Article:
Senek, M. orcid.org/0000-0003-4226-2220, Robertson, S. orcid.org/0000-0002-5683-363X, Taylor, B. et al. (3 more authors) (2022) Consequences of understaffing on type of missed community care - a cross-sectional study. International Journal of Nursing Studies Advances, 4. 100075. ISSN 2666-142X

https://doi.org/10.1016/j.ijnsa.2022.100075

International Journal of Nursing Studies Advances 4 (2022) 100075

Contents lists available at ScienceDirect

International Journal of Nursing Studies Advances

journal homepage: www.sciencedirect.com/journal/international-journal-of-nursing-studies-advances

Consequences of understaffing on type of missed community care- a cross-sectional study

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ARTICLE INFO

Keywords:
Community nursing
Understaffing
Missed care
Unfinished nursing care

ABSTRACT

Background: Resource cuts to primary and community care in combination with a decline of those working in community settings is compromising quality of care and patient safety in the UK. It is reported that the negative consequences of understaffing and underfunding have worsened due to the COVID-19 pandemic.

Objective: This is a cross-sectional study that aimed to examine short and long-term District and Community nursing working conditions. The objectives were to assess the prevalence of understaffing and missed care and the relationship between individual and organisational factors and their association with missed care outcome. We further explored the relationship between additional caseload, staffing levels and missed care.

Methods: We developed a questionnaire based on the validated MISSCARE survey. Outcome measures were, number of vacancies per team, staffing levels, reported incidence of missed care, type of missed care, length of shift and overtime.

Results: Only 23% of teams reported having no vacancies. The mean staffing ratio was reported at 60%, including agency/bank staff (0.59±1.5). Prevalence of missed care was relatively high (60%≈). The distribution of types of missed care was spread evenly across all types of nursing care. A backward stepwise regression analysis showed that the *Proportion of Permanent staff capacity* OR=7.9 (95% CI 0.09-0.65), *Active Caseload Size* OR= 5.5 (95% CI: 1.0 – 1.003), *Number of RNs on the team (*OR 4.8 (95% CI:1.003-1.058) *and Amount of Overtime worked* (OR= 3.9 (95% CI:0.98-1.0) variable are statistically significant predictors of missed care. The analysis showed an increase in additional allocated cases per RN as the permanent staff proportion decreased to 70%, at which point the likelihood of reported *Missed Care* outcome peaks.

Conclusion: The compromised quality of care related to human resources and organisational aspects of the nursing process. Where RNs worked longer hours to make up for the backlog of cases, the prevalence of missed care was more likely. Longer working hours in the community increased the risk of compromised care and sub-optimal patient care. The aspects of the nursing process identified as 'missed' related to The World Health Organisation's three main pillars of community nursing (health promotion, patient education and screening). As such, significant components of the two first pillars are, according to these data, being undermined.

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https://doi.org/10.1016/j.ijnsa.2022.100075
Received 1 October 2021; Received in revised form 30 November 2021; Accepted 8 March 2022
Available online 9 March 2022

Abbreviations

Specialist District Nurse Qualification SPQDN
Royal College of Nursing RCN

1. INTRODUCTION

Community nursing is globally identified as central to national strategies to reduce health inequalities and in providing best value for money, (World Health Organization 2019). In 2018, a European region World Health Organisation (WHO) report declared *'integrated primary care embedded in communities'* as one of *'the nine cornerstones of a comprehensive health system response'* to prevent non-communicable diseases (p.4-5), (World Health Organization 2018). A cross-country study that compared European nations' primary care policy and workforce, prior to the COVID-19 pandemic, highlighted the importance of harmonisation between primary care reform policies and workforce policies. Countries where the two policies were misaligned were failing to produce an effective response to a rise in non-communicable diseases and changing population needs (Kuhlmann et al., 2018).

An evaluation of the primary care process service delivery from 2013, that included European countries, Canada, Australia, and New Zealand, found significant variations and a statistically significant correlation between continuity and comprehensiveness of care and national healthcare expenditures. The expenditure varied from less than one third of the average ($3110 per capita, Macedonia, Romania, Turkey) to twice the average (Norway, Luxembourg). The best overall primary care process service delivery in 2013 in Europe was observed in England and, in the non-European countries, in New Zealand (Kuhlmann et al., 2018). However, since the publication of these findings, the expenditure on primary care in England and all four UK countries, where this primary study is focused, has reduced in real terms (The Kings Fund 2019).

A King's Fund report from 2016, in the UK, showed that underfunding of primary care has created pressure that continues to compromise quality of care (Fund, 2016). The workforce data from 2016 showed a decline in the number of those working in community nursing, and those with the specialist practitioner qualification in district nursing in the UK (SPQDN), thus creating a demand-capacity gap and understaffing (Addicott et al., 2015). The staffing crisis in community nursing, in the UK, has been noted for some time (Baird et al., 2016).

The King's fund report also predicted a compromised quality of care due to an already demoralised community and district nursing workforce. The under resourcing and understaffing were predicted to have inevitable negative consequences on patient care. It is anticipated that the COVID-19 pandemic has exacerbated existing workforce challenges (Charles & Ewbank, 2021).

