European Journal of Internal Medicine xxx (xxxx) xxx

Contents lists available at ScienceDirect

European Journal of Internal Medicine

journal homepage: www.elsevier.com/locate/ejim

Original article

Prevalence, predictors and outcomes of physician care left undone in acute care hospitals across six European countries during COVID-19: A cross-sectional study

Simon Dello [a,*], Luk Bruyneel [a], Dorothea Kohnen [a,b], Hans De Witte [b,c], Wilmar B. Schaufeli [b], Matthew D. Mchugh [d], Linda H. Aiken [d], Walter Sermeus [a], for the Magnet4Europe consortium [a]

[a] Leuven Institute for Healthcare Policy, KU Leuven, Kapucijnenvoer 35 blok D bus 7001, Leuven 3000, Belgium
[b] Occupational & Organisational Psychology and Professional Learning, KU Leuven, Belgium
[c] Optentia Research Unit, North-West University, Vanderbijlpark 1900, South Africa
[d] Center for Health Outcomes and Policy Research, University of Pennsylvania School of Nursing, USA

ARTICLE INFO

Keywords:
Hospitals
Health resources
Quality of health care
Workload
Burnout
Professional

ABSTRACT

Objective: To examine the prevalence, antecedents and consequences of physician care left undone in acute care hospitals.
Design: A multicentre, multinational, cross-sectional survey. An 11-item scale measured physician reports of care left undone. Antecedent measures examined were work environment and perceived workload. Potential consequences examined included emotional exhaustion, job dissatisfaction and perceived quality of care. Generalized linear mixed models were estimated to quantify associations between physician care left undone and the theorized antecedents and consequences.
Setting: 56 acute care hospitals in six European countries.
Participants: 1 963 physicians providing direct patient care to adult in-patients.
Results: Four in five (78.3 %) physicians left one or more care activities undone during their last shift. On average 3.1 (SD 1.0) of 11 activities were left undone. This varied between and within countries. A 10 % increase at the hospital level of physicians saying they have too much work to do, significantly increased the odds of one or more activities being left undone (OR 1.414, 95 % CI 1.268–1.578). Physicians' reports of care left undone were associated with increased odds of emotional exhaustion (OR 3.867, 95 %CI 2.683–5.575) and rating quality of medical care as poor or fair (OR 3.395, 95 % CI 2.215–5.204).
Conclusion: Physicians frequently report leaving some necessary care undone. A shortage of resources compromises physicians' ability to do their jobs, impacting the quality of care they deliver and their job satisfaction and well-being. Ensuring adequate healthcare personnel resources should be a top priority for hospitals.

1. Introduction

Healthcare is becoming increasingly complex [1]. The COVID-19 pandemic arose, in many countries, in a context of prolonged underinvestment, with reduced staffing levels relative to need and poor working conditions contributing to deteriorating mental health of clinicians [2–4]. In the US, over 40 % of physicians report at least one symptom of burnout [5]. In Europe burnout amongst physicians is also prevalent [6]. Burnout has a number of negative consequences for the individual physician, such as increasing risks of depression [7], suicide, and substance abuse. Physician burnout also negatively impacts patient care as physicians burnout is associated with suboptimal quality of care, increased risk of medical errors [8,9] decreased productivity, job dissatisfaction, and intention to leave [10,11].

Research on burnout points to the major drivers lying within the organisation, rather than the individual, and to unsupportive or harmful work environments [12,13]. In environments, characterised by overwork, shortage of resources, and lack of support, health care professionals may be forced to leave some necessary care undone, due to lack of time [14]. This mismatch between effort and personal

* Corresponding author.
E-mail address: simon.dello@kuleuven.be (S. Dello).

https://doi.org/10.1016/j.ejim.2023.10.021
Received 20 July 2023; Received in revised form 13 September 2023; Accepted 18 October 2023

accomplishment might plausibly be expected to contribute to high levels of burnout [15].

Although, to date, most research in the field of care left undone and the impact of the hospital work environment has focused on nurses rather than physicians, what evidence exists supports this argument. Nurses in hospitals with more favourable work environments are significantly less likely to report leaving care nursing care left undone [16] and to have significantly higher rates of burnout [17]. Care left undone also impacts on patient outcomes; more nursing care being left undone is associated with increased odds of patients dying in-hospital following common surgical procedures [18]. However, research on the work environment and its association with care left undone by physicians is sparse.

Physicians working in acute inpatient care perform a broad range of activities within their scope of practice. Some are practical and specific to the patient's condition (e.g., ordering medical imaging, laboratory tests etc.) while other activities are generic, often related to communication and co-ordination of care (e.g. documentation, ward rounds, and responding promptly to concerns of nurses and others). Both, if left undone - which can also be referred to as omission of care – are hypothesised to negatively impact the quality of care and physician outcomes. To the best of our knowledge, no studies have focussed on documenting physician care left undone and the impact of this process on physician outcomes and quality of care.

This study has three aims, to: (a) describe the prevalence and patterns of physician care left undone in acute care hospitals in six European countries during COVID-19; (b) determine the association between the environment in which physicians work, their reported workload and care left undone; and (c) evaluate the association between physician care left undone and physician outcomes, including emotional exhaustion, job dissatisfaction and self-reported measures of the quality of care delivered.

2. Methods

2.1. Design

We undertook a primary analysis of data collected within the Magnet4Europe study. Magnet4Europe is a cluster randomized controlled trial to evaluate the effect of organizational redesign of general acute care hospitals on nurses' and physicians' well-being. The intervention is a multi-component redesign, based on the Magnet© concept that seeks to create organisations that attract and retain nurses. A detailed outlining of the full Magnet4Europe is available elsewhere [19]. The findings presented here are based on results from a survey conducted at baseline.

2.2. Setting and sample

A convenience sample was recruited, consisting of 67 acute care hospitals in 6 European countries i.e. Belgium ($n = 14$), England ($n = 14$), Germany ($n = 20$), Ireland ($n = 15$), Norway ($n = 1$) and Sweden ($n = 3$). These hospitals have ≥ 150 beds, provide acute care for adults, and include, at least, internal medicine and/or surgery wards. Excluded were highly specialized hospitals e.g. those only providing psychiatric, tropical medicine, or paediatric care.

