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Are long shifts, overtime and staffing levels associated with nurses' opportunity for educational activities, communication and continuity of care assignments? A cross-sectional study

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ETHICAL PERMISSIONS: The RN4CAST survey in England was approved by the Health Research Authority via the Research Ethics Service (RES; Service Ref: 09/H0808/69). As the present study is an analysis of secondary data (i.e. no additional primary data was collected), further ethics approval was not required.

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ABSTRACT:

Background & Objectives: Previous research demonstrates the impact of workforce organisation variables on quality of care and nurse wellbeing. However, the extent to which these variables influence completion of important “ancillary” nursing work is unexplored. This type of work can include discussion

of care information between colleagues, promoting continuity of care during shift changes, and participating in continuing professional development programs. Although ancillary work is not usually classified as direct nursing care, it remains critical to the delivery of safe and effective care, as well as for building nurse resiliency and workforce capacity. Our aim was to examine the relationship between ≥ 12 -hour shifts, overtime, and lower staffing levels and opportunities for completing ancillary work.

Design & Methods: Cross-sectional survey of 2990 registered nurses in 48 hospitals in England. Relationships were estimated through generalised linear mixed models.

Results: When compared to ≤ 8 hour shifts, nurses working ≥ 12 -hour shifts were less likely to report having staff education programs (OR=0.58, 95% CI [0.43, 0.76]) and enough opportunity to discuss patient care with other nurses (OR=0.72, 95% CI [0.56, 0.92]). When compared to working overtime, nurses working only scheduled hours reported more opportunities these activities (OR=1.31, 95% CI [1.07, 1.61] and OR=2.06, 95% CI [1.72, 2.47] respectively), and reported fewer cases of losing care information during handovers (OR=0.72, 95% CI [0.60, 0.86]). Furthermore, with each additional patient per nurse (i.e., higher workloads), poorer outcomes for all variables of interest were observed.

Conclusion: Long shifts, overtime, and lower staffing levels are associated with fewer reported opportunities for completing ancillary work. Our findings contribute to the large body of literature exploring the drawbacks of implementing short-term solutions for nurse shortages and warrant careful consideration when establishing nursing shift rotas and staffing policies.

KEYWORDS: 12-hour Shifts, Continuity of Care, Nursing, Overtime, Professional Development

CONTRIBUTION OF THE PAPER:

What is already known about the topic?

- Nursing workforce variables such as workload, staffing levels, and shift length impact quality of patient care and nurse performance/wellbeing
- The relationship between these variables and “ancillary” nursing work, such as care coordination between colleagues/during shift changes, discussion of care between nurses, and keeping up-to-date with knowledge and skills, has rarely been explored

What this paper adds:

- ≥ 12 hour shifts, working overtime and lower staffing levels are independently associated with fewer reported opportunities to complete ancillary nursing work
- These associations may be previously unrecognized mechanisms through which harm occurs to patients from deficits in nursing workforce size or organization
- Missed ancillary work has potentially serious short-term consequences from loss of direct care information, as well as in the long-term due to reduced professional capacity from fewer opportunities for professional development and collaborative communication

INTRODUCTION

The size and organisation of the nursing workforce on hospital wards have repeatedly been shown to be associated with important outcomes for patients, including quality of care, rates of missed care, and patient safety (1–3). In addition to research focusing on patient to nurse ratios or equivalent measures of

workload (4), studies have explored the consequences of longer shifts (≥ 12 hours), overtime work (5,6), and persistent low staffing rates (7) – all of which are strategies used to maintain staffing levels in the face of workforce shortages and growing/ageing patient populations (8). These variables also affect important outcomes for nurses themselves, as demonstrated by increased reports of poorer nurse performance and wellbeing, due to increased fatigue, stress, burnout, physiological strain, mental strain, and emotional exhaustion (9–11). Policymakers in the UK have named the ‘lack of a comprehensive national strategy to secure the workforce’ to be the biggest internal threat to the long-term sustainability of the National Health Service (12).