In acute settings, low nurse-staffing levels have been shown to be associated with adverse outcomes, with missed nursing care identified as an important predictor of avoidable patient deaths (Recio-Saucedo et al., 2018). A number of North American, Western European and Australian studies have highlighted the prevalence of missed or rationed care (Lucero et al., 2009, Sochalski, 2004, Schubert et al., 2013, Ball et al., 2014, Willis & Brady, 2021) and the relationship with poor quality care. Further evidence of missed care is available from across Central Europe. Zeleníková et al (2020) undertook a survey across hospitals in four countries (Croatia, Czech Republic, Slovakia and Poland), finding high levels of unfinished care (Zeleníková et al., 2020). Gurková et al (2019) identified elevated levels of 'unfinished nursing care' in Slovakian hospitals, where patient surveillance was the most likely aspect of care to be omitted (Zeleníková et al., 2020). It is also clear that the consequences of staffing shortages in acute settings are associated with worse patient outcomes due to missed, delayed or omitted care (Carthon et al., 2015) and missed nursing care is increasingly viewed as a critical determinant of poor patient outcomes (Kalisch et al., 2009) with associated reduced job satisfaction, nurse burnout and turnover (Ausserhofer et al., 2014). Patient perceived outcomes as a result of missed care have been reported (Gustafsson et al., 2020), with missing basic care, communication and timeliness being those most readily reported.

The explicit manifestation of missed care as a consequence of poor human resourcing is highlighted by some. A review undertaken by Kalanková et al (2019) draws attention to the ways in which missed care has been conceptualised, pointing to the explicit inclusion of economic factors leading to rationing or missed care in some models (Kalánková et al., 2019). Indeed the RN4Cast study (Ball et al 2014) involved a cross-sectional study involving 79 acute care hospitals showed missed care incidents were halved on shifts where registered nurses (RNs) cared for six patients or fewer (Ball et al., 2016). Other cross country studies have indicated that whilst resources and other individual nurse characteristics are important, the 'cascade' effect of the presence of missed care, whereby its manifestation leads to further care being left undone, is also significant (Blackman et al., 2018).

In community settings, however, the relationship between staffing levels and missed care remains relatively under-explored. A review of missed nursing care in the community revealed a small number of studies, but highlighted the high prevalence and impact of missed care (Andrew Booth, 2019). A large, cross-sectional study of 458 community and district nurses from 2017 in Ireland aimed to determine prevalence and reasons for missed care (Phelan et al., 2018) and found that missed care was highly prevalent and openly reported by RNs. In the UK the secondary analysis of a large nurse staffing database demonstrated that District and Community services were more prone to self-reported missed care (Senek et al., 2020). Whilst in Australia missed care has been highlighted a being prevalent in community based Nursing Home care (Henderson et al., 2017). Whilst the reasons for missed care were listed as lack of administrative support, understaffing, and an unexpected risk in patient numbers and/or acuity, the overarching issue was found to be lack of sufficient resources and chronic underfunding of community services.

The pressure on primary care and community services has since been further exacerbated by the COVID-19 pandemic in the UK and world-wide (OECD 2021). The 2021 report by the Organisation for Economic Co-operation and Development (OECD) emphasised the

importance of countries' strengthening of the primary care health systems to cope with and adapt to the COVID-19 pandemic. It emphasised the pivotal role that the primary and community health care systems have in health crises of the COVID-19 magnitude (OECD 2021).

A review of the adaptation of primary care services in Europe has found that primary care has carried a major role and burden in the response to COVID-19. The study concludes that a strong primary care is essential in reducing health inequalities (Aiken et al., 2012). Similarly, an exploratory study in eight European countries by Wanat et al., 2021 during the pandemic reported that the responsiveness and proper resourcing of primary care is critical to ensure adequate future care delivery during a crisis (Wanat et al., 2021). However, it also emphasised that it will only be able to carry on as a major contributor if it is adequately supported.

As a result, the World Health Organisation (WHO) recommends that, to strengthen the COVID-19 response, countries must support adaptation of primary care services by providing adequate resourcing and finance, adequate levels of human resources and by protecting the primary health care workforce (WHO 2020).

Yet, it is noteworthy that, as in previous crises such as the economic downturn of 2008 and now the COVID-19 pandemic, global resources and priorities have been mainly focused on hospital settings (OECD 2020). The most recent study that compared the experiences of the trainee nursing associates (TNAs) in the UK in primary versus hospital settings during the COVID-19 pandemic, found statistically significant differences in the prevalence of missed care ($p=0.02$), preparedness in terms of staff numbers ($p=0.036$), COVID-risk management ($p=0.07$) and safety at work (0.048) (King et al., 2021). In primary care, the TNAs had less favourable working conditions, unmanageable workload and that resulted in higher prevalence of missed care. These findings suggest that primary care that was already under-resourced and received very little additional support (O'Dowd, 2018).

In addition, a recent large survey of primary care staff in the UK from February 2021 found that the burden of end-of-life care had increased significantly during the COVID-19 pandemic (Mitchell et al., 2021). Due to the changes in the work practice, the study found that the use of remote consultations by general practitioners increased significantly. Consequently, community nurses took greater responsibility in most aspects of end-of-life care practice, particularly face-to-face care. As a result, nurses reported feeling isolated and suffering from emotional distress (Mitchell et al., 2021).

The aim of this research was to examine the association between types of missed patient care, work and caseload, and staffing levels in community and district nursing. We took an existing in-patient conceptualisation of missed care as the basis for our planning data collection and applied this to the community environment, albeit with appropriate amendments to suit the context (Ausserhofer et al., 2014) (see Fig. 1). Specifically, it explored the relationships between workload, types and frequency of missed care and staffing levels. This study was planned prior to the COVID-19 outbreak but data collection was carried out during the time period of the ongoing pandemic.