Within each hospital, physicians (including residents) were invited to take part in the online Magnet4Europe survey between November 2020 and July 2021. To obtain a homogeneous and comparable sample of physicians within and between countries, in- and exclusion criteria were applied to identify an eligible sample. Physicians were eligible if they: (1) had direct inpatient contact, (2) met the minimum qualifications as stipulated by Directive 2013/55/EU amending Directive 2005/35/EC on the recognition of professional qualifications, and (3) worked on adult medical and surgical inpatient units including intensive care units (ICU) or the emergency room (ER). Excluded were physicians working in specialized areas such as neonatology, paediatrics, obstetrics, psychiatry, operating room, pathology, microbiology, radiology, and medical imaging.

2.3. Variables and measures

2.3.1. Physician care left undone (analysed at the individual level)

The instrument to assess physician care left undone is derived from the Tasks Undone scale, first used in the International Hospital Outcome Study [20] and adapted for this study to the context of physicians. Physicians were asked: "On the most recent shift you worked, which of the following medical activities were necessary but left undone (fully or partially) because of time constraints?" and presented with a list of 11 items and asked to tick the box for each item that applied and was left undone. If no care was left undone, respondents were able to tick a box "None of the above". The 11 items were: 'Provide a timely response to concerns raised by nurses', 'Develop patient plan of care', 'Diagnose, treat, or provide continuous care to inpatients', 'Comfort/talking with patients', 'Pain management', 'Documentation of care', 'Review, update and prescribe medications', 'Coordinate patient care', 'Educate colleagues and students', 'Coordinate patient discharge planning', and 'Ward rounds with nurses and other team members'. Cronbach's alpha was used to assess the level of internal consistency and scale reliability of the instrument measuring the physician work environment. In social sciences, a reliability coefficient (i.e. Cronbach's alpha) of 0.70 or higher is deemed acceptable. The value for the Cronbach's alpha for this scale was α=0.801, indicating that the items have a high internal consistency. Pilot testing was performed to assess face validity. Two measures of physician care left undone were derived. The first was a binary score signifying whether any - irrespective of the amount – physician care was left undone or not [21]. Second, a composite measure was calculated as the sum of how many of these 11 activities were left undone (range 0–11) [16].

2.3.2. Organizational context (analysed at the hospital level)

The quality of the physician work environment was assessed using nine items that capture modifiable organisational traits of the hospital such as the level of interdisciplinary teamwork, leadership, staffing and autonomy. The items used to assess the physician work environment are derived from the Practice Environment Scale of the Nursing Work Index (PES-NWI) [22]. A full description of the items is provided in Table 3. Physicians were asked to what extent they agreed or disagreed that the various items included in this scale are present in their work environment using a four-point Likert-type scale (with fixed anchors from strongly disagree to strongly agree). Exploratory factor analysis revealed three factors: job experience, staffing, and autonomy. Model fit information and factor loadings for each item are provided in Appendix A (see Table A.1). All items loaded on either of the three identified factors except for one item: 'A lot of teamwork between nurses and physicians'. This item was retained in this study as an individual item since teamwork between nurses and physicians is identified as a key element characterising a high-quality work environment in acute care hospitals [23,24]. Individual physician scores on each factor and the items related to teamwork were aggregated to the hospital level, creating a set of continuous measures. The hospital level scores were then divided into quartiles, labelled poor (lowest quartile), mixed (second and third quartile) or good (upper quartile) [25,26].

Experience of work and workload was assessed using four items derived from the Questionnaire on the Experience and Evaluation of Work (QEEW) [27]. Physicians were asked how often they experience each of the following using a five-point Likert-type scale (with fixed anchors from never to always): 'Do you have too much work to do?', 'Do you have to work very fast?', 'Are you interrupted at work?' and 'Do you have to do many tasks simultaneously?'. To differentiate physicians who frequently or infrequently experience high workload, the response categories 'always' and 'often' were clustered into one category and

contrasted with the category clustering the responses 'never', 'seldom' and 'sometimes' for each of the four items. To determine the prevalence of high workload - for each of the four items – at the hospital level, we calculated the mean percentage of physicians reporting they often or always experience each item.

2.3.3. Physician reported outcomes (analysed at the individual level)

Physician burnout was measured using the 9-item emotional exhaustion (EE) subscale of Maslach Burnout Inventory (MBI) [28,29]. The rationale for using the EE-subscale is that empirical evidence identifies this as a core element of burnout and is most frequently linked to outcomes compared to the other domains of the MBI [8]. Respondents rate the frequency with which they experience work-related feelings or emotions of emotional exhaustion on a 7-point Likert scale ranging from 'never' (score = 0) to 'every day' (score = 6). Physicians are considered to be emotionally exhausted if their individual sum score on the nine items is greater or equal to 27 [15].

Physician job dissatisfaction was derived from a single item asking physicians: "How satisfied are you with your current job in this hospital" using a 4-point Likert scale ranging from 'very dissatisfied' to 'very satisfied'. Physicians reporting to be 'very' or 'a little dissatisfied' with their job were considered dissatisfied.

Physician reported quality of care and patient safety grade were derived from two survey item and differentiated physicians (1) who reported that the quality of medical care was 'poor' or 'fair' rather than 'good' or 'excellent' and (2) who reported that the patient safety grade in their hospital was 'failing' or 'poor' compared to 'acceptable', 'very good' or 'excellent' [30,31].

2.3.4. Physician characteristics (analysed at the individual level)

Physician characteristics included age, gender, and professional experience in the hospital where they were currently employed or performed most of their clinical activities, measured in years.

2.4. Analysis

Physicians' characteristics were described using means and standard deviation (SD) for continuous variables; categorical variables were described using frequencies and proportions. Prevalence and patterns of physician care left undone between and within countries were described using the mean percentage of physicians who reported not having performed each of the 11 activities.