As hands-on (or direct) patient care is only one aspect of nurses’ workload (13), another potential consequence of low staffing and longer shifts is loss of time to complete important “ancillary” nursing work. This work could include collaborative discussion between care providers, upholding continuity of care during shift changes through meaningful nurse-nurse communication, keeping current with research and developments in evidence-based practice, and participation in professional development/continuing education programs (14). Although these responsibilities cannot be classified as ‘direct’ patient care, they remain crucial to the delivery of safe and effective care, as well as for building nurse resiliency and workforce capacity (see Principles of Nursing Practice E, F, G and H as defined by the Royal College of Nursing (15)).

The relationship between nursing workforce size/organisation and opportunities to complete ancillary work has not been widely studied. Moreover, measurements of missed care are likely not to include these supportive responsibilities as they may not be perceived as ‘omissions’ by staff in the same way, because they are not always directly patient focused. Therefore, the aim of the present study is to examine the influence of workforce variables such as ≥ 12 -hour shifts, overtime, and lower staff levels on opportunities for 1) staff development and education programs; 2) discussing patient care with other nurses; 3) patient care assignments that promote continuity of care; 4) loss of patient care information during handovers. We hypothesized that longer shifts, working overtime, and lower staffing levels would decrease reports of opportunities to complete ancillary care duties.

METHODS

Data used in this analysis were sourced from the Nurse Forecasting in Europe study (RN4CAST), which included a cross-sectional survey of European registered nurses (RNs) aiming to examine how organizational features of hospital care impact nurse recruitment/retention and patient outcomes. Depending on legislation, the study was approved by either central or local ethical committees. The survey was mailed or directly distributed to RNs in acute general hospitals; full details on the study’s protocol have been published elsewhere (16). For the present analysis, only data from RNs in England were used to limit the confounding influence of country-specific contextual factors (48 hospitals, 2990 RNs).

Nurses were asked to report the number of hours worked, full time/part time status, and the period of the day (day/afternoon/evening) on their last shift. Shift length was grouped into four categories: ≤ 8 , 8.1–10, 10.1–11.9, and ≥ 12 hours. Where nurses had identified a shift length that was < 4 or > 18 hours, data were treated as missing. Nurses were also asked to report whether they had worked overtime during their last shift (yes/no), the number of registered nurses giving direct patient care, and the number of patients on the

ward on the last shift they worked. From this we calculated nurse staffing levels as a ratio of patients per RN.

Four survey items related to completing ancillary work were used as outcomes for this study. These included: 1) participating in active staff development and education programs, 2) discussing patient care with other nurses, 3) observing patient care assignments that promote continuity of care, and 4) loss of patient care information during shift changes. Please refer to Table 1 for details of the specific questions used. Nurses were asked to which extent they agreed or disagreed with each statement as it featured in their current job. Scales had a 4-point (strongly disagree, somewhat disagree, somewhat agree, strongly agree) or a 5-point range (an additional 'neither' option). Survey item responses were dichotomized to *agree* vs. *not agree* (or *disagree*) (i.e. '*strongly disagree*', '*somewhat disagree*', and '*neither*' became '*not agree*'). A sensitivity analysis was performed to test the result of dichotomizing '*neither*' to *not agree* (or *disagree*) for the fourth survey item, "Important care information is lost during shift changes". Classifying '*neither*' with '*agree*', or eliminating those responses altogether, made only slight differences to coefficients and did not change statistical significance.

TABLE 1. Selected Survey Items

1	Active staff development or continuing education programs for nurses. (Options: strongly disagree, somewhat disagree, somewhat agree, strongly agree)
2	Enough time and opportunity to discuss patient care problems with other nurses. (Options: strongly disagree, somewhat disagree, somewhat agree, strongly agree)
3	Patient care assignments that foster continuity of care (i.e., the same nurse cares for the patients from one day to the next). (Options: strongly disagree, somewhat disagree, somewhat agree, strongly agree)
4	Important patient care information is often lost during shift changes. (Options: strongly disagree, somewhat disagree, neither, somewhat agree, strongly agree)

Intraclass correlation coefficients (ICC) were calculated from unconditional random intercept models to define within-hospital and within-unit variation. The ICC measures the degree of similarity between individuals in a cluster (17) and details the proportion of outcome variance that can be attributed to variation between groups as opposed to between individuals. The association between variables and outcomes were estimated with multivariable logistic mixed models, where nurses were nested into wards and hospitals. Potential confounding variables were additionally controlled for; these included nurses' age and gender, full time or part time status, and shift type (day/afternoon/evening). Analyses were performed with SPSS, v. 24 (18).

