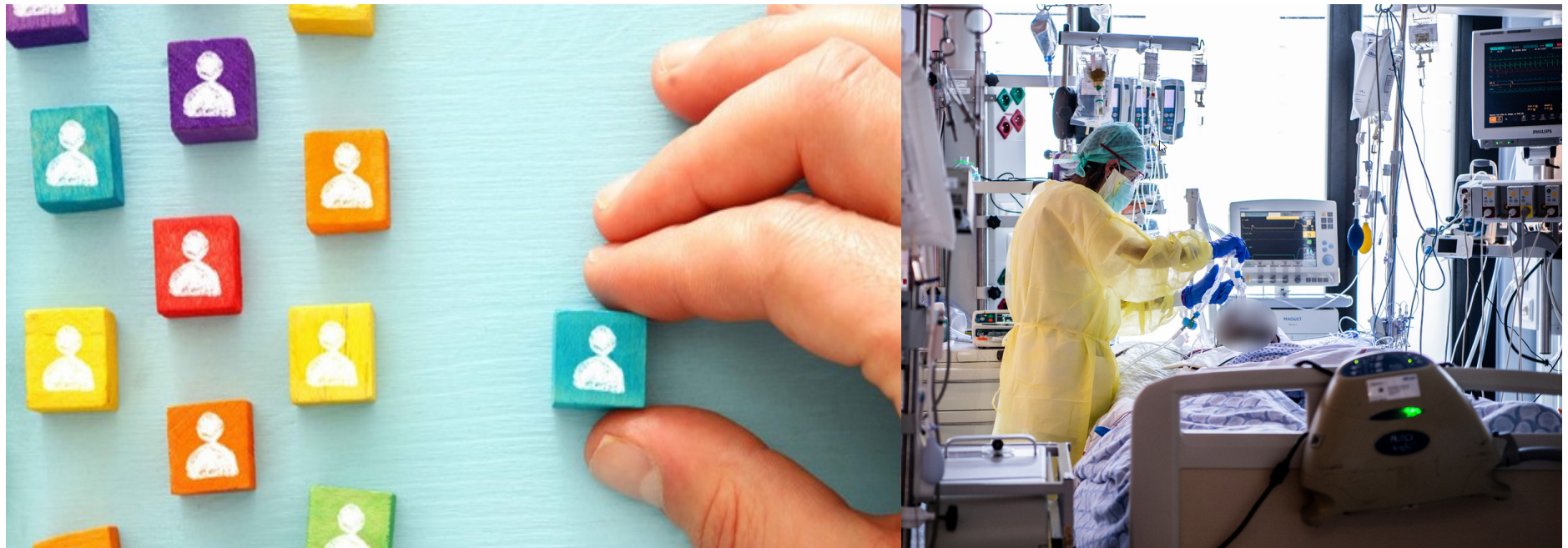


NURSE STAFFING ON BELGIAN INTENSIVE CARE UNITS: THE IMPACT OF TWO YEARS OF COVID-19 PANDEMIC



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- The external experts were consulted about a (preliminary) version of the scientific report. Their comments were discussed during meetings. They did not co-author the scientific report and did not necessarily agree with its content.,
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LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION
APR-DRG-SOI	All Patient Refined-Diagnosis-Related Group-Severity of Illness
BAT	Burnout Assessment Tool
BFM	Budget of Financial Means
B-NMDS	Belgian Nursing Minimum Data Set
CEO	Chief Executive Officer
CNO	Chief Nursing Officer
CMO	Chief Medical Officer
DP	Depersonalisation
ECMO	Extracorporeal Membrane Oxygenation
ECTS	European Credit Transfer System
EE	Emotional Exhaustion
EU	European Union
FTE	Full Time Equivalents
GDPR	General Data Protection Regulation
ICU	Intensive care unit
IF.IC	Instituut voor Functieclassificatie – Institut de Classification de Fonctions
KCE	Belgian Health Care Knowledge Centre
MBI	Maslach Burnout Inventory
NAS	Nursing Activity Score
NEMS	Nine Equivalents of Nursing Manpower Use Score
NRG	Nursing Resource Group
PA	Personal Achievement



PES-NWI

Practice Environment Scale of the Nursing Work Index

SD

Standard Deviation

TISS

Therapeutic Intervention Scoring System



■ SCIENTIFIC REPORT

1 INTRODUCTION

1.1 Summary

- This study on intensive care unit (ICU) staffing will result in two reports. In the first report we describe the state of play of nurse staffing and related factors (nurse working environment, nurse wellbeing, nurse-perceived quality of care, care-left undone); study the across hospital variation and the underlying associations between these key variables. In addition, an in-depth analysis of the perception of the difficulties experienced on the field about nurse staffing on ICUs before and during the pandemic is presented. In a second report (scheduled for 2023) we will focus on action points for a more sustainable nurse staffing policy (including the evaluation of workload measurement systems).
- Based on KCE report 325, recommendations were formulated to develop a safe staffing policy in Belgian hospitals including the implementation and monitoring of safe patient-to-nurse ratios, the investment in supporting roles to allow nurses to focus on tasks requiring nursing expertise, the development of a culture in hospitals where nurse staffing matters from board-to-bedside, and setting up an evaluation of the impact of safe staffing policies. The KCE report 325 focused mainly on general hospitalisation units and concluded that a similar study on other nursing unit types such as ICU was indicated. Although the initiative to invest in nurse staffing was already launched before the pandemic, it was reinforced during the pandemic with a historical increase of the budget for nurse staffing. Although some legal provisions were foreseen to improve the bedside staffing levels (e.g. net increase of staff, agreement of local social concertation committee) it is not yet a 'safe staffing policy' compared to international best practice examples.
- ICUs are resource intensive units providing care to critically ill patients requiring multidisciplinary teams composed by, a.o., nursing and medical staff with advanced expertise in critical care.