We used generalized linear mixed models to explore the association between the organizational context of physicians and leaving any physician care undone (as binary outcome). First, we fitted a simple model for all three latent variables of the work environment, the variable related to teamwork and each of the four workload variables. Second, we fitted a model including all three latent variables of the work environment, the variable related to teamwork and workload variables simultaneously. In all models, we used a random intercept for hospitals to account for the hierarchical structure of the data, i.e. physicians working within hospitals. All models included country, gender, and years of experience in the current hospital as fixed effects.

The association between our binary measure and individual-level physician-reported outcomes was explored using an identical modelling strategy. As a sensitivity analysis, we also used the composite score of physician care left undone, as a count variable, in the same models.

As there was only one Norwegian hospital, this was combined with the Swedish hospitals and presented jointly as "Scandinavia" throughout the analyses and presentation of findings. The level of significance was set at $p < 0.05$. All analyses were performed using SAS software, version 9.4 of the SAS System for Windows [32] and Mplus Version 8.6 was used for the exploratory factor analysis [33].

3. Results

3.1. Physician respondents and their characteristics

23 300 physicians were invited to participate in the online survey; 2 184 physicians from 65 hospitals participated, resulting in an overall response rate of 9.3 %. Only complete cases for the variables analysed were used. Hospitals with less than 10 observations were excluded, resulting in a final sample of 1 963 physicians in 56 hospitals, with on average 35 observations per hospital. Physician characteristics are described in Table 1. Except for Ireland, more than half of the respondents were male. On average physicians had 8.9 (SD 8.5) years of experience in their current hospital and 15.2 (SD 10.6) years of experience in their job overall, with large differences noted between countries.

3.2. Prevalence and patterns of physician care left undone

Physician care left undone ranged from a high of 55.3 % (for 'Educate colleagues and students') to a low of 9.7 % (for 'Pain management'), see Table 2. Some activities were especially frequently left undone in some countries, e.g. 'Educate colleagues and students' (72.0 % in Ireland) and 'Comfort talk with patients' (71.5 % Germany). There was a more than two-fold variation amongst countries in the items 'Adequate documentation of care', 'Timely response to concerns raised by nurses', 'Coordinate patient discharge planning', 'Coordinate patient care' and 'Ward rounds with nurses and other team members' (Table 2).

A large within-country variation is observed with almost all items, revealing differences between individual hospitals. Taking all items into account, the range for within-country variation is smallest in Scandinavia, ranging from 3.8 to 23.4 % points.

On average, physicians left 3.1 (SD = 1.0) activities undone in their most recently worked shift (Table 2). Overall, 78.3 % of physicians left one or more activities undone during their most recent shift while in both Germany and Ireland, less than 15 % of the physicians indicated they left no activities undone (Table 2).

3.3. Physicians' reported quality of the work environment and perceived workload

Table 3 presents physicians' opinions on their work environment and workload. In Belgium, 76.1 % of the physicians agreed that there were enough physicians to get the work done, compared to 30.3 % in Ireland. Only 31.0 % of all physicians agreed that there are enough nurses to get the work done, with similar values in all countries. In Germany, 54.7 % of physicians agreed they have enough freedom to make important decisions about patient care and work, compared to Belgium and Scandinavia where more than 80 % agreed that they had this level of autonomy. There were few differences with all other items related to the work environment.

More than 60 % of physicians report they often or always have too much work to do and must work very fast. More than 70 % of physicians report that they often or always must do many tasks simultaneously and are interrupted at work. This is similar in all countries.

3.4. Association between work environment, workload and physician care left undone

Table 4 reports the results of univariate and multiple regression analyses. In the univariate regression, the odds of leaving one or more activities undone is significantly higher when teamwork of nurses and physicians is categorised as poor versus good (OR 2.094, 95 % CI 1.173 - 3.738). The odds to leave one or more activities undone is significantly higher in work environments where physician staffing and autonomy are categorised as poor compared to good (OR 3.031, 95 % CI 1.693 – 5.428 and OR 3.768, 95 % CI 1.892 – 7.503 respectively) but also where

Table 1
Physician characteristics ($n = 1\,963$).

	Belgium	Germany	England	Ireland	Scandinavia	TOTAL
Number of respondents	464	450	497	251	301	1 963
Female (%)	43.3	43.8	48.1	52.7	47.5	46.5
Min. – Max. (%)*	15.4 – 70.0	12.5 - 69.2	31.0 - 62.9	38.5 – 77.8	45.0 - 50.7	12.5 - 77.8
Age (years) (mean, SD)	43.6 (11.0)	38.9 (9.0)	42.1 (10.3)	37.4 (10.4)	45.2 (10.1)	41.6 (10.5)
Min. – Max. (years)*	24 - 70	25 - 67	23 - 68	24 - 63	27 - 70	23 - 70
Professional experience						
In current hospital (years) [mean (SD)]	12.3 (10.0)	7.4 (7.2)	7.8 (7.6)	5.4 (6.7)	10.8 (8.5)	8.9 (8.5)
Min. – Max. (years)*	0 - 40	0 - 36	0 - 41	0 - 33	0 - 38	0 - 41
Overall (years) (mean SD)	17.4 (10.8)	11.0 (9.0)	17.1 (10.4)	12.5 (10.8)	17.2 (10.0)	15.2 (10.6)
Min. – Max. (years)*	0 - 46	0 - 40	0 - 45	0 - 41	1 – 43	0 - 46

* Minimum and maximum values on hospital level.

Table 2
Prevalence of physician care left undone in six European countries [mean percentage, (min. – max on hospital level)].

