**Box 1: Other activities undertaken & activities left undone**

|  |  |
| --- | --- |
| **Transferrable activity undertaken by RNs** | **Activities left undone (Schubert, Glass et al. 2008)** |
|  | * adequate patient surveillance |
| * Delivering and retrieving food trays | * adequate documentation of nursing care |
| * Performing activities that should be done by other staff groups | * administering medication on time |
| * Arranging discharge referrals and transportation | * comfort/talk with patients |
| * Routine phlebotomy/blood draw for tests | * develop or update nursing care plans/care pathways |
| * Transporting of patients within hospital | * educating patients and/or family |
| * Cleaning patient rooms and equipment | * frequent changing of patient’s position |
| * Filling in for non-nursing services not available on off-hours | * oral hygiene |
| * Obtaining supplies or equipment | * pain management |
| * Answering phones, clerical duties | * planning care |
|  | * preparing patients and families for discharge |
|  | * skin care |
|  | * undertaking treatments/procedures |

**Table 1: Profile of nurse respondents**

|  |  |  |  |
| --- | --- | --- | --- |
| *Characteristics* | *Value* | *Standard Deviation (SD)* | *n=* |
| **Age** | 39.7 (mean)  18-59 (min-max) | 11.0 | 10043 |
| **Gender** |  |  |  |
| Female | 93.1% |  | 9374 |
| Male | 6.9% |  | 694 |
| **Education** |  |  |  |
| Trained in Sweden | 97.8% |  | 9843 |
| Holds a bachelor’s degree in nursing | 58.8% |  | 5879 |
| **Working hours** |  |  |  |
| Full time | 59.9% |  | 6024 |
| Part time | 40.1% |  | 4028 |
| **Last shift worked** |  |  |  |
| Day | 56.4% |  | 5601 |
| Afternoon/evening | 19.7% |  | 1952 |
| Night | 23.9% |  | 2371 |
| **Role (on last shift)** |  |  |  |
| I provided most of the care myself | 27% |  | 2625 |
| I supervised the care by others and provided some myself | 55% |  | 5358 |
| I provided only limited care and most direct care was carried out by others | 18% |  | 1739 |
| **Length of service (mean years)** |  |  |  |
| Nursing career | 11.4 | 10.3 | 10026 |
| Current hospital | 9.6 | 9.1 | 9959 |

**Table 2. Nurses reporting activities ‘left undone’ by time of shift; RN staffing by care undone**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **day** | **After-noon** | **night** | **All shifts** | ***Mean number of patients per RN***  ***(day shift)*** | |
|  | % | % | % | % | *Not reported as undone* | *Reported as undone* |
| 1. Adequate patient surveillance | 20 | 23 | 19 | 20 | 5.7 | 6.7 |
| 2. Skin care | 27 | 31 | 15 | 25 | 5.7 | 6.4 |
| 3. Oral hygiene | 34 | 37 | 21 | 31 | 5.6 | 6.4 |
| 4. Pain management | 6 | 6 | 5 | 6 | 5.8 | 7.0 |
| 5. Comfort/talk with patients | 49 | 51 | 34 | 46 | 5.5 | 6.4 |
| 6. Educating patients and family | 31 | 30 | 12 | 26 | 5.7 | 6.4 |
| 7. Treatments and procedures | 6 | 6 | 4 | 6 | 5.9 | 6.5 |
| 8. Administer medications on time | 26 | 27 | 22 | 25 | 5.7 | 6.5 |
| 9. Prepare patient and families for discharge | 19 | 20 | 7 | 16 | 5.8 | 6.6 |
| 10. Adequately document nursing care | 27 | 29 | 18 | 25 | 5.7 | 6.6 |
| 11. Develop/update nursing care plans/care pathways | 41 | 38 | 16 | 34 | 5.7 | 6.3 |
| 12. Planning care | 12 | 14 | 7 | 11 | 5.9 | 6.4 |
| 13. Frequent changing of patient position | 20 | 22 | 19 | 20 | 5.8 | 6.5 |
| Any care missed | 79 | 80 | 59 | 75 | 4.8 | 6.2 |