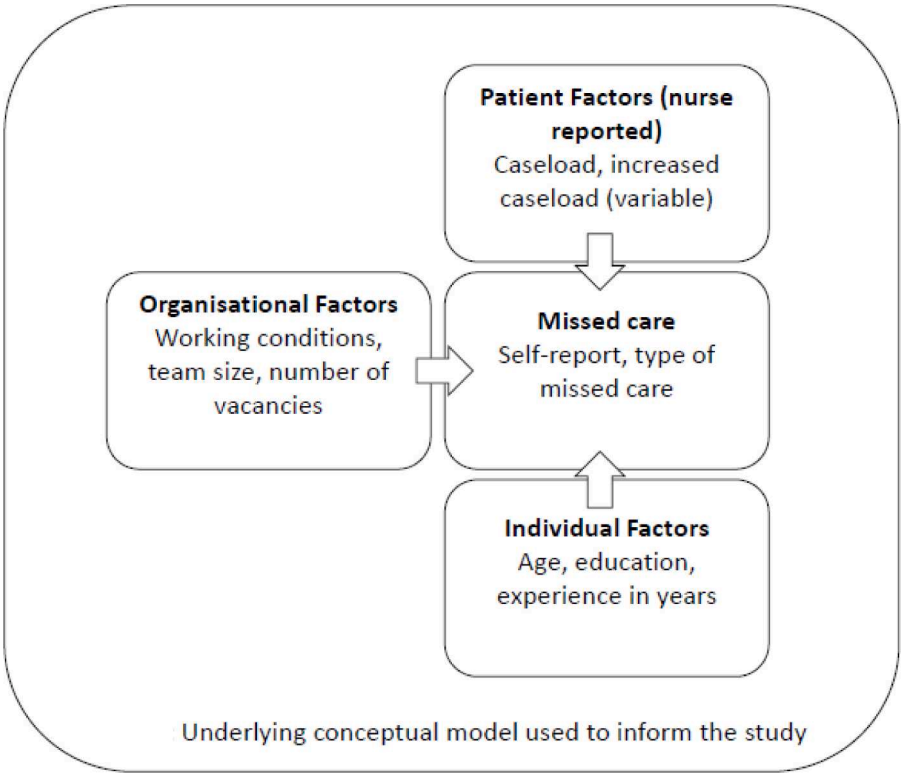

Fig.1. Underlying conceptual model used to inform the study

2. METHODS

2.1. Study Design

This was a cross-sectional survey of community and district nurses. We carried out descriptive analyses and explored statistically significant differences between missed care and no missed care outcomes. We then carried out a backward stepwise regression approach to eliminate predicting variables and best explain the model of unfinished nursing care.

2.1.1. Survey Development

A survey was designed to explore RNs workload, caseload, working conditions, prevalence and type of missed care and staffing levels. For the purpose of exploring missed care in community settings, we adapted the validated missed care in community and district nursing questionnaire that was developed by Phelan et al (Phelan et al., 2018). This was a validated questionnaire that had been previously adapted for community settings-only and used in a large study in Ireland in 2018. This questionnaire itself was an amended version of the validated Kalisch et al., (Kalisch & Williams, 2009) questionnaire.

The validated Phelan et al., version of the missed care in the community settings questionnaire was produced to include all types of nurses working in the community setting including health visitors, school nurses, specialist nurses (e.g. for heart disease/stroke, diabetes, COPD, continence services, Disadvantaged groups (traveling population, homeless population, asylum seeker population, migrant population)), Community Psychiatric Nurses, community based learning disability nurses, and community paediatric nurses. As our study focus was more specifically on generic (not specialist), adult focused, district and community nursing services, our adaptation of Phelan's survey centred around removing items that seemed to relate to these more specialist areas. A further reason for removing non-core items, and making decisions about item exclusion, was to keep the survey of reasonable length to improve completion rates; the length of time for completion was identified as a limitation in the Phelan et al., study.

The process for making these adaptations included discussions with the Phelan study survey developer and other stakeholders to reflect the core nursing activities of community nurses. After initial discussions with Phelan, an iterative process of engagement with the Royal College of Nursing (RCN) took place to determine which items to retain and which to exclude from the Phelan questionnaire. RCN participants included national professional nursing leaders in the fields of end-of-life care, education and district nursing and a district nursing academic. Iterations of the amended tool were circulated over a 6-week period and a consensus reached on relevance of the final items for inclusion and exclusion.

Specific items that were included were; TECHNICAL NURSING (Injections, dressings, gastronomy tube change, collecting specimens, catheter care, Assessments, syringe driver change, pressure area review), FUNDAMENTAL/PERSONAL AND INTIMATE NURSING (Personal care, promotion of skin integrity etc.), EDUCATIONAL (Immunisation information, health advice, advocacy, information on administration of injections), LIAISING WITH OTHER CARE PROVIDERS AND PROFESSIONALS, PROVIDE SUPPORT TO FAMILIES (Following bereavement, marriage/family breakdown etc), PROVIDE SUPPORT TO CARERS (to those caring for a family member with a disability or an older person) SCREENING (Use of screening tools to support clinical risk assessment), HEALTH PROMOTION AMONG PEOPLE (Healthy eating/rest and exercise, well-being and socialisation), EDUCATION (Precepting student nurses, participating in CPD training), ADMINISTRATION (report writing, completing patient notes, updating patient files, other admin duties), GOOD COMMUNICATION (taking enough time to explain and listen to patients' concerns and answer questions).