Item	Belgium	Germany	England	Ireland	Scandinavia	TOTAL
Educate colleagues and students	44.4 (10 - 61.1)	59.4 (33.3 - 83.3)	59.8 (38.1 - 73.7)	72.0 (42.3 - 92.3)	39.4 (24.1 - 47.5)	55.3
Comfort/talk with patients	35.1 (10 - 50.6)	71.5 (41.7 - 100)	52.2 (30.4 - 80)	63.5 (30.8 - 82.4)	31.9 (27.8 - 39.4)	50.7
Adequate documentation of care	28.8 (0 - 44.1)	53.8 (18.8 - 75)	35.5 (23.8 - 70)	46.9 (26.9 - 62.1)	24.5 (20 - 28.8)	38.3
Develop/update patient plan of care pathways	41.0 (18.8 - 52.9)	29.5 (12.5 - 48.5)	31.3 (18.5 - 50)	34.4 (18.5 - 69.2)	24.5 (13.9 - 30.1)	32.5
Timely response to concerns raised by nurses	15.1 (0 - 26.5)	38.9 (18.8 - 57.1)	23.0 (11.9 - 50)	31.8 (18.2 - 53.8)	21.1 (15 - 28.4)	26.2
Review, update and prescribe medications	16.3 (0 - 36.8)	30.6 (12.5 - 47.8)	16.1 (8.7 - 40)	18.8 (8.3 - 25.3)	18.2 (15 - 21.1)	21.2
Coordinate patient care	13.6 (0 - 26.2)	20.8 (0 - 53.8)	21.6 (14.8 - 40)	25.6 (10 - 46.2)	13.0 (5.1 - 19.2)	19.1
Coordinate patient discharge planning	10.0 (0 - 26.3)	17.4 (0 - 34.8)	19.4 (8.7 - 30)	22.9 (7.7 - 40.5)	10.2 (7.3 - 12.5)	17.2
Ward rounds with nurses and other team members	11.6 (0 - 27.3)	25.4 (0 - 50)	12.6 (3.7 - 30)	19.2 (7.7 - 33.3)	4.9 (1.4 - 10)	16.3
Diagnose, treat, or provide care to inpatients	10.3 (0 - 21.1)	19.7 (7.1 - 30.4)	13.6 (5.3 - 20)	15.0 (0 - 30.8)	11.4 (7.5 - 16.4)	15.2
Pain management	7.3 (0 - 16.7)	9.7 (0 - 21.7)	14.0 (3.1 - 60)	12.5 (0 - 30.8)	4.0 (2.5 - 6.3)	9.7
Composite score						
Mean (SD)	2.3 (0.8)	3.8 (0.8)	3.0 (0.8)	3.6 (0.9)	2.0 (0.3)	3.1 (1.0)
Min. – Max.	0.4 - 3.4	1.9 - 5.1	2.3 - 5.4	2.1 - 5.3	1.7 - 2.3	0.4 - 5.3
At least one item left undone (%)	69.9	85.1	75.6	87.3	62.0	78.3
Min. – Max.	(30.0 - 89.2)	(62.5 - 100)	(57.1 - 100)	(63.0 - 100)	(53.2 - 67.1)	(30.0 - 100)

Table 3
Physicians' reports on work environment and workload.

Work environment (*)	Belgium	Germany	England	Ireland	Scandinavia	TOTAL
A lot of teamwork between nurses and physicians	94.4	86.4	92.8	82.9	91.0	90.2
A supervisor who is a good manager and leader	78.4	66.2	80.9	72.9	83.1	76.3
Opportunities for advancement	75.0	76.9	78.5	66.1	77.4	75.5
Management that listens and responds to physicians' concerns	53.0	38.9	58.1	32.3	59.5	49.4
Physicians are involved in internal governance of the hospital	65.5	66.4	73.4	55.4	72.4	67.5
Enough physicians to get the work done	76.1	42.7	40.2	30.3	65.1	51.8
Enough nurses to get the work done	41.8	23.3	28.0	22.3	37.9	31.0
Freedom to make important patient care and work decisions	88.6	54.7	78.3	74.5	81.7	75.3
Not being placed in a position of having to do things that are against my medical judgement	84.7	67.8	80.9	68.1	83.7	77.6
Experience of Work/Perceived workload (**)						
Too much work to do	60.3	71.8	60.8	70.1	51.2	62.9
Work very fast	57.3	78.2	61.8	77.3	57.5	65.8
nterrupted at work	75.2	82.7	74.0	84.9	74.8	77.8
Do many tasks simultaneously	68.1	84.0	71.4	83.7	69.8	74.8

(*) % of physicians that strongly agree or agree that this item is present in their work environment.
(**) % of physicians that report always or often experiencing this.

both factors are categorised as mixed versus good (OR 2.092, 95 % CI 1.335 – 3.281 and OR 1.994, 95 % CI 1.311 – 3.032).

The odds to leave one or more activities undone significantly increases when physicians have too much work to do, have to work very fast, are interrupted at work, or have to do many tasks simultaneously. A 10 % increase in physicians indicating they have too much work to do in a hospital significantly increases the odds of physician care being left undone (OR 1.414, 95 % CI 1.268 – 1.578).

When combining the three work environment factors, the variable related to teamwork and the four workload variables in one model, aspects of the work environment being either poor versus good or mixed versus good did not significantly increase the odds of physician care being left undone. Only two variables related to physician workload; i.e. having too much work to do or being interrupted at work, significantly increase the odds of physician care being left undone in the multiple regression model. In Scandinavia, the odds of physician care being left undone were significantly lower compared to the other countries (OR 0.538, 95 % CI 0.328 – 0.883). The odds of physician care being left undone or not decreased in physicians who had more experience in their current hospital (OR 0.967, 95 % CI 0.954 – 0.979). The odds to leave one or more activities undone was lower for male than female physicians (OR 0.724, 95 % CI 0.577 – 0.9088). When controlling for characteristics of the hospital, in this case hospital size and teaching status, the results of the multiple regression model remained the same (see

Table 4
Association between physicians' organizational context (work environment and workload) and physician care left undone.