**Table 3: Descriptive results by time of shift**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **day** | | | **afternoon** | | | **night** | | | **all** | | |
| *Characteristics* | *%* |  | *n=* | *%* |  | *n=* | *%* |  | *n=* | *%* |  | *n=* |
| I provide most care myself | 19 |  | 1017 | 20 |  | 383 | 52 |  | 1210 | 27 |  | 2625 |
| I supervise the care by others and provide some myself | 57 |  | 3089 | 63 |  | 1202 | 44 |  | 1019 | 55 |  | 5358 |
| I provide only limited care and most direct care was carried out by others | 24 |  | 1297 | 17 |  | 330 | 4 |  | 99 | 18 |  | 1739 |
|  | Mean | SD | *n=* | Mean | SD | *n=* | Mean | SD | *n=* | Mean | SD | *n=* |
| Number of ‘transferrable’ activities often undertaken | 2.64 | 1.99 | 5552 | 2.38 | 1.99 | 1948 | 1.66 | 1.68 | 2365 | 2.35 | 2.0 | 9865 |
| Total number of patients per ward/unit | 21.4 | 8.9 | 5465 | 21.7 | 10.3 | 1920 | 22.0 | 9.0 | 2347 | 21.6 | 9.2 | 9803 |
| Patients per RN providing care | 5.5 | 3.1 | 5350 | 7.0 | 3.6 | 1876 | 11.4 | 5.6 | 2188 | 7.2 | 4.6 | 9482 |
| Patients per nursing support worker | 6.5 | 4.0 | 5186 | 8.2 | 4.4 | 1852 | 16.9 | 7.5 | 1743 | 8.9 | 6.4 | 8781 |
| Patients per member of nursing staff | 2.9 | 1.4 | 5400 | 3.7 | 1.7 | 1910 | 7.9 | 4.1 | 2341 | 4.2 | 3.2 | 9651 |
| Number of patients individual RN directly responsible for | 5.9 | 3.5 | 5571 | 7.6 | 4.1 | 1943 | 11.9 | 5.8 | 2365 | 7.6 | 4.9 | 9956 |
| Number of own patients requiring assistance with all ADLs | 2.3 | 2.1 | 5319 | 2.9 | 2.5 | 1879 | 4.0 | 3.5 | 2325 | 2.8 | 2.7 | 9595 |
| % ‘high dependency’ patients | 33% | 24 | 4683 | 34% | 23 | 1743 | 32% | 22 | 2223 | 33% | 23 | 8716 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

**Table 4: Transferrable activities done ‘often’ by time of shift and by role (percentages)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **day** | **pm** | **night** | **All shifts** | **Most care** | **Some care** | **Limited care** |
| 1. Delivering and retrieving food trays | 23 | 24 | 2 | 18 | 40 | 23 | 9 |
| 2. Performing non-nursing care | 24 | 25 | 25 | 25 | 39 | 24 | 14 |
| 3. Arranging discharge referrals and transportation (including to long term care) | 41 | 22 | 4 | 29 | 29 | 38 | 40 |
| 4. Routine phlebotomy/blood draw for tests | 43 | 31 | 43 | 41 | 50 | 39 | 34 |
| 5. Transporting of patients within hospital | 18 | 15 | 8 | 15 | 25 | 16 | 11 |
| 6. Cleaning patient rooms and equipment | 21 | 19 | 18 | 20 | 45 | 17 | 9 |
| 7. Filling in for non-nursing services not available on off-hours | 6 | 8 | 9 | 7 | 9 | 7 | 5 |
| 8. Obtaining supplies or equipment | 23 | 22 | 21 | 22 | 35 | 21 | 18 |
| 9. Answering phones, clerical duties | 66 | 73 | 38 | 61 | 65 | 67 | 72 |
| Mean number of transferrable activities ‘often’ done (SD) | 2.64  (1.99) | 2.38  (1.98) | 1.66  (1.99) | 2.35  (1.96) | 3.34  (2.25) | 2.51  (1.96) | 2.10  (1.60) |

