< **e-component file 2. Tables 1-2** >

**SI Table 1: Association between nurse staffing level and risk of patient mortality**

| **First Author (Year)** | **Nurse Staffing Measure** | **Internal Validity** | **Nature of association** | **Mortality** | | | **Survival**  **In-hospital** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **In-hospital** | **In- ICU** | **30-day or 28-day** |
| Amaravadi  (2000) | NNPR | ++ |  | H-L 0.70  (0.30-2.0)OR |  |  |  |
| Baykara  (2018) | N:P | + |  |  |  | L-H 2.00  (1.26 -3.04)OR  L2-H 1.43  (0.98-2.01)OR |  |
| Blegen  (2011) | NHPPD | ++ |  | L-H 0.02  (0.01-0.03)Reg |  |  |  |
| Checkley  (2014) | Bed: nurse | + |  |  | L-H 3.70  (0.50- 6.80)% |  |  |
| Cho  (2008) | N:PT  N:PS | ++ |  | L-H 0.54  (0.22-1.33)OR  L-H 1.43  (1.16-1.77)OR |  |  |  |
| Dimick  (2001) | NNPR | ++ |  | L-H 0.49  (0.18-1.29)OR |  |  |  |
| Dodek  (2015) | N:P | ++ |  | H-L 2.08  (1.45–0.97)OR  H-L 1.37  (0.81–2.33)OR |  |  |  |
| Graf  (2010) | N:P | + |  | NR |  |  |  |
| Jansson  (2020) | N:P | ++ |  | L-H 0.91  (0.72-1.16)OR |  |  |  |
| Kelly  (2014) | N:P | + |  |  |  | L-H 1.03  (0.93–1.15)OR30 |  |
| Kim  (2020) | N:bed | ++ |  | H–L 0.44  (0.27 - 0.70)OR  L3-L 0.50  (0.33-0.76)OR  L2-L 0.83  (0.57-1.19)OR |  |  |  |
| Kim  (2019) | N: bed  Tertiary  hopsitals  General  hospitals | - | *NR* |  |  |  | H-L2 2.35  (1.27-4.36)OR  L-L2 *NR*  H-L2 1.38  (0.96–1.99)OR  L-L2 0.81  (0.54-1.22)OR |
| Kim  (2012) | N:P | + |  | H- L 0.65  (0.33-1.30)HR |  | H-L 0.46  (0.21-0.99)HR28 |  |
| Lee  (2017) | Workload: N | ++ |  |  |  |  | L-H 0.35  (0.16-0.79)OR |
| Margadant  (2020) | Mean NNR  Mean N:P | ++ |  | L-H 1.24  (1.05-1.46)OR  L2-H 1.29  (1.10-1.51)OR  L3-H 1.07  (0.92-1.25)OR  L-H 1.03  (0.82-1.30)OR  L2-H 1.02  (1.00-1.47)OR  L3-H 1.08  (0.92-1.27)OR |  |  |  |
| Neuraz  (2015) | N:P | ++ |  |  | L-H 3.50  (1.30-9.10)RR  L2-H 2.30  (0.90-5.80)RR  L3-H 2.00  (0.80-5.00)RR  L4-H 1.90  (0.70-4.60)RR |  |  |
| Sakr  (2015) | N:P | ++ |  | H-L 0.69  (0.53-0.90)OR  L3-L 0.71  (0.57-0.87)OR  L2-L 0.84  (0.70-1.01)OR |  |  |  |
| Stone  (2007) | NHPPD | ++ |  |  |  | H-L 0.89  (0.76-1.05)OR30  L3-L 0.81  (0.69-0.95)OR30  L2-L 0.8  (0.77-1.02)OR30 |  |
| Tarnow-Mordi  (2000) | Workload per occupied bed | ++ |  | L-H 3.10  (1.90-5.00)OR  L2-H 1.90  (1.20-3.10)OR  L3-H 2.00  (1.20-3.30)OR |  |  |  |
| Van den Heede  (2008) | NHPPD | ++ |  | *NR* |  |  |  |
| West  (2014) | N:bed | ++ |  |  | H-L 0.90  (0.83-0.97) OR |  |  |

**Nurse staffing measure [***Ratio antecedents and consequents may have been calculated either way round, for e.g. as N:P or P:N]****: N:P*** *Nurse to Patient ratio; N:PT in tertiary hospitals, N:PS in secondary hospitals (Cho, 2008);* ***NNPR*** *Night-time Nurse to Patient Ratio;* ***N: VentP*** *nurse to ventilated patient ratio;* ***N: Bed*** *Nurse to bed ratio;* ***N*** *number of nurses on shift;* ***NHPPD*** *nursing hours per patient day;* ***NNR*** *NAS score per nurse ratio;* ***Workload*** *composite measure based on average nursing requirement per occupied bed and peak occupancy in any shift during patient’s stay (Tarnow-Mordi, 2000); total TISS-76 divided by the average number of direct patient care nurses per 24hour day (Lee, 2017).* **Internal Validity***: ++ Strong; + Moderate, - Weak.*

*Higher staffing is significantly (p<0.05) beneficial, higher staffing is numerically beneficial. Higher staffing is significantly (p<0.05) detrimental, higher staffing is numerically detrimental. No evidence of a significant association (p≥0.05) and no figures given.*