Bachelor-prepared nurses with additional expertise and education in ICU and emergency care can obtain a special title in ICU and emergency care (about 6% of nurses in Belgium). This title resulted in an annual bonus which was first abolished due to a general reform of the nurse pay-rate schedules but recently reintroduced (in a different form).

- Although less studied, evidence on similar relationships (as for general hospitalisation units) between nurse staffing and patient and nurse outcomes in the ICU starts to emerge. Internationally patient-to-nurse ratios (e.g. 1:1, 1:2, 1:3) are often a key factor in defining different ICU levels. In Belgium, there is currently no clear policy to differentiate in levels of ICU. With 17.3 ICU beds per 100 000 inhabitants (increased up to 26.7 in 2020 during a given period in the pandemic), Belgium has a relatively high number of ICU beds in an international context. An ICU in Belgium has a minimum of 6 beds and at least two nurses (at least 1 with a professional title in ICU and emergency care) per six beds. For additional capacity this minimum staffing level is adjusted accordingly (but mathematically rounding: for 7 beds: 2 nurses are still sufficient, for 8 beds: 3 nurses are required).
- Nurses, and ICU nurses in particular, played a central role during the COVID-19 pandemic and the importance of having sufficient nurses with the proper expertise level became clearly visible and gained public as well as political attention. Providing nursing care in the context of the COVID-19 pandemic had an enormous impact on the personal and professional lives of nurses. The high influx of COVID-19 patients created an unprecedented need for ICU capacity with an impact on elective admissions. Moreover, COVID-19 patients appeared to be resource intensive (e.g. mobilization, hygienic care, respiratory care and support of relatives) and the context in which nurses had to work was stressful and physically demanding (e.g. fear to be infected, high mortality rates, impact of visitor restrictions and personal protective equipment (PPE)).
- The usual standards could not be maintained during the COVID-19 pandemic (e.g. patient-to-nurse ratios increased, non-ICU staff

worked on ICUs). In the current report we describe the state of play of ICU nurse staffing and nurses' wellbeing after two years of the COVID-19 pandemic.

1.2 General study objective

This report includes the results of a study on nurse staffing in Belgian Intensive Care Units (ICUs). In this report we will focus on four main objectives:

- What is the state of staffing levels, composition of the workforce, the working environment, perceived quality of care and staff wellbeing in Belgian ICUs after more than 1.5 years of COVID-19 pandemic?
- How do these key variables vary across Belgian ICUs at the hospital site level?
- What is the association between variables on the nurse working environment and nurse staffing levels on ICU with nurse wellbeing, care left undone and nurse-perceived quality of care?
- Which were the difficulties experienced in Belgian intensive care units about nurse staffing on ICUs before and during the pandemic and which lessons about it can be drawn from the COVID-19 crisis?

To study the first three research objectives we have conducted a survey among nurses working on Belgian ICUs (see Chapter 2). Focus groups with physicians, nursing management, head nurses and nurses were organised to deal with the fourth study objective (see Chapter 3).



Other ongoing related KCE studies

In a second report (to be published in 2023) we will study ICU workload measurement tools and action points towards sustainable nurse staffing patterns in the future.

Staffing levels and organisation of ICUs are closely related. Therefore, a separate KCE study on the “organisation of ICUs” runs in parallel with the current study. This study will in particular focus on the question if there is a need in Belgium to make a differentiation in levels of ICU. As such, the insights that result from the current study on nurse staffing can be used as input for the KCE study on organisation of ICUs (publication scheduled in 2023).

1.3 The importance of nurse staffing in the ICU

Medical and nursing staff with advanced specialty qualifications

Intensive care units (ICU) are special services staffed, designed and equipped to provide intensive care to critically ill patients requiring an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of life-threatening organ system insufficiency. Staffing of ICUs requires a multidisciplinary and inter-professional clinical team. These teams are composed by medical and nursing staff often with advanced specialty qualifications in intensive care medicine next to other disciplines (e.g. physiotherapists, clinical pharmacist).^{1, 2} A study conducted in four European countries³ estimated the cost of ICUs at around 20% of total hospital costs, of which about half is spent on nurse staffing.⁴

Associations between nurse staffing and outcomes on general hospitalisation units