	Simple regression		Multiple regression	
Covariates	OR	95 % CI	OR	95 % CI
Work environment				
Teamwork				
Poor vs. Good	**2.094***	**1.173 - 3.738**	0.930	0.536 - 1.611
Mixed vs. Good	1.088	0.711 - 1.665	0.828	0.571 - 1.201
Job experience				
Poor vs. Good	**1.813***	**1.015- 3.239**	1.229	0.750 - 2.012
Mixed vs. Good	1.079	0.710 - 1.640	1.147	0.838 - 1.570
Staffing				
Poor vs. Good	**3.031***	**1.693 - 5.428**	1.158	0.607 - 2.210
Mixed vs. Good	**2.092***	**1.335 - 3.281**	1.153	0.701 - 1.897
Autonomy				
Poor vs. Good	**3.768***	**1.892 - 7.503**	1.207	0.553 - 2.635
Mixed vs. Good	**1.994***	**1.311 - 3.032**	0.969	0.579 - 1.623
Workload				
Too much work to do	**1.035***	**1.024 - 1.047**	**1.020***	**1.004 - 1.038**
Work very fast	**1.028***	**1.012 - 1.045**	0.994	0.972 - 1.015
Interrupted at work	**1.043***	**1.029 - 1.057**	**1.020***	**1.002 - 1.039**
Do many tasks simultaneously	**1.044***	**1.029 - 1.060**	1.011	0.983 - 1.039

* Indicate statistical significance ($p < 0.05$). Note: Adjusted for gender, years of experience in their current hospital and country. Estimated using a generalized linear mixed model with a random intercept for hospital.

Appendix A, Table A.3).

3.5. Physician reported outcomes and measures

Physicians' outcomes and measures related to quality of care are reported in Table 5. In England more than 28.2 % of physicians reported being burnt out, compared to only 10.8 % in Belgium. There was a 27-point percent difference amongst countries in the percentage of physicians dissatisfied with their current job. More than 1 in 5 physicians in Ireland and Germany reported that the quality of medical care on their ward was poor or failing. The overall patient safety measure reported was poor or failing by 15 % of physicians surveyed in England but only by 1.9 % in Belgium (Table 5).

Leaving one or more activities undone was significantly associated with emotional exhaustion, job dissatisfaction, poor or failing quality of care and a poor or failing patient safety grade (Table 6). When controlling for characteristics of the hospital, in this case hospital size and teaching status (included as fixed effect), the results of the regression model remained the same (see Appendix A, Table A.4).

When modelling medical activities left undone as a count variable, the odds of burnout significantly and progressively increase as the number activities are left undone increases. A similar pattern, although to a lesser extent, is observed for the odds of experiencing job dissatisfaction, rating the quality of care as poor or fair and rating the patient safety grade as failing or poor (Appendix A, Table A.2). Again, also here when controlling for hospital size and teaching status (included as fixed effect), the results of the regression model remained the same (see Appendix A, Table A.5).

4. Discussion

This study measured the prevalence and patterns of physician care left undone in 56 acute care hospitals in Europe and related these findings to organizational context and physician outcomes, including self-reported measures for quality of care. This is the first study to explore these relationships in acute care hospitals worldwide.

We demonstrate that care left undone by physicians is prevalent. Similar patterns of care left undone are observed between countries. Items related to psychosocial care (e.g., 'Comfort/talk with patients') and 'Documentation of care' are most frequently left undone, while activities related to providing direct care and addressing the physical needs of patients, e.g. 'Pain management' and 'Ward rounds with nurses and other team members' are less frequently left undone. These patterns are relatively similar to those seen in similar studies of nursing care, both in single- [21] and multi-country studies [16]. A potential explanation for the observed patterns may lie in the time needed to complete these activities, how well the activities are structured [34] and the impact an activity has on the patients' physical needs. The activities that are most left undone can be characterised as less structured (e.g. talking and comforting patients) and the time to complete them is difficult to predict. On the other hand, activities that are least left undone appear to be more structured in nature. Activities having a direct impact on patients' physical needs also seem to receive the highest priority. Yet physicians spending less time with patients might negatively impact patients' experiences and reduce their trust in physicians.

Table 6
Association between any physician care left undone and emotional exhaustion, job dissatisfaction, and perceived quality of care.

Physician outcomes	OR (95 % CI)
Emotional exhaustion	**3.867* (2.683 - 5.575)**
Job dissatisfaction	**2.208* (1.629 - 2.992)**
Poor or fair quality of medical care	**3.395* (2.215 - 5.204)**
Failing or poor patient safety grade	**2.618* (1.470 - 4.663)**

* Indicates statistical significance ($p < 0.05$). Note: Adjusted for gender, years of experience in their current hospital and country. Estimated using a generalized linear mixed model with a random intercept for hospital.

Table 5
Physician reported outcomes and measures (absolute percentage).

Outcomes	Belgium	Germany	England	Ireland	Scandinavia	TOTAL
Emotional exhaustion	10.8	25.8	28.2	19.5	11.9	22.7
Dissatisfied with job	13.2	27.6	30.0	39.8	14.0	24.3
Poor or fair quality of medical care	8.6	21.3	18.3	20.7	10.0	15.7
Poor or failing safety grade for hospital	1.9	6.2	7.4	14.3	9.3	7.0

Work environment and workload, as antecedents of medical activities left undone, are both modifiable factors. The simple regression models indicated that working in hospitals where teamwork, staffing and autonomy are rated as poor significantly is associated with increased odds of medical activities being left undone. This association remains even when staffing and autonomy are rated as mixed compared to good. The multiple regression model reveals that the odds to leave care undone increases if physicians' perceived workload increases. A potential explanation can be found when looking at the Job Demand Control model of Karasek [35]. The demands for physicians are high and their level of decision latitude often low, posing a high strain on physicians and potentially leads to care being left undone. These findings further strengthen the intuitive case for hospitals to invest in their work environment, building on evidence of a multiplicative effect of increased nurse staffing and good work environments [36]. An organisational intervention to improve work environment is the Magnet hospital recognition program through the American Nursing Credentialling Center (ANCC) [37]. Magnet hospitals are recognized for the excellent nurse work environment, improved autonomy and improved patient care [38,39]. The Magnet Recognition Program of the ANCC primarily focuses on nursing excellence, but it is hypothesised that this hospital wide intervention not only improves nurse outcomes but can also be a catalyst for superior physician performance [40].

