associated with poor patient and employee outcomes. Specifically, patients admitted to hospitals on weekends are more likely to die and not receive necessary procedures. There was a small effect for patients admitted at night. Specifically, babies who were born at night were more likely to die. Employees who work at night are more likely to suffer from fatigue as compared with employees who work during the day. Furthermore, when employees rotate to cover night shifts, they are also more likely to suffer from fatigue. However, there is minimal evidence that poor employee outcomes may negatively impact quality care. Differences in the evidence exist between nights and weekends, future research should examine these types of off-shifts more closely.

Nursing implications

It is unclear why patient outcomes are worse on off-shifts, specifically on weekends, than during normal day hours. Decreased resources and staffing on off-shifts may impact patient outcomes; however, there is lack of research examining these associations. Future research should also include studying the off-shift workforce, which may differ from the day workforce and the impact on patient outcomes. The nursing work at night may differ than during the day. In addition, training and continuing education programmes may only be offered to nurses during the day limiting the ability for permanent night nurses to further their clinical education; for example, night nurses may not be able to attend clinical educational programmes that are offered during the day due to conflict with other responsibilities (Stewart *et al.* 2010). Without access to continuing education programmes, the night nursing workforce may be less adept at detecting changes in patient's conditions which may result in worse patient outcomes. Therefore, there is a need to increase educational opportunities for permanent night nurses.

Rotating nurses to ensure adequate clinical skills does not seem sensible given that there is little evidence suggesting poor quality of care on these shifts. Furthermore, there is evidence supporting the notion that nurses who work at night and rotate to work at night have worse physical and mental ailments than nurses who work during the day. If possible, nurse administrators should limit the shift rotation of employees and encourage night employees to self-schedule to provide for consistency. Self-scheduling may a decrease stress and improve the well-being and job satisfaction of night nurses. It may also behove administrators to determine which nurses are willing and prefer working at night rather than requiring nurses to take a night position.

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No conflict of interest has been declared by the authors.

Author contributions

All authors meet at least one of the following criteria (recommended by the ICMJE: http://www.icmje.org/ethical_1author.html) and have agreed on the final version:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

Supporting Information Online

Additional Supporting Information may be found in the online version of this article:

Table S1. Quality assessment criteria.

Table S2. Quality appraisal outcome for each study.

Table S3. Characteristics of 60 studies in the systematic review.

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