Recently, KCE published a report on safe nurse staffing levels on general hospitalisation units. This report did build on a large body of evidence demonstrating associations between higher patient-to-nurse ratios and worse nurse wellbeing and patient outcomes.⁵⁻⁹ It was shown that in 2019 the patient-to-nurse ratio in Belgian general hospitalisation units was on average 9.4, which is far beyond what is considered as a safe staffing

level in international best-practices.^{8, 10} High rates of problems with nurse wellbeing and job dissatisfaction (e.g. 27% dissatisfied with the job; 32% with an intention-to-leave the job) were reported as well as other problems were identified, such as high rates of missed care (e.g. on average, nurses reported leaving 2.2 out of 7 clinical tasks and 2.3 out of 5 planning and communication tasks left undone during their last shift) and nurses performing tasks below skill level (e.g. 82% distributed food trays; 61% transported patients). Although an evaluation of association between nurse staffing and patient outcomes was out of scope, it was shown that higher patient-to-nurse ratios and higher rates of reported non-nursing tasks were associated with higher rates of care left undone. Moreover, it was shown that the variation in patient-to-nurse ratios across hospitals was associated with a variation in nurse wellbeing. In addition, aspects of the nurse working environment such as leadership and participation of nurses in hospital affairs were associated with nurse wellbeing and job dissatisfaction.⁸

Recommended safe staffing policy

Based on the study results of KCE report 325, KCE recommended to implement a safe staffing policy in Belgium including 5 main action points:

- Install minimum safe patient-to-nurse ratios adapted to the patient acuity levels of different disciplines. Via a budget simulation it was calculated that this would require a yearly investment of approximately EUR 400 million to obtain the patient-to-nurse ratios on general hospitalisation units, adopted by best-practice examples such as California, Victoria and Queensland;
- Monitor patient-to-nurse ratios and related factors (e.g. nurse working environment, patient acuity, nurse wellbeing) via a nationwide data-information system;
- Increase the use of nurses' expertise by investing 'supporting roles', complementary (and not as a substitution) to nursing staff;
- Stimulate the hospital sector to implement in each hospital a culture and practice where staffing matters from board to bedside;
- Set up the evaluation of an impact of the policy measures.



The KCE also stressed the need to extend this type of research to other areas such as ICU.

Evidence on similar relationships between nurse staffing and patient and nurse outcomes in the ICU start to emerge

The evidence for associations between nurse staffing levels and patient and nurse outcomes in the ICU is more recent. Several somewhat older systematic reviews in this domain are inconclusive about these relationships in the ICU setting.¹¹⁻¹³ A potential explanation might be that variation in nurse staffing levels and outcomes in the ICU might not be so easy to demonstrate as there is less variation. After all, common staffing practices on ICU is to set fixed ratios depending on patient acuity (e.g. 1:1, 1:2 or 1:3 ratio).¹⁴ Nevertheless, a recent systematic review (including 55 studies with mostly moderate to strong internal validity) concluded that higher nurse staffing levels on ICUs are associated with better patient outcomes and nurse wellbeing.¹⁴ Due to study heterogeneity and methodological limitations (e.g. measures of nurse staffing, risk-adjusters) as well as different study settings (e.g. ICU definitions vary across countries, countries with a larger ICU capacity tend to admit more lower patient acuity cases) it is not possible to formulate precise recommendations on staffing levels.

1.4 Patient-to-nurse ratio and workload

An ICU is not an ICU is not an ICU

In Belgium there is no clear policy to differentiate in levels of ICUs. Nevertheless, in practice the case-mix and nursing activities vary between ICUs. The preliminary analysis of the VG-MZG/Di-RHM (Belgian Nursing Minimum Data Set) performed in KCE report 325 showed a large variation between ICUs regarding nursing care profiles as well as in staffing levels.⁸

It is not uncommon in healthcare systems abroad to differentiate ICUs in different levels (mostly primary-secondary-tertiary).¹ Although the organisation and payment of ICUs is the subject of a separate KCE study, there is a clear link between staffing on ICUs and the organisation of ICUs in different levels. After all, the different levels of ICUs are mostly associated with different levels of patient-to-nurse ratios (e.g. primary level: 1:4; secondary level: 1:3; tertiary level 1:2 or 1:1).¹

Nursing workload on the ICU: a variety of measurement tools available

An important element to determine patient-to-nurse ratios on intensive care is an objective workload measurement. Over time, different scoring systems have been developed aiming to quantify the nursing workload. Based on a retrospective coding of nursing activities per shift or 24h, the workload for nurses is estimated. In 1974 with TISS (Therapeutic Intervention Scoring System), a first scoring system was introduced in the medical literature. The TISS-28 is a simplified version (28 items instead of 76 items in the initial instrument) of the original TISS which is, after all these years, still in use.¹⁵ Over time, several variations or alternative scoring systems emerged of which the Nine Equivalents of Nursing Manpower Use Score (NEMS) and the Nursing Activities Score (NAS) are the most well-known and reported scoring systems. The NEMS measures workload based on nine nursing intervention items is assessed retrospectively once a day. It results in an index score that ranges from 1 to 56 points. It was developed to compare nursing workloads across ICUs and not to use in day-to-day staffing on a per ICU basis.¹⁶

The Nursing Activities Score (NAS) quantifies the need of nursing care based on the assignment of a score per patient based on the executed nursing tasks (for therapeutic and nursing activities including hygiene, mobilization, administrative activities, psychologic support for patient and family), where each of the 23 items and sub-items of the NAS receive a weight in function of the time spent per task. It is a frequently used and researched instrument and the coding burden is relatively limited.¹⁷ The score per patient can vary from 0 to 170 points and it is recommended that 1 nurse can take on a workload that corresponds to no more than 100 points.¹⁵



NAS is the most commonly used scoring system and is gaining support in Belgium

To date, the NAS is the most commonly used instrument to measure nursing workload in ICUs internationally. Also in Belgium it is widely supported by the (French-speaking) professional organisation of ICU nurses^a and some Flemish hospitals^{18,19} register the NAS systematically in their ICU. Sixteen French-speaking hospitals registered the NAS in the context of a study conducted in 2018.¹⁷ The authors concluded that the staffing standards included in the Belgian regulation (patient-to-nurse ratios corresponding to 3:1 or 6 nurses per 2 beds) differed substantially from the patient-to-nurse ratios that were recommended based on the measured NAS-scores.