RESULTS

Data from 2959 participants were available for analysis. The mean age of respondents was 39.6 years, with 92% (n=2734) of respondents being female. Fifty-nine percent (n=1681) of respondents reported working on day shifts and 77% (n=2273) worked full time. In terms of shift hours category, 33.0% (n=893) worked ≤ 8 hours, 13.8% (n=374) worked 8.1-10 hours, 19.2% (n=519) worked 10.1-11.9 hours, and 34.1% (n=924) worked ≥ 12 hours on their last shift. Nine percent of shift-length data were treated as missing (reported shift length < 4 or > 18 hours on last shift). Overall, the mean nurse staffing level had a patient-to-nurse ratio of 8.61, and 51% (n=1509) of respondents reported working beyond their contracted hours in their last shift. Please refer to Table 2 for further demographic details by shift category. ICCs

revealed a tendency for individuals within units to give similar responses (staff development/education programs ICC= 0.103, discussing patient care ICC=0.116, continuity of care ICC=0.081, loss of information during shift changes ICC= 0.056) verifying that multi-level models were required (19).

TABLE 2. Shift category by shift type, overtime status, full/part-time status, and average staffing levels

	Shift Category % (n) or mean (SD)				Total % (n) or mean (SD)
	≤8	8.1-10	10.1-11.9	≥12	
Shift Type % (n)					
Day	37.7 (595)	10.8 (170)	13.8 (218)	37.7(594)	100 (1517)
Afternoon/Evening	73.6 (281)	12.6 (48)	4.2 (16)	9.7 (37)	100 (382)
Night	1.2 (8)	22.6 (154)	39.3 (267)	36.9 (251)	100 (680)
Overtime % (n)					
Yes	30.4 (416)	17.9 (245)	17.7 (243)	34.0 (466)	100 (1370)
No	35.4 (471)	9.6 (127)	20.6 (274)	34.4 (457)	100 (1329)
Full/Part-Time % (n)					
Part time	42.0 (258)	17.8 (109)	16.3 (100)	23.9 (147)	100 (614)
Full time	30.4 (623)	12.7 (260)	19.7 (404)	37.1 (759)	100 (2046)
Staffing Levels Mean (SD)					
Average # patients per nurse	8.22 (3.06)	9.30 (3.38)	8.96 (4.27)	8.67 (4.45)	8.66 (3.88)

Descriptive analyses are presented in Table 3. Nurses working ≥12 hours showed the smallest percentage of agreement with opportunities for staff development and time for discussion with nursing colleagues when compared to other shift categories. Similarly, those working overtime showed the smallest percentage of agreement with time for staff development, time for discussion with nursing colleagues, and observing care assignments that foster continuity of care; nurses working overtime also showed the largest percentage of agreement when observing loss of care information during shift changes. Lastly, when nurses agreed with survey items, the average number of patients per nurse was lower (or higher, in the case of observing loss of care information during shift changes).

TABLE 3. Shift category, overtime and average staffing levels by ancillary activities

	% Agreement (n/total) or Mean (SD) when agreeing/disagreeing			
	Time for active staff development and education programs	Time for discussing patient care with colleagues	Patient care assignments that foster continuity of care	Important care information is lost during shift changes
Shift Category % (n)				
≤8 hours	77.1 (684/887)	57.4 (510/889)	55.8 (495/887)	37.4 (331/886)
8.1-10 hours	73.6 (273/371)	49.1 (182/371)	54.2 (202/373)	38.5 (143/371)
10.1-11.9 hours	73.5 (377/513)	56.1 (290/517)	62.6 (323/516)	34.0 (176/517)
≥12 hours	71.2 (653/917)	53.7 (493/918)	63.7 (585/919)	36.4 (333/916)
Overall	73.9 (1987/2688)	54.7 (1475/2695)	59.6 (1605/2695)	36.5 (983/2690)
Overtime % (n)				
Yes	71.2 (1064/1494)	46.1 (691/1498)	56.5 (847/1499)	40.5 (606/1495)
No	76.2 (1088/1428)	65.0 (932/1434)	65.1 (932/1432)	31.9 (457/1433)
Staffing Levels Mean (SD)				