Items that were excluded were Care Management (performing patient need assessment prior to discharge from hospital), client advocacy, solely Older People Focus (maintaining older people register, management of elder abuse cases, follow-up dementia care), Involvement in out-of-hours services, liaising with community intervention teams, health promotion in schools, older people-only provision, specialist heart disease/stroke, diabetes, COPD, continence services, disadvantaged groups (traveling population, homeless population, asylum seeker population, migrant population), Mental Health, Disabilities Service, Children with Life Limiting Conditions, Chronic Disease Management, Primary Care Teams (coordination, organization etc.), Referral to and follow up for other primary care services.

On our final questionnaire, missed care questions were categorised in sections to represent the core components of community nursing. These sections are; Home Nursing Care, Care Management, Family Support, Older People, Health Promotion, Education, Provision of other Community Services, and Administration. The respondents were asked to indicate how often these aspects of care had been missed on their last shift using a 4-point scale.

2.2. Recruitment and Consent

Recruitment took place by means of closed social media forums and established community and district nursing networks. Recruitment was carried out via the largest national District and Community Nursing Forum with over 6000 members, hosted within a closed, private Facebook group. Participants were deemed eligible if they are a community or district nurse and are working in one of the four countries of the UK (England, Wales, Northern Ireland or Scotland). Participants were required to indicate eligibility by confirming their registered status.

2.2.1. Participants

District and community nurses of all pay grades in all four UK countries were eligible to take part. District and community nurses of all Agenda for Band grades were eligible to take part. RNs with or without a Specialist District Nurse Practitioner Qualification (SPQDN) qualification were eligible to take part. For this study, we aimed to achieve a response rate of at least 10 %.

3. Ethical Approval

The study was approved by [Blinded for Peer review] ethics committee *(UREC 037623, January 2021)*.

3.1. Confidentiality and Safeguarding

All the information that was collected during the research remained confidential and was only accessible to members of the research team. Data was stored on a secure server. All data was strictly anonymized for publication. No participants are not identified in the publication.

4. Data Collection

Data was collected between February 8th to April 26th, 2021 for a period of 10 weeks. A web link to the questionnaire was posted on the group forum by the group administrator. Qualtrics© web software was used to administer the questionnaire as it allows for easy access, monitoring and is particularly user- friendly on mobile phone devices. Qualtrics operate on protected high-end firewall systems and uses encryption for all transmitted data.

5. Measured Outcomes

We collected information that can be categorised into following domains: demographics, frequency and type of missed care, staffing levels, reasons for missed care, job satisfaction and intention to leave.

5.1. Demographic variables

We collected non-identifiable participant data including; role title, whether they hold an SPQDN qualification, age, gender, years in practice, Agenda for Change (Afc) pay grade (where band 5 is typical of those with least experience and/or level of education, band 6, band 7, band 8 are typical of those with highest level of education/and or experience), part-time/fulltime working, country of the UK, and first four digits of their work postcode.

5.2. Missed Care and Types of Missed Care

'Due to a lack of time did you leave necessary care (any aspect of required patient care) undone on your last shift? The response options were 'yes' or 'no'. The survey instrument also asked questions about types of care that were missed. Based on the approach used in the original missed care survey, the types of missed Care responses were dichotomized in the following way; Rarely and Occasionally responses were combined into one No/Rarely Missed Care and the Frequently and Always responses were combined into Yes Missed Care one response.

6. Reasons for Omitted Care

Respondents were asked to select from a list of options of reasons for omitted care. They could select as many options as they think apply. The options were inadequate staffing, unanticipated rise in patient volume and/or acuity/complexity, lack of secretarial/ administrative support or other and an option to explain if they wish to do so.

6.1. Caseload

We asked participants to list their current caseload, additional caseload that was handed to them due to staff absence on their last shift and the proportion of their caseload that are COVID-19 related cases.

7. DATA ANALYSIS

SPSS Version 20 was used to analyse the data set. Descriptive data are presented using frequencies and percentages. Mean and standard deviation were used to present the staffing ratios, caseloads, additional caseloads, and proportion of vacancies. Frequencies are reported for other individual or organisational factors. We report missing cases for each variable. Data were aggregated across all 4 countries. No additional analysis was done by country.

We used the first 4 digits of work postcode as provided by participants to identify participants that may have been on the same team. We did not identify any participants with the same postcode. Therefore, we did not exclude any participants on this basis.

We did not carry out a subgroup analysis by country due to the comparatively smaller sample size in 3 out of 4 countries.

Individual nurse factors and structural/organisational factors and patient factors (nurse report) in missed care were explored more fully (see Fig. 1). This is consistent with our underlying conceptual model used to inform the study (Ausserhofer et al). Individual nurse factors included: SPQDN qualification and years community nursing, The patient factors (nurse report) were: current active caseload and additional cases to current caseload on last shift. Organisational factors were: length of last shift (hours), overtime on last shift

(minutes), total travel mileage on your last shift and sufficient support from manager, number of RNs on the team, percentage of staff permanent and full complement of staff on last shift. The numbers were reduced as several respondents reported a larger number of vacancies than their team size; this meant there were 500 cases in this analysis. These cases were removed from the analysis. The difference was compared using a Chi-squared Test or a Mann-Whitney U-Test.

To explore further the relationship between individual factors and organisational factors logistic regression analysis was carried out using the factors found significant in the bivariate analysis. Backward Stepwise selection was used to determine the terms in the final model. A grouped scatter plotted the proportion of vacancies, additional cases and missed care. Backwards Stepwise elimination was used to give us a more parsimonious model. We plotted the observed groups and predicted probabilities.