Administrative registration with the Belgian Nursing Minimum Data set (VG-MZG/ Di-RHM)

The Belgian Nursing Minimum Data set (VG-MZG or DI-RHM) is a coding system that is used in the context of the Belgian hospital payment system and is registered 4 times a year during 15 days on all Belgian acute hospital units. Since 2008, the VG-MZG/Di-RHM was updated and expanded with more items that are specific to the care provided on ICU. Nevertheless, VG-MZG/Di-RHM is rarely used by hospitals to guide their ICU staffing allocation. One could assume that within the ICU community there is more trust in ICU-specific scoring systems compared to a scoring system that is part of an administrative database. Moreover, in some small-scale studies the association between NAS and VG-MZG/Di-RHM was evaluated, with moderate observed associations.²⁰⁻²³ In the second report on this study (planned for 2023) the association between NAS and VG-MZG/Di-RHM will be studied in a larger set of hospitals.

1.5 ICU staffing and the COVID-19 pandemic

Nurses, and ICU nurses in particular, played a central role during the COVID-19 pandemic.²⁴ The importance of appropriate ICU nurse staffing levels, both in terms of number and expertise level became clearly visible and received increased public attention. While nurses have been called 'everyday heroes', especially during the first waves of the pandemic, the need for a highly skilled and expert nursing workforce to care for these complex patients has been insufficiently acknowledged.²⁵ Indeed, ICU nurses are present at the patients' bedside 24 hours a day, seven days a week and can as such be considered as the single most constant factor of ICU care. If the levels of staff in terms of expertise and number is inappropriate it can have an impact on patient care.²⁶ In addition, it is clear that providing nursing care in the context of a pandemic has an impact on nurses their personal and professional lives, the organisation in which they work, the hospital and healthcare sector as well as on the nursing profession in general.^{24, 27} It is therefore important to learn from this experience and include the lessons learned in policy measures.²⁸ In this section we introduce some topics identified in the recent scientific literature relevant in the context of nurse staffing during the COVID-19 pandemic without trying to be comprehensive/exhaustive.

- **COVID-19 patients require much nursing time:** The COVID-19 pandemic created an, in recent history, unprecedented need for ICU capacity. ICUs needed to accommodate higher than usual numbers of patients with high mortality rates.^{29, 30} In addition to an increased number of patients, the ICU nurses were also confronted with a new patient category with a complex care demand.³¹ Several studies compared the workload (measured via the NAS) between COVID-19 ICU patients and other ICU patients and concluded that workload is higher for COVID-19 patients.³¹⁻³⁴ COVID-19 patients require more time for activities like monitoring and titration, mobilisation (e.g. more patients requiring mobilization and positioning with 3 nurses or more), hygiene (e.g. higher proportion of patients requiring >4h for hygienic procedures), support and care for relatives (e.g. potentially due to

^a <http://www.siznursing.be/nas/>



high ICU mortality of COVID-19 patients as well as by visiting limitations during the COVID-pandemic) and respiratory care. It is hypothesized by Hoogendoorn et al. 2021³¹ that some of these higher observed NAS scores are linked to the use of PPE (e.g. higher NAS scores for the time needed for hygienic procedures might be due to nurses avoiding to change PPE and stay longer at the bedside).^{31, 33}

- **Nursing workload on ICU is high during the COVID-19 pandemic:** In addition to the individual patient complexity, a high pressure on the existing ICU capacity existed due to the continuous influx of COVID-19 patients in combination with a long length of stay in this patient group. Elective surgery was cancelled which also had an impact on overall the workload at the unit level. After all, earlier research showed that the nursing workload of unplanned (medical and surgical) admissions is higher compared to elective (surgical) admissions.³¹
- **COVID-19 patients per nurse ratio:** ICU have a longstanding tradition to adapt their staffing levels to the patient acuity by setting different levels of patient-to-nurse ratios. Several countries published staffing guidelines for ICU staffing based on patient acuity (e.g. in England the sickest critically ill patients correspond with a 1:1 ratio while a 1:2 ratio is used for those requiring critical care support for single non-respiratory organ failure).^{35, 36} In Belgium (as written in section 1.6.4) the maximum number of patients per nurse on ICU is set at three (calculated at the unit level). Yet, COVID-19 patients are a new patient population and indications exist that a lower patient-to-nurse ratio than for an average ICU patient is required (e.g. NAS workload management COVID-19 patients suggests an average required 1:1 ratio for COVID-19 patients³¹; in Germany the targeted ratio for COVID-19 is 2:1²⁹). Nevertheless, the observed patient-to-nurse ratio for COVID-19 patients is often higher than recommended.^{29, 31}
- **Not enough nurses with ICU-specific expertise to staff the required ICU capacity:** During the COVID-19 pandemic a substantial increase in available ICU capacity was needed and the most blocking factor to expand capacity was in most countries the availability of nurses (and physicians to a lesser extent) with specific

