Chapter 4. Conclusions

Evidence About the Effects of Healthcare Working Conditions

A diverse body of research conducted in both healthcare and other workplace settings provides evidence about how working conditions affect processes relevant to patient safety. Most of the research has been observational, but there have also been useful experimental studies examining some aspects of workflow design and environmental factors. For all categories of working conditions examined in this report, there is evidence that provides guidance for patient safety improvement. However, as summarized in the individual sections of Chapter 3, the sufficiency of evidence to draw clear conclusions varies considerably among the categories. The strongest evidence for a direct relationship between working conditions and patient safety is in the domains of workforce staffing and workflow design. In the domain of physical environment, it has been demonstrated that ambient noise is not a threat to patient safety. The research on personal/social and organizational working conditions is insufficient to answer any of the key questions, but the available evidence in these domains provides useful guidance for future research (discussed further in Chapter 5).

The field of working conditions encompasses a wide range of specific factors, and it is not surprising that the research has tended to focus on certain factors, to the exclusion of others. The evidence on how working conditions affect patient safety is limited to certain specific types of working conditions and to certain healthcare delivery settings. However, the cumulative evidence demonstrates that working conditions are important in influencing patient safety and deserve careful attention from healthcare professionals.

In Chapter 3 the evidence was summarized for the specific areas of working conditions addressed in this report. In this chapter each key question will be reviewed to summarize the overall evidence across all areas of working conditions.

Key Question 1. Do Working Conditions Affect Patient Outcomes that are Related to Patient Safety?

The largest body of available evidence was found to apply to this key question. Many observational studies have examined a variety of working conditions and patient outcomes related to adverse events, such as in-hospital mortality, nosocomial infections, and decubitus ulcers. A common finding across multiple studies examining this question is that the evidence is strongest for such non-fatal outcomes as newly acquired infections and short-term re-hospitalizations. Evidence for a direct effect of any working condition upon patient death is suggestive but relatively weak. For example, in a retrospective review of 1,609 sentinel events among hospitalized patients, inadequate nurse staffing was reported to be a contributing factor in 24 percent.[60] However, in multiple studies that have examined nurse to patient ratios and mortality rates in inpatient settings, a consistent effect of nurse staffing on patient mortality has not been found. Part of this discrepancy is probably due to the fact that mortality is only partly related to patient safety problems. For analyzing patient safety, an adverse outcome is considered to be an injury caused by health care rather than by the underlying disease. Patient

deaths are often due to overwhelming disease, and casemix measures do not adequately control for this mode of causation. Medical errors can cause excess deaths over and above those caused by disease, but methods for attributing cause of death have not yet been developed for studies of the effects of working conditions on mortality. Although the present available evidence does not permit the conclusion that changes in working conditions will lead directly to lower patient mortality, the data are sufficient to assert that selected changes in some working conditions are likely to lead to lower rates of non-fatal patient outcomes that are related to patient safety.

In studies examining both acute care hospitals and nursing homes, the mechanisms by which patient safety is affected appear to be similar across these healthcare settings. However, initiatives to improve patient safety need to be based upon data applicable to specific settings. For example, guidelines for sufficient nurse to patient ratios will differ greatly among intensive care units, non-intensive acute care units, and nursing homes.

Key Question 2. Do Working Conditions Affect the Rate of Medical Errors?

The evidence about the relationships between individual working conditions and rates of medical errors is diverse. Based on evidence from cross-sectional studies that measured error rates and retrospective analyses of reported medical errors, we concluded there is sufficient evidence that some working conditions, including patient-to-nurse ratios and workplace interruptions, affect rates of certain medical errors. There also is highly suggestive evidence that other factors, such as environmental lighting, affect error rates. The types of error studied have been limited. Most evidence pertains to medication administration and dispensing errors by nurses and pharmacists. There has been very little research conducted on many other important areas of error, including breaks in precautions to prevent worker-involved transmission of infectious agents among patients and technical errors in operative procedures. Studies of error rates among physicians have mostly been conducted in simulated care delivery settings. A common feature of nearly all studies of error rates is that the errors involve simple calculation and recording tasks. Potentially important but more complex types of error, such as prioritizing clinical tasks or developing diagnostic assessments, have not been studied in the context of working conditions.