<i>Agree</i>	8.47 (3.73)	8.09 (3.88)	8.37 (4.01)	8.95 (4.18)
<i>Disagree</i>	9.04 (4.55)	9.27 (4.14)	8.98 (4.05)	8.42 (3.95)

Associations between workforce variables and reported opportunities for completing ancillary care from the multivariable model are presented in Table 4. When compared to nurses who worked ≤ 8 hours, those who worked ≥ 12 hours were less likely to report having time for staff development or continuing education programs by 42% (OR=0.58, 95% CI [0.44-0.76], $p < 0.001$). Moreover, with each increasing shift-hours category, the odds of agreeing with this item steadily decreased. When compared to those who worked ≤ 8 hours, those who worked ≥ 12 hours were 28% less likely to report having time and opportunity to discuss patient care with other nurses (OR=0.72, 95% CI [0.56-0.93], $p = 0.011$). A similar observation was made when nurses who worked 8.1-10 hours were compared those who worked ≤ 8 hours (OR=0.77, 95% CI [0.57-1.03]), however this was not statistically significant. The associations between working ≥ 12 -hour shifts and continuity of care or losing care information during shift changes were also not statistically significant.

TABLE 4 Results of Multilevel Regression Models: Associations between Variables and Survey Items

	Time for active staff development and education programs (n=2413) AIC= 2825.7, BIC=2712.1	Discussing patient care with other nurses (n=2422) AIC=3052.8, BIC=2712.1	Patient care assignments that foster continuity of care (n=2420) AIC=3102.6, BIC= 3189.1	Important care information is lost during shift changes (n=2416) AIC= 3085.7, BIC=3172.2
	Odds Ratio [95% CI]	Odds Ratio [95% CI]	Odds Ratio [95% CI]	Odds Ratio [95% CI]
≤ 8 hours (ref.)				
8.1–10 hours	0.84 [0.59, 1.17]	0.77 [0.57, 1.03]	1.04 [0.77, 1.39]	0.99 [0.74, 1.33]
10.1–11.9 hours	0.72 [0.51, 1.01]	0.86 [0.64, 1.15]	1.27 [0.95, 1.71]	0.83 [0.62, 1.11]
≥ 12 hours	0.58 [0.44, 0.76] [†]	0.72 [0.56, 0.93]*	1.25 [0.98, 1.59]	0.95 [0.75, 1.21]
Day Shift (ref.)				
Afternoon/Evening	0.76 [0.56, 1.03]	1.03 [0.79, 1.36]	0.91 [0.69, 1.18]	1.14 [0.88, 1.49]
Night	0.97 [0.74, 1.28]	1.30 [1.01, 1.67]*	1.058 [0.82, 1.36]	1.02 [0.80, 1.31]
Overtime (ref.)				
Not Overtime	1.31 [1.07, 1.61]*	2.06 [1.72, 2.47] [†]	1.41 [1.18, 1.68] [†]	0.72 [0.60, 0.86] [†]
Full Time Status (ref.)				
Part Time	0.80 [0.63, 1.01]	0.91 [0.74, 1.13]	0.98 [0.97, 0.99]*	1.07 [0.86, 1.32]
Patient to Nurse Ratio	0.96 [0.93, 0.99]*	0.91 [0.89, 0.94] [†]	0.96 [0.93, 0.98]*	1.03 [1.01, 1.06]*
Age	1.01 [0.99, 1.02]	0.98 [0.98, 0.99]*	0.98 [0.97, 0.99] [†]	0.99 [0.98, 1.00]
Female (ref.)				
Male	0.71 [0.50, 1.01]	0.85 [0.62, 1.18]	0.85 [0.62, 1.18]	1.16 [0.84, 1.60]

* = statistically significant ($p < 0.05$)

† = statistically significant ($p < 0.001$)

CI = confidence interval

Working overtime was associated with all study outcomes. When compared to nurses who worked overtime during their last shift, nurses who worked their scheduled hours only were more likely to report having enough time for staff development or education programs (OR=1.31, 95% CI [1.07-1.61], $p = 0.008$), and having enough time and opportunity to discuss patient care problems with other nurses (OR=2.06, 95% CI [1.72-2.47], $p < 0.001$). Furthermore, when compared to nurses who worked overtime, nurses who worked their scheduled hours only were less likely to report observing loss of care information during shift changes by 28% (OR=0.72, 95% CI [0.60-0.86], $p < 0.001$) and were more likely to report care assignments that foster continuity of care (OR=1.41, 95% CI [1.18-1.68], $p < 0.001$).