ICU expertise. Describing the various used surge strategies in detail is out-of-scope of the current report (we refer the interested reader to KCE report 335). Yet, it can be stated that on the one hand ICU admissions were reduced (mainly elective surgery) and on the other hand non-ICU nurses were redeployed to ICU (e.g. tiered staffing models, just-in-time training for non-ICU nurses, designated treatment teams, and deployment of trainees)^{29, 35} or patient-to-nurse ratios were increased.²⁸ Despite the support of non-ICU staff, the ICU nurse often held the overall responsibility for the care of the patients (or felt that she was responsible). Moreover, supervising of and delegating tasks to non-ICU staff was new for most ICU nurses.³⁷

- **Several sources of stress for ICU and redeployed staff identified:** although nurses felt a great sense of professional duty to work during the pandemic and the collegiality and sharing of the load with co-workers was an important factor, the COVID-19 pandemic clearly was stressful for nursing staff working on ICU.³⁰ Several sources of stress can be identified such as the decreased skill mix (nurses from other units with no experience in caring for critically ill patients), the impact on nurses personally especially during the first waves at the pre-vaccination era (e.g. being infected, transmission to family members, restrictions personal freedom); high mortality rates and unmet needs of the dying patients (e.g. due to visitor restrictions), lack of and rapid changing nature of protocols, possible patient safety events, long working hours, physical overload (also linked to impact PPE), and ethical and societal issues. From the literature it seems that redeployed nurses who were usually less skilled in the context of critical care were more vulnerable to stress compared to ICU nurses (e.g. sudden transition from an expert in their field to a novice in ICU, not used to take care of critically ill patients and the high mortality rates).^{25, 35, 38}

All these have direct consequences on staff wellbeing. The long-term consequences are not yet known, but need to be monitored.^{24, 30}

- **Increased levels of risk of burnout and other dimensions of nurse wellbeing:** the impact of the COVID-19 pandemic on nurse wellbeing seems to be substantial. A Belgian study (French-speaking nurses recruited via an open survey during 2020), for instance,



identified a substantial increase in risk of burnout (measured by the Maslach Burnout Inventory) among ICU nurses compared to pre-pandemic levels (January 2020).³⁹ The risk of emotional exhaustion, increased from 33.6% to 48.9% while the risks of depersonalisation and reduced personal accomplishment increased from 26.9% to 39.4% and from 19.1% to 28.3%, respectively.³⁹ Furthermore it was illustrated that the lack of PPE was a significant risk factor for an increased risk of burnout. Having high social support from colleagues was a protective factor of burnout while also having high support from superiors and management was a protective factor in ICU nurses.³⁹ A review including 11 studies conducted in 2020 concludes that burnout prevalence among healthcare professionals working on ICU (and emergency departments) is high which is especially the case for nurses. Moreover the review identified several socio-demographic and work-related factors that were associated with risk of burnout of which many are pandemic-related variables (e.g. shortage in PPE, anxiety for COVID-19, and stigmatization).⁴⁰ A review on nurses experiences during the pandemic concluded that support from governments, policy makers, hospital management and professional nursing organizations is essential to prevent that nurses develop burnout and/or leave the profession as a consequence of the psychological issues that they experienced when taking care of COVID-19 patients.²⁴

1.6 Legislation and policy initiatives relevant to ICU nurse staffing

The information provided in this section is an elaboration of the description of the nursing practice and education in Belgium in KCE report 325 (2019)⁸, with a focus on the ICU context. For more details regarding the general nursing practice and education, we refer the reader to this report.

1.6.1 Nursing education in Belgium

The practice of nurses is regulated on the federal level. At the federal level graduates of a nursing education programme that comply with the minimal qualification criteria as specified in article 45 of the coordinated law (Royal Decree of 10 May 2015⁴¹) that regulates the healthcare professionals' practice in Belgium are considered as nurses. It should be noted that there are differences in the implementation of these legal requirements between the federated entities.⁴²

1.6.1.1 Pre-registration educational pathways

The nursing education in Belgium is regulated by the federated entities. Currently, there are two educational pathways to become a nurse in Belgium: (i) bachelor-level (Bachelor verpleegkundigen – Bachelier d'infirmière) and (ii) diploma-level ("Hoger Beroepsonderwijs niveau 5 [HBO-5] verpleegkundigen" in Flanders and Brevet d'infirmier-ère in the French-speaking community [Fédération Wallonie-Bruxelles]).⁴² In the remainder of this report we will refer to the "Bachelor level" and the "Diploma level".

In all communities, the diploma level programme was, until recently, organised through a 3-year vocational training programme following secondary level education. However, in the French-speaking community it was decided to extend the education (with an additional 6 months) to comply with the EU Directive. This reform has not yet taken place in the Flemish community.

The bachelor level education is organised by Higher Education Institutions linked to universities (called university colleges). To comply with EU Directive 2013/55/EU, the three-year programme (180 European Credit



Transfer System [ECTS] points) was reformed to a four-year programme (240 ECTS points), covering the required 4 600 hours including 2 300 hours of practical training (from the academic year 2016-2017 onwards). Diploma level nurses can follow a bridging programme to become a bachelor level nurse (previously 120 ECTS points; since 2016: 150 ECTS points).