***OR*** *Odds Ratio (95% Confidence Intervals, CIs)* ***OR30****Odds Ratio (95% CIs) for 30-day mortality*

***Reg*** *Non-standardised regression coefficient (95% CIs)*

***%*** *% increase in annual ICU mortality per unit increase of staffing (95% CIs)*

***HR***  *Hazard Ratio HR (95% CIs) for 30 day mortality* ***HR28****HR (95% CIs) for 28-day mortality*

***RR***  *Relative Risk (95% CIs)*

***NR*** *Not Reported*

***L-H*** *Lowest compared to highest amount of nurse staffing,* ***H-L*** *Highest compared to Lowest.*

***L2-H*** *= second lowest level of staffing compared to highest* ***L3- L*** *=third lowest level of staffing compared to lowest*

**SI Table 2: Association between nurse staffing levels and risk of patient nosocomial infection**

| **First Author (Year)** | **Nurse Staffing Measure** | **Internal Validity** | **Nature of association** | **Type of nosocomial infection** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CLABSI** | **CVC-BSI** | **MRSA** | **Pneumonia** | **Septicaemia/**  **sepsis** | **VAP** | **Other** |
| Amaravadi (2000) | NNPR | ++ |  |  |  |  | L-H 2.40  (1.20-4.7)OR | L-H 3.60  (1.10-12.5)OR |  |  |
| Blegen  (2011) | NHPPD | ++ |  |  |  |  |  | L-H -0.04  (-0.07, -0.01)Cor |  | L-H 0.02  (-0.03,-0.06)Cor |
| Blot  (2011) | N:P | - |  |  |  |  |  |  | L-H 1.74  (0.76-4.99)OR  L2-H 1.32  (0.55-3.13)OR  L3-H 1.78  (0.80-4.97)OR |  |
| Boev  (2015) | NHPPD | + |  | L-H -0.42  (0.84-0.00)Cor |  |  |  |  | L-H -0.02  (-0.18,-0.13)Cor |  |
| Dancer  (2006) | N | + |  |  |  | L-H 6.90  (0.49-310.0)OR |  |  |  |  |
| Dorsey  (2000) | Staffing quotient | + |  |  |  |  |  |  |  | L-H -0.88DSQ |
| Fridkin  (1996) | N:P  NHPPD | + |  |  | L-H -0.22DNP  L-H -3.3DNH |  |  |  |  |  |
| Halwani 2006 | N:P | ++ |  |  |  |  |  |  |  | L-H 3.28  (1.43-7.53)OR |
| Hugonnet  (2007) | N:P | ++ |  |  |  |  |  |  | Late onset  H-L 0.42  (0.18-0.99)HR  Early onset  H-L 0.78  (0.42-1.45)HR |  |
| Jansson  (2019) | N:P | + |  |  |  |  |  |  | L-H 0.30  (0.20-0.40)ROC |  |
| Schwab  (2012) | N:VentP | + |  |  | GraphID |  |  |  | GraphID | H-L 0.42  (0.32-0.55)IR  L3-L 0.64  (0.54-0.75)IR  L2-L 0.77  (0.67-0.88)IR |
| N:P | + |  |  | GraphID |  |  |  | GraphID | GraphID |
| Stone (2007) | NHPPD | ++ |  | H-L 0.57  (0.20 -1.67)OR  L3-L 0.32 (0.15-0.70)OR  L2-L 0.97 (0.55-1.17)OR |  |  |  |  | H-L 0.21  (0.08-0.53)OR  L3-L 0.68 (0.39-1.21)OR  L2-L 0.71 (0.43-1.19)OR | H-L 0.86  (0.37 – 1.98)OR  L3-L 0.96  (0.44-2.07)OR  L2-L 0.79  (0.50-1.25)OR |
| Vicca (1993) | N:P | + |  |  |  | H-L -0.15  (-0.07, -0.23)Cor |  |  |  |  |

**Nurse staffing measure [***Ratio antecedents and consequents may have been calculated either way round, for e.g. as N:P or P:N]****: N:P*** *Nurse to Patient ratio, further broken down in Table 1 included in the article;* ***NNPR*** *Night-time Nurse to Patient Ratio;* ***N: VentP*** *nurse to ventilated patient ratio;* ***NHPPD*** *nursing hours per patient day;* ***N*** *number of nurses on shift****.* Internal Validity***: ++ Strong; + Moderate, - Weak.*

*Higher staffing is significantly (p<0.05) beneficial, higher staffing is numerically beneficial. Higher staffing is significantly (p<0.05) detrimental, higher staffing is numerically detrimental. No evidence of a significant association (p≥0.05) and no figures given.* ***CLABSI****,Central Line Associated Blood Stream Infection.* ***CVC BSI****, Central Venous Catheter-Associated Blood Stream Infection.* ***Other****: ‘infection due to medical care’ (Blegen, 2011); enterobacter and serratia (Dorsey, 2000);pathogens including MRSA (Halwani, 2006); bloodstream and pneumonia infections (Schwab, 2012); Catheter Associated Urinary Tract Infection (Stone, 2007).*

***OR*** *Odds Ratio (95% Confidence Intervals, CIs)*

***Cor*** *Regression/correlation coefficient (95% CIs)*

***DSQ*** *Difference in staffing quotient between outbreak and non-outbreak months, p=.02*

***DNP*** *Difference in N:P between outbreak and non-outbreak, p<.01*

***DNH*** *Difference in NHPPD between outbreak and non-outbreak, -3.3, p<.01*

***%*** *% increase per unit increase of staffing (95% CIs)*

***HR*** *Hazard Ratio HR (95% CI)*

***IR*** *Incident Rate Ratio (95% CIs)*

***ROC*** *Receiver operating characteristic curve: area under the curve (95% CI)*

***GraphID*** *Graph presentation of incidence density*

***L-H*** *Lowest compared to highest amount of nurse staffing,* ***H-L*** *Highest compared to Lowest.*

***L2-H*** *= second lowest level of staffing compared to highest* ***L3- L*** *=third lowest level of staffing compared to lowest*