For every additional patient per nurse (i.e. increased nurse workload), there was a 4% reduction in staff reporting enough time for staff development and education (OR=0.96, 95% CI [0.93-0.99]), 9% reduced likelihood of time for discussing patient care, (OR=0.91, 95% CI [0.89-0.94]), 5% reduction in reports of assignments that foster continuity (OR=0.96, 95% CI [0.93-0.98]), and 3% increase in reports of loss of care information during shift changes (OR=1.03, 95% CI [1.01-1.06]) (all $p < 0.05$).

Other workforce variables were also assessed. Night shifts were associated with higher odds of nurses reporting enough time and opportunity to discuss patient care problems with other nurses when compared to day shifts (OR=1.30, 95% CI [1.01-1.67], $p < 0.05$). Working part time was less likely to be associated with nurses reporting patient care assignments that foster continuity of care (OR=0.98, 95% CI [0.97-0.99], $p < 0.05$). Older nurses were also slightly less likely to report they had time to discuss patient care (OR=0.98, 95% CI [0.98-0.99], $p < 0.05$) and observe patient care assignments that foster continuity of care (OR=0.98, 95% CI [0.97-0.99], $p < 0.001$).

DISCUSSION

The aim of this study was to explore the relationship between nursing workforce organisation variables and neglected aspects of ancillary nursing work. When compared to working ≤ 8 hours, working ≥ 12 hours was associated with fewer reports of having time to participate in education programs and less opportunity to discuss patient care problems among colleagues. Working overtime and lower staffing levels also similarly associated with decreased opportunities for these activities, in addition to increasing the likelihood of reporting that important care information is lost during handovers and reporting fewer care assignments that foster continuity of care.

Time to complete educational/professional development courses is a critical component of career development and satisfaction as healthcare professionals (20). However, our findings are consistent with qualitative and anecdotal reports that long shifts may impede opportunities to participate in professional development activities. McGettrick & O'Neill (2006) found that nurses expressed more negative comments during discussions about continuing education, and they suggested that the loss of overlap time associated with 12-hour shifts reduced opportunities for clinical education. Banakhar's (2017) systematic review of nurses' job satisfaction found that when compared to 8-hour shift nurses, 12-hour shift nurses attended fewer continuing education classes. We also found that nurses working ≥ 12 hours were less likely to have the opportunity to discuss important care information with other nurses. Effective care-team communication is required for positive and effective work environments in nursing, which are in turn linked to better patient outcomes and higher job satisfaction (22). However, when working 12-hour shifts or longer, the quality and amount of communication between nurses may suffer as a result of reduced handover/shift overlap time. This may in turn result in communication between nurses that is too hurried or that is given through a medium not conducive to feedback (e.g. written notes or bedside report vs. face-to-face communication). Qualitative research has shown that nurses prefer verbal reporting as it gives them the opportunity to ask questions and receive immediate response (23). While the extended handovers and shift overlaps of a three-shift system are often presented as 'unproductive' and potentially harmful by advocates of longer shifts, it is evident from these results that valuable work may be undertaken during these periods. While there is some anecdotal evidence that some staff prefer long shifts

to maintain work-life balance, these findings add to a body of evidence that undermines any claim that productivity is increased (6,24–26).