1.6.1.2 Special professional title or postgraduate for nurses specialised in intensive and emergency care

Bachelor level nurses can follow a specialised course to deepen their expertise in intensive and emergency care. ECTS for these courses vary between 20 and 60 points. These specialised courses are/were organised as a Bachelor after Bachelor programme. This is currently still the case in the French-speaking Community. Nevertheless, following the introduction of the four-year Bachelor education, this specialised course was reformed to a “postgraduate course” in Flanders. For this reason, funding for these Bachelor after Bachelor programmes was also stopped.

1.6.2 Facts and figures about intensive care units and nursing staff in Belgium

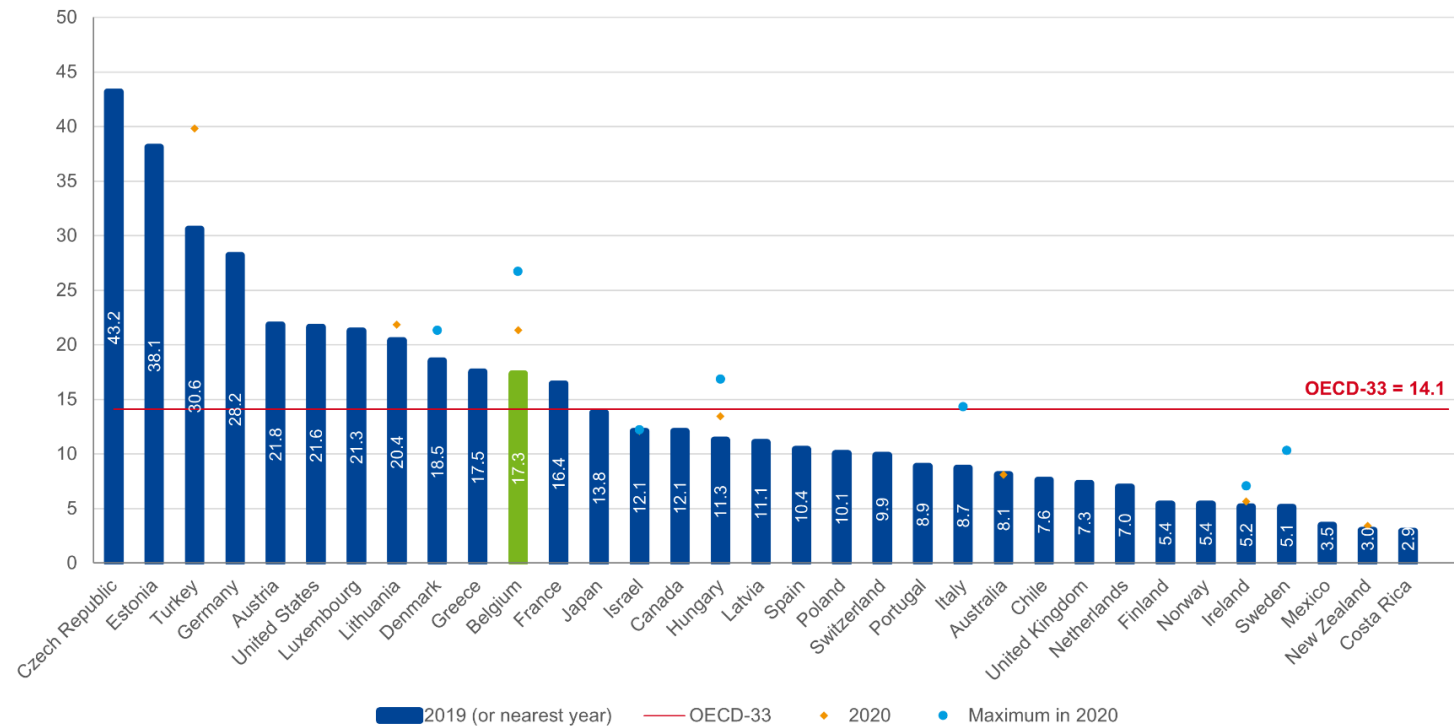
1.6.2.1 Number of intensive care beds in Belgium

In 2019, there were 17.3 intensive care beds^b per 100 000 population in Belgium (Figure 1). This number is higher than the OECD-33 average, which was 14.1 intensive care beds per 100 000 population. The number of intensive care beds in Belgium was even higher in 2020 (due to the COVID-19 pandemic), with a maximum of 26.7 intensive care beds per 100 000 population.

^b There are currently no clear defined levels in intensive care in Belgium. Some hospitals also organise ICUs with a lower care intensity (e.g. medium care). However, all the beds are labelled as intensive care, even though some of them are also used as medium care.