We show how the ability to do their jobs impacts not just the quality of care that physicians deliver but also how satisfied they are with their jobs and their well-being. If they leave care undone physicians are more likely to rate patient safety adversely and experience negative outcomes like burnout and job dissatisfaction, themselves associated with poor patient outcomes. It is not just whether care is left undone that is important but also the number of care activities, with an incremental increase in the odds of burnout and job dissatisfaction. These findings resonate with findings from research focussing on nurses, where the effect of care left undone was associated with organizational outcomes like intention to leave and decreased job satisfaction [41].

4.1. Limitations

Several limitations must be considered and merit attention when interpreting the findings. The data used in this study are cross sectional, limiting the opportunity to establish causal relationships. The survey took place during the COVID-19 pandemic which caused a major exogenous shock to healthcare systems worldwide, impacting hospitals and the health workforce in various ways. Most hospitals were experiencing high workloads and staffing shortages [42]. Some physicians reported for example a reduction in workload due the fact that many patients were not coming to the hospital and postponing their care [43,44]. Physicians working in intensive care settings and emergency care on the other hand experienced an increase in workload and patient acuity [45,46]. Physicians were often redeployed to different settings within the hospital to care for patients with COVID-19 [47,48]. These exceptional circumstances may have obscured the prevalence of care left undone by physicians which under less exceptional conditions may be higher of lower.

The instrument to measure physician care left undone is a novel – investigator developed – instrument and relies on self-report of physicians. While the instrument is novel, it builds upon a substantial body of research in nursing – spanning over two decades - with instruments that have established strong predictive validity when used in various inpatient specialties [14,18,49]. Self-reported outcome assessments are prone to recall bias and social desirability bias. The risk of recall bias is low due to the recall period being very short (i.e. their most recent shift). Given the sensitive nature of the content and the fact that some physicians might find it controlling or conscientiously difficult to indicate which activities were left undone, while in fact they were expected to be performed, there might be a risk of providing socially desirable answers. In spite the potential bias induced by using a self-reported instrument, this method of self-reporting is predominantly used to evaluate care left undone and has demonstrated good validity in nursing research. Although direct observations of care left undone potentially provide a more accurate reflection of care left undone, they are labour intensive and prone to other types of bias (e.g. Hawthorne effect).

Hospitals participating in Magnet4Europe were self-selected as being committed to improving work environments leading to potentially underestimating the scale of care left undone by physician across European hospitals. Only six European countries were included in our sample and a low proportion of the overall number of hospitals in each of the countries, limiting the interpretation of the observed differences within and between countries. The majority of the respondents come from Belgium, England and Germany, while less observations are available for Ireland and Scandinavia. Although these first three countries represent and exemplify the two main types of healthcare systems, i.e., Bismarck (Belgium and Germany) and Beveridge (England) it remains crucial to exercise caution when extrapolating these findings to a broader set of European countries as the current sample only encompasses a limited subset of European countries and is not representative for the region of Europe as a whole. This study is the first in its kind and generates an impetus for further research in Europe and the rest of the world.

There is considerable heterogeneity in physicians' work and work obligations depending on their speciality and setting in which they are active. The findings in this study are therefore limited to physicians working in medical, surgical, and intensive care and emergency care settings in acute care hospitals and cannot be generalized to physicians in different settings. Despite limiting the sample to physicians active in these settings, those physicians represent the largest share of physicians in hospitals. We also did not study whether the same associations persist across morning, day and night shifts, or across shifts with different lengths. In this study we evaluated the association between physician care left undone and physician reported outcomes. Evidence from nursing research however demonstrated that leaving care undone is also associated with decreased patient satisfaction and increased odds of patients dying in-hospital following common surgical procedures, making care left undone a highly useful and easy performance measure for hospitals to monitor. In this study we did not evaluate the impact of care left undone by physicians on patient satisfaction or patient outcomes.

The response rate to the survey was low, posing a potential threat to the internal validity and limiting the generalisability of the findings. In addition, due to the low response rate, the results are susceptible to suffer from selection bias, potentially and inadvertently leading to having physicians with more outspoken views and opinions, both positive and negative. The observed low response rate may be attributed to the phenomenon of survey fatigue, which has been exacerbated by the COVID-19 pandemic [50]. However, the overall sample size is large (1 963) and on average there are 35 observations per hospital, ranging from 25 in Ireland to 75 in Scandinavia.

4.1.1. Implications for practice and future research

Hospital work environments and the physician workload are modifiable and can be influenced by healthcare organisations. Having a high-quality work environment and balanced workload are essential if physicians are to provide high quality, safe patient care. However, how this can be achieved and sustained requires much further study.

Future research should focus on identifying organizational interventions that are most effective in enabling physicians to perform all their medical activities in a timely manner. Expanding the sample of physicians as well as different settings in which physicians are active would also be relevant for future studies evaluating physician care left undone. The evaluation and development of instruments and measures to better understand and quantify physician staffing levels also merits attention in future research. Qualitative research can be used to shed light and further explore physicians' experiences when not being able to

provide care consistent with their professional values. Finally, evaluating the association between physician care left undone and patient outcomes is important to unveil if physician care left undone can also serve as early warning indicator for higher risk of poor patient outcomes.

5. Conclusion

Care left undone by physicians across European hospitals is prevalent. Leaving care undone primarily results from having a high workload and negatively impacts physicians' well-being and perceived quality of care. Hospitals must prioritize the availability of sufficient healthcare personnel resources to mitigate the occurrence of care left undone by physicians.

Funding

This study is funded by the European Union's Horizon 2020 research and innovation programme under the project Magnet4Europe: Improving Mental Health and Wellbeing in the Health Care Workplace (Grant Agreement No. 848031), starting 1st January 2020 until 31st December 2023. The materials presented here are the responsibility of the authors only. The EU Commission takes no responsibility for any use made of the information set out.

