Question: In inpatient units, what is the effect of case mix index (CMI) levels on nursing care hours or other direct care measures?

Search for Evidence

Databases: CINAHL

Keywords: “Personnel Staffing and Scheduling”[subject heading], hours, staffing, “case mix”, CMI

Critically Analyze the Evidence

There were three primary research articles found addressing the effect of case mix index (CMI) levels on nursing care hours or other direct care measures.

A cross-sectional descriptive study by Kalish et al. (2011) surveyed nurses in 92 units at 11 acute care hospitals and found that both hours per patient day ($r = 0.314, p = 0.006$) and nurse-reported patient workload ($r = 0.348, p = 0.002$) were significantly correlated with unit-level CMI. However, nurse-reported staffing adequacy was not associated with unit-level CMI. Additionally, both unit-level CMI ($\beta = -0.29, p < 0.01$) and inadequate number of assistive personnel ($\beta = 0.30, p = 0.04$) were significantly associated with a multivariable linear regression model based on nurse-reported patient workload “on the last shift”.

A descriptive study by Mark & Harless (2011) looked at both cross-sectional and longitudinal data in 579 hospitals in 13 states over 6 years and compared nursing intensity weights (NIW)-adjusted, CMI-adjusted, un-adjusted staffing models. Analysis of the cross-sectional data found very minimal differences between NIW-adjusted and CMI-adjusted staffing models (mean -0.010, $r = 0.921$).
However, this correlation was no longer present when hospitals were sub-grouped based on hospital-related variables (size, % Medicare patients, teaching status, public/private/non-profit). Analysis of the longitudinal data found that the mean growth in CMI-adjusted staffing and NIW-adjusted staffing over the study period were significant (mean =0.075 and 0.042, respectively, p<0.001). However, the NIW-adjusted staffing growth was significantly smaller than the CMI-adjusted staffing growth. Both were lower than the unadjusted staffing growth (mean=0.082).

Romito (2006) evaluated the use of a CMI-based nurse staffing matrix in a California-based rehabilitation unit. The study found: 1) an increase in the percentage of patient meeting benchmarks at discharge, with 87% of stroke patients leave within national benchmarks after implementation of the CMI-based staffing matrix compared with 56% before adjusted staffing; 2) higher nursing satisfaction scores from the Great Place to Work survey, 3) consistently more staff when there is an increase in higher acuity patients, and 4) demonstration of cost effectiveness, with cost in actual dollars increasing by only 0.25%.

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<th>PICO Question: In inpatient units, what is the effect of case mix index (CMI) levels on nursing care hours or other direct care measures?</th>
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<td><strong>Author/Date/Journal</strong></td>
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<td>Kalisch et al., 2011, Medical Care</td>
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<table>
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<tr>
<th>Study</th>
<th>Objective</th>
<th>Design (cross-sectional, longitudinal, descriptive)</th>
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<td>Mark &amp; Harless, 2011, <em>Nursing Research</em></td>
<td>To examine the extent to which CMI can substitute for nursing intensity weights (NIW) in the measurement of acuity-adjusted nurse staffing</td>
<td>Descriptive</td>
<td>579 hospitals in 13 states with available staffing information and a daily census &gt; 20 patients based on data from CMS, AHRQ and the American Hospital Association Annual Survey of Hospitals between 2000-2006</td>
<td>Cross-sectional: The correlation between NIW-adjusted and CMI-adjusted staffing was 0.921 with a mean difference of -0.010. However, when hospital-related variables (size, % Medicare, teaching status, public/private/non-profit) were taken into account the mean differences between NIW-adjusted and CMI-adjusted staffing were significant. This was also true for the mean differences between NIW-adjusted and unadjusted staffing.</td>
<td>Study Limitations = None</td>
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Both unit-level CMI (β = -0.29, p < 0.01) and inadequate number of assistive personnel (β = 0.30, p = 0.04) were significantly associated with the model based on nurse-reported patient workload “on the last shift” and explained 46.8% of the variance in nurse-reported patient load.

Increase Quality Rating if:

- Large Effect
- High
- Moderate
- Low
- Very Low

Level of evidence for studies as a whole:

- High
- Moderate
- Low
- Very Low
growth. Both were lower than the unadjusted staffing growth (mean=0.082). There were no significant differences were found for hospital-related variables (ΔNIW-adjusted staffing – ΔCMI-adjusted staffing =0.98, p=0.46).

Romito, D., 2006, Rehabilitation Nursing
To evaluate the use of case mix index (CMI) as an indicator of nursing time as an integrated component of a shift staffing matrix

Descriptive Nursing staff matrix at 1 acute rehabilitation unit with around the clock 8-hr shifts in California
-Staffing per 24 hrs changed on a sliding scale dependent upon the CMI

After 1 full year of use (2004), the CMI-based staffing matrix has yielded positive results:
-Consistently more staff when there is an increase in higher acuity patients: the daily CMI averages varied between 1.06 and 1.6, with a yearly average of 1.26.
-Maintenance of excellent patient outcomes with a 25-point gain and within federal benchmark for LOS. 87% of stroke patients leave within national benchmarks, compared with 56% before adjusted staffing.
-Demonstration of cost efficacy: the average nursing hours per patient day initially increased by 0.97, but overtime decreased. Between 2003 and 2004, cost in actual dollars (calculated by productive hours/units of service) increased by only 0.25%.
-Higher nursing satisfaction scores from the Great Place to Work survey: Positive

Study Limitations =
☑️ None
Non-Experimental/Observational Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, survey)
☒ Insufficient sample size
☒ Sample not representative of patients in the population as a whole
☒ Variables (confounders, exposures, predictors) were not described
☒ Outcome criteria not objective or were not applied in blind fashion
☒ Insufficient follow-up, if applicable
☒ For prognostic study, sample not defined at common point in course of disease/condition
☒ For diagnostic study, gold standard not applied to all patients
☒ For diagnostic study, no independent, blind comparison between index test and gold standard
comments about the improvement of the staffing situation have been received, and the unit hopes to see this more positive attitude reflected in the survey.

REFERENCES

