrease medication errors and, in some settings, hospital re-admissions.
- Levels of ambient noise in health care settings do not adversely affect patient safety.

Future Research

For several specific working conditions, there is evidence that the working condition affects patient safety, but the evidence comes from few studies and is insufficient to draw clear conclusions. Further research to clarify and confirm the findings from existing studies will permit judgments to be made about the importance of these working conditions. The areas in which such targeted research is indicated include workplace stress, workplace lighting conditions, and several aspects of organizational factors.

With the exception of selected work processes pertaining to workflow design, most of the evidence on the relationship of working conditions to patient safety is derived from non-experimental studies. Thus, there remain unanswered questions about the magnitude of improvement in patient safety that can be achieved by improving working conditions. There is a need for significant future research that evaluates how specific workplace interventions will affect patient outcomes. Such research could be conducted as clinical trials or as carefully designed demonstration projects and program evaluation studies.

Availability of the Full Report

The full evidence report from which this summary was derived was prepared for AHRQ by the Oregon Health and Science University Evidence-based Practice Center under contract number 290-97-0018. It is expected to be available in spring 2003. Printed copies may be obtained free of charge from the AHRQ Publications Clearinghouse by calling 800-358-9295. Requesters should ask for Evidence Report/Technology Assessment No. 74, *The Effect of Health Care Working Conditions on Patient Safety*. When available, Internet users will be able to access the report online through AHRQ's Web site at: www.ahrq.gov.

AHRQ Pub. No. 03-E024
March 2003
ISSN 1530-440X