CRediT authorship contribution statement

Simon Dello: Formal analysis, Conceptualization, Data curation, Methodology, Project administration, Writing – original draft. **Luk Bruyneel:** Methodology, Formal analysis, Conceptualization, Supervision, Writing – review & editing. **Dorothea Kohnen:** Data curation, Project administration, Validation, Writing – review & editing. **Hans De Witte:** Validation, Writing – review & editing. **Wilmar B. Schaufeli:** Validation, Writing – review & editing. **Matthew D. Mchugh:** Methodology, Validation, Writing – review & editing. **Linda H. Aiken:** Methodology, Conceptualization, Funding acquisition, Validation, Writing – review & editing. **Walter Sermeus:** Methodology, Conceptualization, Funding acquisition, Supervision, Validation, Writing – review & editing.

Declaration of Competing Interest

The authors declare they have no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ejim.2023.10.021.

References

[1] World Health Organization, World Bank Group, OECD. Delivering quality health services: a global imperative for universal health coverage. Geneva: World Health Organization; 2018. https://doi.org/10.1596/978-92-4-151390-6.
[2] Vanhaecht K, Seys D, Bruyneel L, et al. COVID-19 is having a destructive impact on health-care workers' mental well-being. Int J Qual Health Care 2020. https://doi.org/10.1093/intqhc/mzaa158. Published Online First: 3 December.
[3] Aiken LH, Sloane DM, McHugh MD, et al. A repeated cross-sectional study of nurses immediately before and during the COVID-19 pandemic: implications for action. Nurs Outlook 2022. https://doi.org/10.1016/j.outlook.2022.11.007. Published Online First: 8 December.
[4] Zapata T, Azzopardi-Muscat N, McKee M, et al. Fixing the health workforce crisis in Europe: retention must be the priority. BMJ 2023;381:p947. https://doi.org/10.1136/bmj.p947.
[5] Shanafelt TD, West CP, Sinsky C, et al. Changes in burnout and satisfaction with work-life integration in physicians and the general US working population between 2011 and 2020. In: Proceedings of the mayo clinic. 97; 2022. p. 491–506. https://doi.org/10.1016/j.mayocp.2021.11.021.
[6] Hiver C, Villa A, Bellagamba G, et al. Burnout prevalence among European physicians: a systematic review and meta-analysis. Int Arch Occup Environ Health 2022;95:259–73. https://doi.org/10.1007/s00420-021-01782-z.
[7] Bianchi R, Schonfeld IS, Laurent E. Burnout-depression overlap: a review. Clin Psychol Rev 2015;36:28–41. https://doi.org/10.1016/j.cpr.2015.01.004.
[8] Tawfik DS, Scheid A, Profit J, et al. Evidence relating health care provider burnout and quality of care: a systematic review and meta-analysis. Ann Intern Med 2019;171:555–67.
[9] Tawfik DS, Profit J, Morgenthaler TI, et al. Physician burnout, well-being, and work unit safety grades in relationship to reported medical errors. Mayo Clin Proc 2018;93:1571–80. https://doi.org/10.1016/j.mayocp.2018.05.014.
[10] Shanafelt TD, Raymond M, Kosty M, et al. Satisfaction with work-life balance and the career and retirement plans of US oncologists. J Clin Oncol 2014;32:1127–35. https://doi.org/10.1200/JCO.2013.53.4560.
[11] Dewa CS, Loong D, Bonato S, et al. How does burnout affect physician productivity? A systematic literature review. BMC Health Serv Res 2014;14:325. https://doi.org/10.1186/1472-6963-14-325.
[12] West CP, Dyrbye LN, Shanafelt TD. Physician burnout: contributors, consequences and solutions. J Intern Med 2018;283:516–29. https://doi.org/10.1111/joim.12752.
[13] Dall'Ora C, Ball J, Reinius M, et al. Burnout in nursing: a theoretical review. Hum Resour Health 2020;18:41. https://doi.org/10.1186/s12960-020-00469-9.
[14] Lake ET, Riman KA, Sloane DM. Improved work environments and staffing lead to less missed nursing care: a panel study. J Nurs Manag 2020. https://doi.org/10.1111/jonm.12970. Published Online First.
[15] Maslach C, Jackson SE, Leiter MP. Maslach burnout inventory. Scarecrow Education; 1997.
[16] Ausserhofer D, Zander B, Busse R, et al. Prevalence, patterns and predictors of nursing care left undone in European hospitals: results from the multicountry cross-sectional RN4CAST study. BMJ Qual Saf 2014;23:126–35. https://doi.org/10.1136/bmjqs-2013-002318.
[17] Aiken LH, Sloane DM, Clarke S, et al. Importance of work environments on hospital outcomes in nine countries. Int J Qual Health Care 2011;23:357–64. https://doi.org/10.1093/intqhc/mzr022.
[18] Ball JE, Bruyneel L, Aiken LH, et al. Post-operative mortality, missed care and nurse staffing in nine countries: a cross-sectional study. Int J Nurs Stud 2018:10–5. https://doi.org/10.1016/j.ijnurstu.2017.08.004.Post-operative.
[19] Sermeus W, Aiken LH, Ball J, et al. A workplace organisational intervention to improve hospital nurses' and physicians' mental health: study protocol for the Magnet4Europe wait list cluster randomised controlled trial. BMJ Open 2022;12:e059159. https://doi.org/10.1136/BMJOPEN-2021-059159.
[20] Aiken LH, Clarke SP, Sloane DM, et al. Nurses' reports on hospital care in five countries. Health Aff (Millwood) 2001;20:43–53.
[21] Ball JE, Murrells T, Rafferty AM, et al. Care left undone" during nursing shifts: associations with workload and perceived quality of care. BMJ Qual Saf 2014;23:116–25. https://doi.org/10.1136/bmjqs-2012-001767.
[22] Lake ET. Development of the practice environment scale of the nursing work index. Res Nurs Health 2002;25:176–88. https://doi.org/10.1002/nur.10032.
[23] Kramer M, Schmalenberg C. Essentials of a magnetic work environment part 1. Nursing 2004;34:50–4. *2022*.
[24] Kang XL, Brom HM, Lasater KB, et al. The association of nurse–physician teamwork and mortality in surgical patients. West J Nurs Res 2020;42:245–53. https://doi.org/10.1177/0193945919856338.
[25] Kutney-Lee A, Wu ES, Sloane DM, et al. Changes in hospital nurse work environments and nurse job outcomes: an analysis of panel data. Int J Nurs Stud 2013;50:195–201. https://doi.org/10.1016/j.ijnurstu.2012.07.014.
[26] Schlak AE, Aiken LH, Chittams J, et al. Leveraging the work environment to minimize the negative impact of nurse burnout on patient outcomes. Int J Environ Res Public Health 2021;18:1–15. https://doi.org/10.3390/ijerph18020610.
[27] Van Veldhoven M, De Jonge J, Broersen S, et al. Specific relationships between psychosocial job conditions and job-related stress: a three-level analytic approach. Work Stress 2002;16:207–28. https://doi.org/10.1080/02678370210166399.
[28] Aiken LH, Clarke SP, Sloane DM, et al. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. J Am Med Assoc 2002;288:1987–93. https://doi.org/10.1001/jama.288.16.1987.
[29] Maslach C, Jackson SE. The measurement of experienced burnout. J Organ Behav 1981;2:99–113. https://doi.org/10.1002/job.4030020205.
[30] Aiken LH, Sermeus W, Van den Heede K, et al. Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. BMJ 2012;344:e1717. https://doi.org/10.1136/bmj.e1717.
[31] Sorra J, Nieva VF. Hospital survey on patient safety culture. Agency for Healthcare Research and Quality; 2004.
[32] SAS Institute Inc. Sas® 9.4. Cary NC: SAS Inst Inc.; 2017.
[33] Muthén L.K., Muthén B.O. Mplus user's guide. 2010.
[34] Abdelhadi N, Drach-Zahavy A, Srulovici E. Toward understanding nurses' decisions whether to miss care: a discrete choice experiment. Int J Nurs Stud 2023;139:104448. https://doi.org/10.1016/j.ijnurstu.2023.104448.
[35] Karasek Jr RA. Job demands, job decision latitude, and mental strain: implications for job redesign. Adm Sci Q 1979:285–308.
[36] Aiken LH, Cimiotti JP, Sloane DM, et al. Effects of nurse staffing and nurse education on patient deaths in hospitals with different nurse work environments. Med Care 2011;49:1047–53. https://doi.org/10.1097/MLR.0b013e3182330b6e.
[37] Luzinski C. The Magnet® model: an infrastructure for excellence. J Nurs Adm 2011;41:441–2. https://doi.org/10.1097/NNA.0B013E3182346BB1.
[38] McHugh MD, Kelly LA, Smith HL, et al. Lower mortality in magnet hospitals. Med Care 2013;51:382–8. https://doi.org/10.1097/mlr.0b013e3182726cc5.