**Table 5: Multilevel models: amount and incidence of missed care**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Number of items of missed care observed during a shift** | | | | **Shifts where at least one item of missed care was observed** | | | |
|  | **Mixed Model Poisson Regression** | | | | **Mixed model logistic regression** | | | |
|  |  | **Confidence interval** | |  |  | **Confidence interval** | |  |
|  | **RR** | **L95%** | **U95%** | **p** | **OR** | **L95%** | **U95%** | **P** |
| ***Level 1 – Hospital level variables*** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **Practice Environment Scale (PES-28)** | .516 | .393 | .677 | <0.001 | .300 | .143 | .629 | 0.001 |
| ***Level 2. Shift level variables*** |  |  |  |  |  |  |  |  |
| **Shift (global)** (F[2,8511], p) | (251.292, <0.001) | | | |  | | | |
| Day | 1.776 | 1.687 | 1.869 | <0.001 | 5.747 | 4.634 | 7.127 | <0.001 |
| Afternoon/evening | 1.671 | 1.590 | 1.758 | <0.001 | 3.778 | 3.046 | 4.686 | <0.001 |
| Night | 1.000 |  |  |  | 1.000 |  |  |  |
| **Assistance with daily living**  **(% patients high dependency)** | 1.006 | 1.005 | 1.006 | <0.001 | 1.016 | 1.014 | 1.019 | <0.001 |
| **Frequent monitoring (% patients)** | 1.002 | 1.001 | 1.002 | <0.001 | 1.004 | 1.002 | 1.006 | <0.001 |
| **No. transferrable activities often done** | 1.087 | 1.080 | 1.094 | <0.001 | 1.241 | 1.198 | 1.285 | <0.001 |
| **Own involvement in care delivery (global)** (F[2,8511], p) | (77.353, <0.001) | | | |  | | | |
| Deliver most care | .753 | .720 | .788 | <0.001 | .563 | .459 | .691 | <0.001 |
| Some | .899 | .870 | .930 | <0.001 | .916 | .770 | 1.090 | 0.323 |
| Limited | 1.000 |  |  |  | 1.000 |  |  |  |
| ***Nurse Staffing variables*** |  |  |  |  |  |  |  |  |
| **Patients per RN (global)** (F[7,8511], p) | (84.914, <0.001) | | | |  | | | |
| Best (< 4) | .520 | .491 | .551 | <0.001 | .148 | .115 | .191 | <0.001 |
| 4-4.99 | .629 | .596 | .663 | <0.001 | .271 | .210 | .350 | <0.001 |
| 5-5.99 | .713 | .679 | .750 | <0.001 | .348 | .271 | .447 | <0.001 |
| 6-6.99 | .760 | .723 | .798 | <0.001 | .466 | .364 | .597 | <0.001 |
| 7-7.99 | .811 | .768 | .856 | <0.001 | .554 | .426 | .720 | <0.001 |
| 8-8.99 | .845 | .798 | .895 | <0.001 | .684 | .521 | .897 | <0.001 |
| 9-9.99 | .880 | .823 | .941 | <0.001 | .721 | .535 | .972 | .006 |
| Worst (10 or more) | 1.000 |  |  |  | 1.000 |  |  |  |
| **Patients per nursing support worker (global**) (F[8,8511], p) | (11.089, <0.001) | | | |  | | | |
| Best (< 4) | .885 | .818 | .958 | .003 | .714 | .536 | .951 | .021 |
| 4-4.99 | 1.085 | 1.007 | 1.170 | .033 | 1.029 | .763 | 1.387 | .852 |
| 5-5.99 | 1.091 | 1.014 | 1.173 | .019 | 1.000 | .750 | 1.332 | .998 |
| 6-6.99 | 1.090 | 1.013 | 1.172 | .021 | 1.091 | .818 | 1.455 | .554 |
| 7-7.99 | 1.142 | 1.058 | 1.232 | .001 | 1.236 | .904 | 1.690 | .183 |
| 8-8.99 | 1.110 | 1.025 | 1.202 | .011 | 1.037 | .749 | 1.435 | .829 |
| 9-9.99 | 1.156 | 1.056 | 1.264 | .002 | 1.010 | .692 | 1.474 | .960 |
| Worst (10 or more) | 1.119 | 1.052 | 1.189 | <0.001 | 1.071 | .872 | 1.315 | .516 |
| No HCSW | 1.000 |  |  |  | 1.000 |  |  |  |
| **Random variance** | **σ** | **L95%** | **U95%** | **p** | **σ** | **L95%** | **U95%** | **p** |
| Hospitals (n=79) | 0.027 | 0.018 | 0.041 | <0.001 |  |  |  |  |

**Figure 1. Care left undone by RN staffing**

**(based on multilevel regression analyses presented in Table 5)**