Figure 1 – Number of intensive care beds per 100 000 population in OECD countries, 2019 (or nearest year) and 2020



Source: adapted from OECD (2022)⁴³

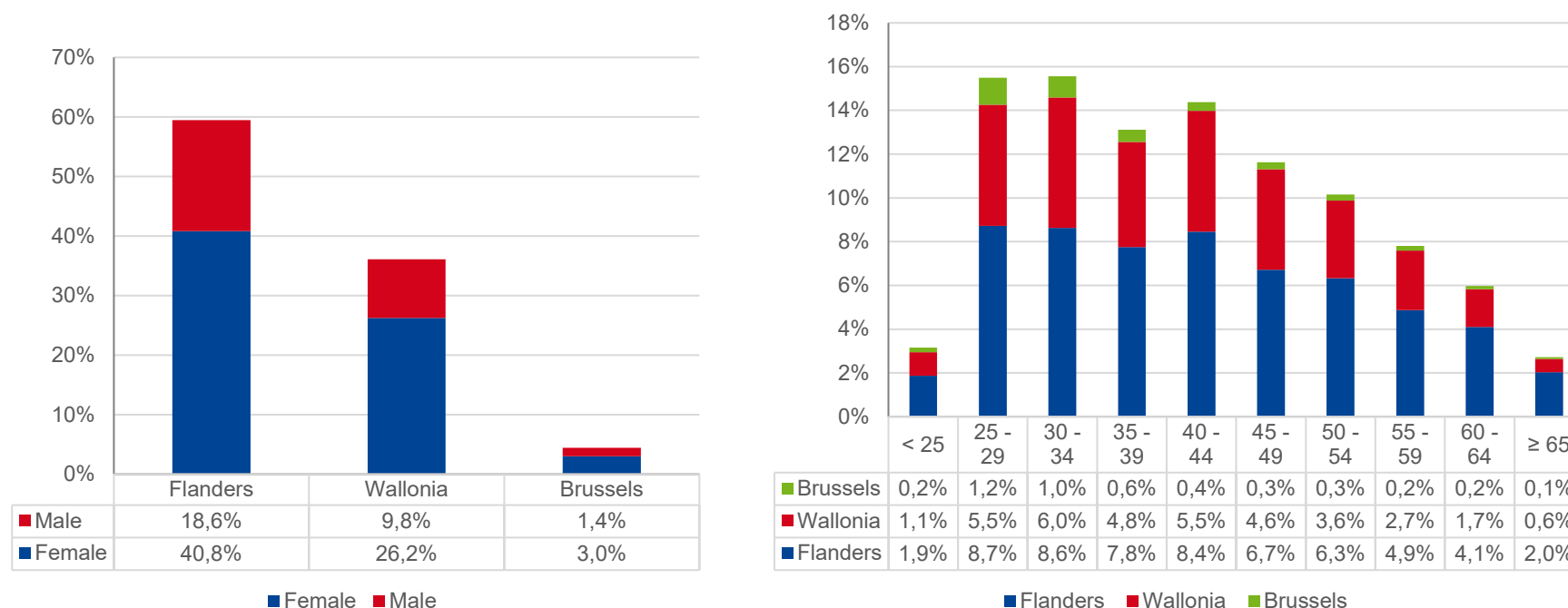


1.6.3 Numbers about nursing staff working in intensive care units

STATAN provides annual statistics on the number of healthcare professionals and includes data about nurses licensed to practice. It includes all nurses with a licence. A crosslink with Social Security data revealed that in 2018 115 217 of 214 352 licensed nurses were active in healthcare (78 023 [68%] in hospitals).⁴⁴ According to STATAN (2020), there are 202 513 nurses in Belgium of which 12 332 hold a special professional title “intensive and emergency care”. However, not all of

these nurses work on ICUs. As such, in 2020, approximately 6.1% of the nurses in Belgium hold a special professional title “intensive and emergency care”. The majority of the nurses with this special professional title are female (70.1%) (Figure 2). About one third of these nurses are between 30 – 40 years (28.7%), 18.7% are below 30 years, 26.0% are between 40 – 50 years, 18.0% between 50 – 60 years and 8.7% above 60 years (Figure 2).

Figure 2 – Percentage of nurses with a special professional title “intensive and emergency care”, by sex/age and region of activity



Source: STATAN (2020)



1.6.4 Licensing standards intensive care function

1.6.4.1 Definition

Intensive care is considered to be a function of a hospital. The intensive care function is intended for patients who are seriously threatened in one or more of their vital functions. These patients require expert care to support or adjust these functions, by means of an adapted medical, nursing and paramedical organisation, continuous monitoring and monitoring and appropriate diagnostic and therapeutic interventions.⁴⁵

1.6.4.2 Licensing standards regarding architecture and equipment

The intensive care function should have a minimum capacity of six beds. These beds are positioned so that each patient can be visually monitored at all times and hospital hygiene and intimacy of the patient is maintained. In addition, the intensive care function should have a separate entrance, at least one isolation room per six beds, separate office for both medical and nursing team, meeting or relaxation area for the staff, private room for the medical staff who ensures permanence, waiting room to facilitate visitors and family members. The aforementioned accommodations, with the exception of the waiting room, may be shared with another service, function or unit, provided it is architecturally adjacent to the intensive care function.⁴⁵

Concerning logistic rooms, the intensive care function must have a separate room for equipment, storing consumables, clean linen, soiled linen and equipment, service or distribution kitchen and separate sanitary facilities for the staff.

There are no formal regulations regarding working surface and the surface area per bed. However, the Royal Decree states that these surfaces must be appropriate to the medical and nursing activities. The function may be divided into separate units, but each unit should comply with the minimum capacity and all other standards. If these units are spread over different buildings, each unit must organise its own medical permanency.