[39] Kutney-Lee A, Stimpfel AW, Sloane DM, et al. Changes in patient and nurse outcomes associated with magnet hospital recognition. Med Care 2015;53:550–7. https://doi.org/10.1097/mlr.0000000000000355.

[40] Bekelis K, Missios S, Mackenzie TA. Correlation of hospital Magnet status with the quality of physicians performing neurosurgical procedures in New York State HHS public access. Br J Neurosurg 2018;32:13–7. https://doi.org/10.1080/02688697.2018.1429563.

[41] Cho S.H., Lee J.Y., Sun J.Y., et al. Nurse staffing, nurses prioritization, missed care, quality of nursing care, and nurse outcomes. Published Online First: 2019. doi:10.1111/ijn.12803.

[42] OECD, European Union. Health at a glance: europe 2022: state of health in the eu cycle. Paris: OECD 2022; 2022. https://doi.org/10.1787/507433b0-en.

[43] Scott AM, Murray A, Jones M, et al. I was prepared to become infected as a frontline medical staff`: a survey of Australian emergency department staff experiences during COVID-19. Emerg Med Aust 2022;34:569–77. https://doi.org/10.1111/1742-6723.13943.

[44] Arslan HN, Karabekiroglu A, Terzi O, et al. The effects of the COVID-19 outbreak on physicians' psychological resilience levels. Postgrad Med 2021;133:223–30. https://doi.org/10.1080/00325481.2021.1874166.

[45] Sapiano MRP, Dudeck MA, Soe M, et al. Impact of coronavirus disease 2019 (COVID-19) on US Hospitals and Patients, April–July 2020. Infect Control Hosp Epidemiol 2022;43:32–9. https://doi.org/10.1017/ice.2021.69.

[46] Van den Heede Koen, Bouckaert Nicolas, Detollenaere Jens, et al. Verpleegkundige bestaffing op belgische intensieve zorgen afdelingen: impact van twee jaar COVID-19 pandemie. Brussel:: Federaal Kenniscentrum voor de Gezondheidszorg (KCE) 2022. doi:10.57598/R353AS.

[47] Martinez M, Stewart NH, Koza AL, et al. The effect of redeployment during the COVID-19 pandemic on development of anxiety, depression, and insomnia in healthcare workers. J Gen Intern Med 2022;37:1003–5. https://doi.org/10.1007/s11606-021-07253-y.

[48] Bronheim RS, Humbyrd CJ. COVID-19 and the orthopaedic surgeon: who gets redeployed? J Med Ethics 2023;49:3–8. https://doi.org/10.1136/medethics-2021-107421.

[49] Bruyneel L, Li B, Ausserhofer D, et al. Organization of hospital nursing, provision of nursing care, and patient experiences with care in Europe. Med Care Res Rev 2015;72:643–64. https://doi.org/10.1177/1077558715589188.

[50] Gnanapragasam SN, Hodson A, Smith LE, et al. COVID-19 survey burden for health care workers: literature review and audit. Public Health 2022;206:94–101. https://doi.org/10.1016/j.puhe.2021.05.006.