Key Question 3. Do Working Conditions Affect the Rate of Recognition of Medical Errors after they Occur?

Recognition and reporting of medical errors have been emphasized as part of patient safety improvement programs.[262] Our systematic literature review yielded only limited evidence that working conditions are related to error recognition and reporting. Some aspects of workforce staffing (shift scheduling) and organizational factors were found to affect error reporting.

Key Question 4. Do Working Conditions Affect the Probability that Adverse Events will Occur Following Detected or Undetected Medical Errors?

The ideal study of working conditions would be a prospective evaluation that examined healthcare delivery sites with systematically different working conditions and recorded both medical errors and relevant clinical outcomes. Such a study would test whether working conditions influenced the relationships among errors and patient outcomes. Unfortunately, no such studies have yet been conducted. There have been studies that examined both medical errors and adverse outcomes, but they have not provided the detail of results to evaluate whether medical errors led directly to adverse outcomes. Thus, there is insufficient evidence to answer this key question for any type of working condition at this time.

Key Question 5. Does the Complexity of the Plan of Care Affect Whether Working Conditions Affect Patient Outcomes that are Related to Patient Safety?

Answering this question requires that research be conducted in a broad enough range of healthcare settings to permit synthesis of findings across settings. The body of research on working conditions research has been conducted in a wide variety of settings and has examined a large number of clinical problems. For selected working conditions, there is sufficient evidence to answer this question. Findings about the effect of patient to nurse ratios on adverse event rates has been sufficient to conclude that the magnitude of the effect differs between intensive care and general inpatient care settings. Studies of physician workload have not demonstrated that the complexity of the clinical environment influence the effect of procedural volume on adverse event rates, but the range of physician practices examined in these studies has been limited. Many types of physician work have not been studied. These findings suggest that extrapolations across clinical settings should be made with caution and need to be guided by empirical research.

Key Question 6. Do Working Conditions Affect Measures of Service Quality in Industries Other than Health Care?

Research in non-healthcare settings provides useful evidence for evaluating several areas of working conditions. Research on the effects of ambient noise in factories has provided evidence comparable to that from healthcare settings and has permitted us to judge the evidence to be sufficient to conclude that ambient noise does not affect patient safety. Most research on workplace colors and aesthetics has been conducted outside of healthcare but is sufficiently comparable to conclude that these factors also do not affect patient safety. Research conducted on organizational factors outside of health care also has been complementary to healthcare studies and contributes to a growing level of knowledge in this domain.

These examples illustrate that research conducted outside of health care is particularly useful for answering questions about patient safety that have not been adequately studied in healthcare settings. If there is sufficient evidence to answer a key question for a particular healthcare working condition, then further evidence from outside health care is interesting but not necessary. In contrast, insight into key questions that do not have sufficient evidence from

healthcare settings could be provided by non-healthcare research. Incorporating evidence from other industries requires careful analysis of whether the non-healthcare work is similar enough to healthcare tasks that generalization of the findings to health care is valid. The similarity of work is particularly important for aspects of workflow design. There is a large body of research on workflow design in non-healthcare settings such as aviation, but there are not yet well accepted criteria for applying much of this work to health care, where work processes are highly specialized to meet patient care needs. Thus, we found many areas of working conditions for which non-healthcare research could not be applied.

Key questions 3 and 4 have the lowest level of available evidence from healthcare settings. These key questions pertain to the recognition and effects of medical errors. There is inadequate research in non-healthcare settings on errors that can be generalized to health care. It is not yet understood whether error patterns in settings such as simulated aviation cockpits can be generalized to health care. Thus, non-healthcare research did not contribute evidence to answer these two key questions.

Clinical and Health Policy Implications of the Findings on the Effects of Healthcare Working Conditions

The systematic literature review conducted for this report 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 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 non-hospital settings (“hand offs”) decrease medication errors and in some settings hospital re-admissions.

- Levels of ambient noise in healthcare settings do not adversely affect patient safety.