8. RESULTS

8.1. Participants

A total of 533 respondents completed at least 90% of the survey. Out of the 533 participants, the majority were from England (n=357, 67%), followed by Scotland (n=70, 13%), Northern Ireland (n=51, 9.5%) and Wales (n=39,7.5%) and 16 (3%) did not provide sufficient post code information to determine the country.

Half of the respondents (51%, n=269) reported that they *had* a SPQDN qualification. In terms of roles, 48.2% (n=254) identified as *district nurse,* 41.5% (n=219) *community staff nurse*, 5.8% (n=30) as *nurse specialist* and 4.5% (n=24) as *community matron* (missing values n=6).

The distribution between pay grades was 34% (n=184) Afc B 5, 41% (n=221) Afc B 6, 21.6% (n=116) Afc B 7 and 12 (2.2%) in Afc B 8. *(missing cases, n=6.)* There was a strong association between career progression (in terms of banding level) and whether the respondents had an SPQDN qualification. The majority of RNs in band 5 (98.4%) were those RNs that lacked an SPQDN qualification. The majority of band 8 RNs had an SPQDN qualification (see Table 1).

8.2. Permanent Understaffing

The average team size reported was 12.34±9.6 RNs per team. Respondents were asked to indicate how many vacancies currently existed within their team. Only 23% of respondents (equivalent to 122 teams) had a full complement of permanent staff. The remaining 77% or 411 teams had at least one vacancy being advertised at the time the respondent completed the questionnaire. The average number of vacancies per team ranged from 2-4. The average vacancy rates were 2.6±4.6. Those teams that had at least one vacancy had on average low staffing capacity. Staffing capacity includes bank and agency staff, therefore a vacancy does not automatically mean low staffing capacity if it has been filled with a bank/agency nurse. The mean proportion of vacancies per team showed that teams with posts un-filled are functioning at an average capacity of 60% (Mean Staffing Ratio, SD= 0.59±1.5).

8.3. Additional Caseload

The respondents were asked about the number of additional cases that they had to take on their last shift due to staff absence. There were regional variations, with the average number of additional patients per shift per RN due to staff absence was 4.9±10.7.

Respondents were also required to indicate increases in caseload as a consequence of COVID-19 pressures. More than three-quarters (n=405, 77%) of RNs reported that their case load had increased as a result of COVID-related cases. The burden of COVID-related cases was 20.7±56. In England, average COVID-cases per RN were reported as 24.9±66.1, which is nearly a 30% increase in case load due to COVID-related cases. In Northern Ireland, average additional cases per RN were 14.4±33.3 (20% of total cases load), in Wales 9.3 ±11.7 (20% of total case load) and in Scotland 7±11.8 (8% of total case load).

Team Size, Average Length of Shift, Mileage, Overtime Work, Staffing Level

On average, respondents reported 9.80±4.20 hours worked. Respondents reported that they had travelled, on average, 29.30±22 miles per shift. In terms of overtime work, respondents were asked how many minutes of overtime they had worked on their last shift. In the sample, 22% (N=118) had done no overtime on their last shift. Out of the 415 respondents who listed that they had worked overtime, the average overtime worked was 99.60±58.25 minutes. Respondents were asked about management support received. Among those, 43.8% (N=235) reported that they were not receiving sufficient support from management, whilst 36.7% (197) felt supported (N=101 respondents left the question blank). In terms of staffing, 88.6% (N=477) reported that they did not have adequate number of RNs on their last shift.

Table 1
Banding vs SPQDN qualification

		Band 5	Band 6	Band 7	Band 8a	Total
Do you have a SPQDN qualification?	**Yes**	3 (1.6%)	160 (72.4%)	98 (84.5%)	11 (91.7%)	272 (51%)
	No	181 (98.4%)	61(27.6%)	18 (15.5%)	1(8.3%)	261(49%)

9. Reporting of Missed Care

Overall, 59.4% of the RNs responded, 'yes' to the question; On your last shift did you leave necessary care undone due to a lack of time'. The types of care that were most frequently missed are listed in Table 2. There were missing cases in the 'types of care missed' as well as 'did not apply to workload' responses. Therefore, total responses varied.

Respondents who had reported that they had missed care on their last shift were asked to indicate the reason for missed care. They could select as many reasons as they thought appropriate. All five items were identified by the participants as reasons for missed care. The factor that has the greatest and most frequent impact was the unanticipated rise in patient volume and/or acuity (61.6%) followed by understaffing (58.1%) (see Table 3).

10. Individual and Organisational Factors associated with Missed Care

We explored the difference between missed care and rarely missed care outcomes for a number of variables by descriptive analysis and testing for statistically significant difference (see Table 4). Current active caseload number (*p=0.004)*, length of shift *(p=0.012*), number of RNs on team *(p=0.014)* and proportion of permanent staff *(p=0.05),* were statistically significantly different between the missed care vs rarely missed care outcome. Received managerial support was borderline statistically significant (p=0.09). Whether they got sufficient support from the manager was just above 10% level of significance (p=0.103) but would have reduced the sample size to 407 if included in the logistic regression. Arguments could be made as to whether it would have been significant if more nurses had filled in this question, however as it was not significant and reduced the sample size it was excluded from the regression.

The regression analysis was thus conducted on 500 cases in total. The aim of the regression analysis was to test potential predicting variables of the missed care outcome.