In our study, working overtime was significantly associated with all poorer outcomes: reports of fewer opportunities to participate in continuing educational programs, less opportunity to discuss patient care information with other nurses, observing less patient care assignments that foster continuity of care, and observing loss of patient care information during shift changes. This further supports previous research that has investigated the negative consequences of overtime for both patients and nurses (27–29). Yet, working overtime in the nursing profession is common practice; over half of the nearly 3000 RNs surveyed in this study reported working beyond their contracted hours in their last shift. Nurses may still choose to work overtime for added remuneration or because of an ethical obligation to maintain patient care/safety in the absence of sufficient staffing numbers (30). However, it should be noted that remuneration for *unplanned* overtime work is very rare, and it is estimated that additional unpaid time worked by RNs in the National Health Service across the UK equates to £396 million per year (31). It is also likely that ancillary nursing work is completed during this unplanned overtime, as low staffing levels and 12-hour shift patterns (and reduced overlap between shifts) may prevent nurses from completing this work during regular scheduled hours only. Further research is recommended to determine what specific nursing responsibilities (both direct and ancillary) are completed during instances of unplanned overtime.

Insufficient nurse staffing levels and poor nurse retention have been serious issues in many countries. For example, in the UK, despite efforts to systematically recruit more nurses and nursing assistants, the National Health Service is expected to have a shortage of 14,000 nurses specializing in the care of adult patients alone in 2020 (12). Moreover, it is reported that half of nurses in England's National Health Service do not believe there are sufficient staffing levels to allow them to perform their job responsibilities (12). Our findings echo this, as increased workload (i.e., more patients per nurse, a direct consequence of low staffing levels) was significantly associated with poorer outcomes for all ancillary work variables. Even in more recent estimates (32), trends in the nursing workforce still remain a large concern, with increasing nursing vacancy rates and substantial declines in the number of people applying for/completing nursing degrees. Without major action, it can be expected that these estimations will worsen over the next decade, and current nurses will see even less time and fewer opportunities to complete their ancillary work. This should be of particular concern to policymakers, especially when considering that missed ancillary nursing work pose serious short-term (loss of direct care information) and long-term (reduced professional capacity from fewer opportunities for professional development and collaborative communication) consequences.

Limitations and Research Recommendations

The present study has certain limitations that should be considered when interpreting results and implications. Firstly, as this was an analysis of cross-sectional survey data, the associations and relationships uncovered cannot infer causality. Secondly, the primary purpose of the RN4CAST survey was not to look at the effects of 12-hour shift patterns, overtime, and low staffing alone, and therefore certain nuances related to these phenomena may have been missed, including: number of breaks taken during shifts, nurses' preferred shift pattern, number of hours worked overtime, reasons for working overtime, perceptions of work environments, perception of support from hospital administration, etc.

Future research should be mindful of these aspects so that the relationships uncovered in the present study can be substantiated and more accurately explained. Thirdly, the data analysed in this study was obtained through nurse self-reporting. Although previous research has validated nurses' subjective reporting against objective evaluations of patient care quality (33), future studies should include objective measures of workforce variables (e.g. work schedules, overtime records) to verify nurse survey responses. Lastly, RN4CAST survey data collection occurred during 2009-2010, which may be considered dated. However, no more recent comparable data are available and we are not currently aware of any substantial changes in healthcare systems that could influence the associations found in this study, with the exception of a documented increase in the use of 12-hour shift patterns in hospitals when compared to this survey's data collection period (31).

CONCLUSION

We found that frequent 'solutions' for RN shortages, including longer shifts, overtime, and low staffing levels, are associated with fewer reported opportunities for completing ancillary work. Working longer shifts significantly decreased reports of opportunities for professional development and time to discuss patient care problems with other nurses. Working overtime and lower staffing levels also showed similar associations, in addition to reports of observing loss of important care information during shift changes and observing fewer care assignments that foster continuity of care. Our findings contribute to the large body of literature exploring the many drawbacks on the use of longer nursing shifts, overtime, and persistent low staffing levels.

There is a growing call for action from policymakers regarding nursing workforce shortages, as both patient and nurse wellbeing are negatively impacted. To enable nurses to provide care that is continuous, high quality and evidence-based, attention should be paid to both direct and indirect (ancillary) nursing work/responsibilities. Furthermore, ancillary work should be given special consideration when addressing the issue of nurse workforce recruitment, retention and turnover, as the type of work discussed in this report is likely to influence nurses' satisfaction with their career, capacity to manage workloads, and incentives to recruit more nursing students. Our findings highlighted how using overtime, reducing staffing levels and implementing long shifts are not plausible solutions to the workforce crisis.

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