The final model was overall significant x^2 (3) = 19.864 p<0.01. The model showed that the *Proportion of Permanent staff capacity* OR=0.985 (95% CI 0.974-0.995)*, Active Caseload Size* OR (of an increase of 10 patients) = 1.010(95% CI: 1.000 – 1.020) *and Number of RNs on the team* OR (per RN) 1.018 (95% CI:0.997-1.039) variable are statistically significant predictors of missed care. It should be noted there was a moderate correlation between shift length and the amount of time worked r=0.464, p<0.001) and weak correlations between percentage of staff that are permanent and length of shift (r=-0.161, p<0.001) and number of RNs on team (r=0.139, p<0.001). Also, a weak correlation between no of RNs on team and current clinical caseload (r=0.090, p<0.001.

Additional caseload variable is not significant in the above analysis. However, there appears to be a relationship between additional caseload's impact and the proportion of percentage of staff (See figure 2).

The analysis of the association between additional cases, missed care and proportion of permanent staff showed that as the proportion of permanent staff decreases (i.e., the proportion of vacancies increases), there is an increase in additional allocated cases per RNs to their current caseload. However, this increase only happens down to 70% of permanent staff capacity (or 30% of vacancy). As a result, the likelihood of reported *Missed Care* outcome increases and peaks at the point of 0.3 or 30% vacancy rate. As such, there is a non-linear relationship between *Additional Cases* and *Proportion of Vacancies* because this relationship changes and therefore is not linear. When this relationship was further explored, by testing where the differences are most significant, the analysis showed that the difference between missed care and/ rarely missed care cases reported is only statistically significant between teams that have zero vacancies per team (full complement of permanent staff and any other team with at least one vacancy). The odds ratio of missed care for one vacancy per team is 0.45 (OR-0.45) meaning that the likelihood of missed care being reported doubles for each vacancy within a nursing team. These findings suggest that even where teams compensate for vacancies by employing temporary agency and/or bank staff, the RNs are still more likely to report missed care.

Furthermore, there was a difference in prevalence of missed care on teams with no vacancies and teams with at least one vacancy (One vacancy or more Missed Care=64.3%, N=243 vs. No Vacancy Missed Care=44.7%, N=51). The difference in prevalence of missed care between the two is statistically significant (p=0.001).

Table 2
Due to a lack of time, how frequently did you leave this care undone'?

	Rarely/No Missed Care	Missed Care	Total Responses	Did not Apply to Workload
Health Promotion Among People	53 (13.3%)	347 (86.6%)	400	33 (6.1%)
Administration (eg. Report Writing)	74 (17.2%)	357 (82.8%)	431	2 (0.4%)
Screening	83 (20.1%)	329 (79.9%)	412	21 (3.9%)
Education	81 (20.2%)	321 (79.8%)	402	31 (5.8%)
Liaising with Other Health Care Professionals	97(22.6%)	332 (77.4%)	429	4 (0.7%)
Educational (Immunisation advice, health advice, advocacy)	93 (23.5%)	302 (76.5%)	395	38 (7.1%)
Providing Support to Carers	122 (30.4%)	279 (69.6%)	401	32 (6%)
Providing Support to Families	131 (32%)	281 (68%)	412	21 (3.9%)
Fundamental Personal/Intimate Nursing	151 (37.8%)	249 (62.3%)	400	33 (6.1%)
Technical Nursing	187 (44.3%)	235 (55.7%)	422	11 (2%)
Good Communication	275 (64.4%)	152 (35.6%)	427	9 (1.1%)

Table 3
Reasons for Missed Care

	Moderate/Significant	Minor/Not A Reason	Missing cases (n)
Unanticipated rise in Patient Volume and/or Acuity	331 (62.6%)	198 (37.4%)	*N=4*
Permanent Understaffing	306 (57.8%)	223(42.2%)	*N=4*
Additional Workload due to COVID-19	260 (49.2%)	269 (50.8%)	*N=4*
Understaffing due to Sickness	259 (49%)	270 (51%)	*N=4*
Lack of Secretarial/Admin Support	222 (42%)	307 (58%)	*N=4*

Table 4
Missed Care Outcome by Individual and Organisational Factors showing means ±SD for scale variables and N (%) satisfying criteria for dichotomous variables

	No Missed Care	Missed Care	No of Cases	Test	p-value
Individual Factors					
SPQDN Qualification*	97 (47.5%)	152(51.4%)	499	chi-squared (1) =0.70	0.414
Years Community Nursing	13.78 ±9.23	13.54 ±10.06	500	MW U-Test=28720	0.402
Current Active Caseload	174.01 ±173.08	227.95 ±216.88	500	MW U-Test=25631.5	0.004
Additional Cases to current caseload on last shift	3.73 ±4.5	5.7 ±13.67	500	MW U-test= 28063	0.175
Length of Last Shift (hours)	9.04 ±1.07	9.17 ±1.98	500	MW U-Test=27168.5	0.050
Overtime on last shift (hours)	1.12 ±0.97	1.28 ±1.02	500	MW U-Test=27441	0.078
Total travel mileage on your last shift?	28.02 ±23.58	27.57 ±21.53	500	MW U-Test=29990.5	0.899
Sufficient Support from Manager*	81 (50.6%)	104 (42.1%)	407	chi-squared (1) =2.84	0.103
Organisational Factors					
Number of RNs on the Team	12.07 ±9.91	13.39 ±9.48	500	MW U-Test=26297.5	0.014
Percentage of Staff Permanent	82.65 ±17.45	78.06 ±19.25	500	MW U-Test=25755.5	0.005
Full complement of Staff on last shift*	26 (12.7%)	26 (8.8%)	500	chi-squared (1)=2.03	0.180

* These variables were dichotomous; all others were scalar.

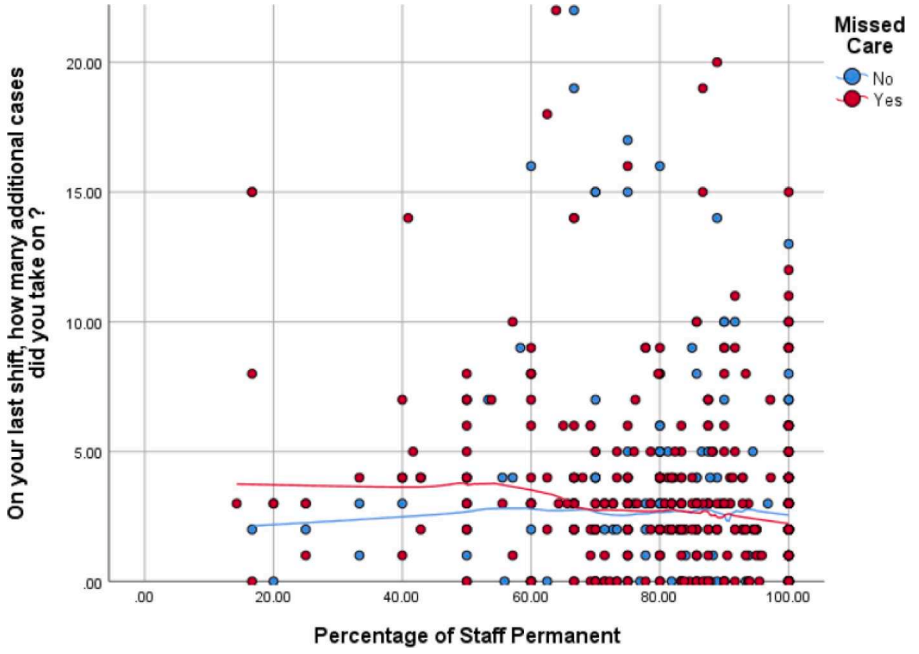

Fig.2. Relationship between Missed Care, Additional Cases and Percentage of Permanent Staff -created by the authors

11. DISCUSSION

Previous studies have primarily focused on missed care in acute settings (Senek et al., 2020, Griffiths et al., 2019, Ball et al., 2016). This study gives an insight to the challenges that are facing nurses working in community settings. Our findings indicate that community nursing teams across the UK are experiencing high levels of permanent workforce shortages. Whilst we do not have data for how long the posts have been unfilled, the figures clearly indicate a huge challenge for the nursing workforce and communities of

patients. The Queen's Nursing Institute, noted understaffing as chronic, and it is inevitably affecting the quality of care that can be delivered (Queen's Nursing Institute RC of NO models of district nursing 2019). Our findings indicate that the prevalence of missed care (60%≈) is high, especially relative to a similar study carried out recently (Baird et al., 2016). The distribution of types of care left undone was spread evenly across all categories, including health promotion (86.6%), screening (79.9%), intimate /personal care (62.3%), and support to carers (69.6%). With the recent recognition of the importance of primary and community care in addressing health crises (WHO 2020), including the current pandemic, community nursing will require more attention and resources to be able to respond effectively to these demands.

Almost two-thirds of respondents reported sub-optimal staffing ratios during their last shift. This data collection was carried out in February-March 2021, at the time when there was no COVID-19 vaccine available and therefore many staff may have been shielding in line with UK Government guidelines. However, given the high rate of vacancies noted in community nursing teams, these data suggest that this low staffing ratio may be permanent, and that understaffing is not compensated for by the use of additional bank and/or agency staff. The consequence of this is a higher prevalence of reported missed care, including during those shifts with a presence of temporary staff. The association between missed care and a high proportion of temporary nursing staff has been previously reported in acute settings, where it was demonstrated that a higher proportion of temporary staff does not account for the same quality of work that would be delivered by a permanent member of staff (Senek et al., 2020). Relying on temporary staff to compensate for vacancy gaps is not the optimal solution to chronic workforce shortages. The importance of a full complement of permanent staff is further emphasised on the regression analysis where the strongest predictors of missed care were the *Proportion of Permanent staff capacity* OR=7.9 (95% CI 0.09-0.65), followed by *Active Caseload Size* OR= 5.5 (95% CI: 1.0 – 1.003).

Furthermore, our analysis demonstrates that organisational factors such as the *size of the active caseload, additional cases, length of shift* and the *proportion of permanent staff* was statistically significant between those respondents reporting missed care. Individual factors such as *age, years of experience* or whether the respondent has an *SPQDN qualification* were not statistically significant. As such there is an indication that missed care cannot be attributed to the RNs' abilities or coping strategies. Rather, the determinants of missed care and compromised quality of care are factors related to human resources and organisational aspects of the nursing process (Kalisch & Xie, 2014). Where RNs worked longer hours to make up for the backlog of cases, the prevalence of missed care was more likely. This indicates that staying beyond the time of their allocated shift, does not compensate or make up for the excessive workload, and does result in missed care. Similar findings were reported by Caruso et al., (Caruso, 2014) where longer working hours in the community increased the risk of reduced performance, fatigue-related errors and patient harm (Caruso, 2014).

The additional observation that there exists a non-linear relationship between additional cases, missed care and the proportion of permanent staffing is also worthy of discussion. The prevalence of missed care was highest in the lower range of permanent understaffing (0.001-0.3) indicating that these teams are facing the biggest challenges. It suggests that when the permanent understaffing is deemed relatively low, the practice of dividing the additional cases among the team is prevalent. Only when that permanent understaffing is beyond a certain point is the situation deemed unmanageable and the team then supported by additional resources such as temporary staff or RNs from other localities.

It was noted that our work was shaped with reference to a Donebedian formed model devised by Ausserhofer et al (2014) (Ausserhofer et al., 2014). Within this conceptualisation structural factors (staffing, organisation and environment) provide the context for (process) individual nurse factors (age, qualification and education) and patient factors (e.g. acuity of need) to contribute to missed care, with implications for subsequent outcomes. Our study indicates that a range of human resource and organisational factors (structure) contribute to missed care outcomes and there are clear relationships between staffing numbers and rising caseloads as significant predictors of missed care. Our findings do not necessarily implicate individual nursing (process) factors here. When considering these findings in relation to existing hospital based conceptualisations of missed care therefore, our findings resonate with an *'implicit rationing of care'* model (Schubert et al., 2008) with an emphasis upon nurse decision making in the context of economic reduction and scarcity of resources, and therefore prevailing at the structural and organisational level. Furthermore, our data also show variation in the areas of nursing activity that are implicitly 'rationed' with an emphasis on those tasks situated within the fields of surveillance/screening, education and health promotion. This is consistent with Schubert et al's (2013) notion of nurse decision making when resources are scarce (Schubert et al., 2013). Falling short of explicating our own conceptualisation for missed care in a community nursing context, we certainly regard this to be an urgent research objective for the field.

These data provide further evidence of the relationship between inadequacies in the RN community workforce and poor quality of care provided to communities. However, those aspects of the nursing process identified as 'left undone' is also of some concern, especially when we consider the goals of community nursing. The World Health Organisation's three main pillars of community nursing interventions have been reiterated as: health promotion, disease prevention and disease management (WHO, 2017). Those aspects of missed nursing care reported as most prevalent in this paper include health promotion, patient education and screening. As such, significant components of the two first pillars identified by WHO are, according to these data, being undermined. The third, disease management, is also potentially impaired by aspects of missed nursing care work with families and carers as well as that identified as 'liaising with other professionals' (care coordination) and 'administration/reporting' (care management). We can begin therefore to speculate as to some of the potential failings of the current UK community and district nursing provision. We suggest, from the data presented, that these failings can mainly be attributed to inadequate human resourcing and the organisation of services. Moreover, Ausserhofer et al (Ausserhofer et al., 2014) identify missed nursing care as a predictor of job dissatisfaction, burnout and intention to leave and we would further suggest that sub-optimal human resources itself adds to the challenges being faced by organisations as they attempt to stem the flow of experienced RNs away from the profession.

11.1. Strengths and Limitations

Our study contributes to the gap in the literature on the prevalence of missed care and staffing in UK community settings that may also have resonance in similar health service contexts internationally. The main limitation of our study is that it does not include patient outcomes, which would shed further light on how the current resources crisis in community nursing is impacting patients and quality of care. The data is dependent upon self-reported levels of staffing and missed care and as such should be viewed with necessary caution. The study was carried out during the COVID-19 pandemic, which is known to have generated a major burden on the community services in addition to that already present. However, a lot of the data that we have collected are long-term variables that may or may not have been significantly impacted because of the pandemic. To minimize response bias, we avoided binary response formats such as "Yes/No", "True/False", and "Agree/Disagree". To avoid selection bias, we recruited RNs of all grades, years of experience, geographical locations, and age. The accuracy of our findings are based on participants' ability to recall data. Unfortunately, there was no way for us to verify the accuracy of their recall. The burden of COVID-19 cases was assessed by the assessment of proportion of COVID-19 cases out of the overall caseload, which highlighted large variation among the four countries of the UK. Furthermore, the study is a good reflection of the community settings' coping capacity during an ongoing pandemic.

What is already known

- Good primary and community care is critical in combating infectious and non-infectious diseases.
- Underfunding and workforce shortages in community settings compromise quality of care.
- The negative consequences of under resourcing of community services in the UK may have been exacerbated by the COVID-19 pandemic.

What this paper adds

- This study is the first primary study to explore the relationship between staffing levels and missed care in community settings in the UK which is relatively under-explored.
- Prevalence of self-reported missed care was high (≈60%).
- Majority of community nursing teams had at least one long-term unfilled vacancy (77%)
- *Proportion of Permanent staff capacity, Active Caseload Size, Number of RNs on the team* and *Amount of Overtime worked* are significant predictors of missed care.

12. Ethical Approval

The study was approved by [Blinded for Peer review] ethics committee *(UREC 037623, January 2021)*.

13. Funding source

The project was funded by the Royal College of Nursing (RCN) as part of the Strategic Research Alliance (SRA) between the RCN and the [Blinded for Peer review]. The views expressed are those of the author(s), and not necessarily those of the RCN or the [Blinded for Peer review].

14. Authors Contribution

MS, TR and SR developed the survey. MS carried out planning and analysis. RK, EW, BT and AT contributed to the interpretation of the data and writing of the manuscript. All authors have approved the manuscript for submission.

15. Grant/Award number

Not Applicable

Declaration of Competing Interest

None

Acknowledgements

We would like to thank all those who participated in this study.

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