1.6.4.3 Functional licensing standards

Each bed should be equipped with the necessary equipment allowing continuous monitoring and treatment of critical care patients in the cardiac, respiratory, metabolic, cerebral and circulatory area, including during possible transport. This equipment must allow oxygen to be administered at each bed, infusions with strictly controlled flow rates, aspirations, (mechanical) ventilation and cerebral or cardiopulmonary resuscitation. Each bed must be height-adjustable and be articulated to ensure the correct positioning of the patient.⁴⁵

The intensive care function must, within the hospital of which it is a part, be able to call upon an operating room for urgent surgical procedures, clinical biology laboratory and a medical imaging department. In addition, the function should have a supply of erythrocyte concentrate O Rhesus negative and plasma substitutes (unless the hospital has its own blood bank which can supply these products at any time).

1.6.4.4 Licensing standards regarding nursing staffing

The Royal Decree also stipulates some conditions for the medical and paramedical staff. However, we will not elaborate these conditions here because these are beyond the scope of this study.⁴⁵

Nursing staff

The head nurse of an intensive care unit should hold a “special professional title (bijzondere beroepstitel – titres professionnel particulier) in intensive and emergency care”, or should be a bachelor or diploma nurse with at least 5 years proven experience in this function. This experience should be obtained either in (i) a licensed intensive care unit, (ii) a unit for intensive treatment which corresponds with the description in appendix 3 of the Royal Decree of 28 November 1986 containing the standards to which a service for medical imaging with transversal axial tomography has to comply to be licensed as medical-technical unit, or (iii) an emergency department which corresponds to the description in appendix 1 of the Royal Decree of 28 November 1986.



The intensive care function holds an own specific nursing team in which a 24/7 permanence is assured by at least two nurses per six beds (in the “requirement framework” of the Flemish government it is specified that each intensive care unit should have at least 2 nurses present = basic permanence) of which at least one holds a special professional title in intensive and emergency care, or is a bachelor or diploma nurse with at least 5 years proven experience in one of the units listed in article 17, second paragraph. For every additional 6 beds that are opened, the number of nurses should be adjusted proportionally according to the number of beds. The nursing team should be adjusted based on the intensive care activities.⁴⁵ This means that the ratio intensive care patients/nurse should be maximum 3:1 (mathematically rounded i.e. for 7 patients, 2 nurses are sufficient but for 8 patients, 3 nurses are needed, etc.). Supplementary staff can be healthcare assistants, administrative or logistic help. In case the head nurse is effectively (partially) scheduled in direct care, the hours can be calculated in care.⁴⁶

The staffing framework for the intensive care units should have at least 12 FTE nurses per 6 licensed intensive care beds, of which at least 6 FTE hold a special professional title in intensive care and emergency care, unless the nurse can prove that (s)he on 29 July 1998, had at least 5 years proven experience in one of the units listed in article 17, second paragraph of the Royal Decree of 27 April 1998. This fixed/own team can be complemented with staff out of the floating pools, temporary work force, etc. For every additional 6 beds the FTE nurses should be adjusted a ratio of the amount of beds.⁴⁶

1.6.5 Financing intensive care function

Hospitals mainly receive their revenue through a dual system. Both revenue sources are (partly) used to pay for nursing staff.

- A national budget covering nursing and non-medical activities, called the Budget of Financial Means (BFM). This is a national close-ended budget which is fixed annually and allocated to hospitals according to a set of specific rules. It consists of three major parts (A, B and C) which are set separately and are divided into subparts (all according to different rules and criteria). Part A refers to capital and investment

costs (mainly transferred to the Federated entities since the 6th State Reform, Part B refers to operational costs and Part C to some corrections (positive or negative) of budgets for past financial years. For a detailed description and evaluation of the BFM, we refer the reader to KCE report 229.⁴⁷ In current chapter, we mainly focus on the subparts that are used to pay nursing staff (in intensive care units).

- Fees for medical activities: medical and medico-technical acts (such as consultations, medical imaging or technical procedures) and paramedical activities (e.g. physiotherapy) are mainly paid via the fee-for-service payment system to the care providers. These care providers then give a share of their fees to the hospital to pay (part of) the costs (e.g. space, equipment and staff). The amount and mechanisms of care providers paying for these hospital costs differs between hospitals and specialties.

1.6.5.1 Budget of Financial Means (BFM)

The largest part of the BFM is the B2-part, which mainly covers services of nursing staff and healthcare assistants and most medical consumables. A close-ended budget for the B2-part is yearly defined at the national level. This national budget is allocated to individual hospitals by dividing it by the total number of B2-points earned by all hospitals. This gives the monetary value of one B2-point.

The national B2-budget is allocated to individual hospitals (mainly) on the basis of the national average length of stay per All Patient Refined-Diagnosis-Related Group-Severity of Illness (APR-DRG-SOI). The basic concept in this DRG-based budget allocation is called “justified activities” where justified reflects average activity. The number of justified patient-days for a hospital is the result of multiplying the national average LOS per APR-DRG-SOI with the case-mix of the hospital. Per department or group of departments, the number of justified patient-days is multiplied by 365 and the “normative occupancy rate” to calculate the number of justified beds.

Basic points are granted to finance nursing staff. These points are based on the number of justified beds. The surgical unit is taken as reference



with one point corresponding to one justified bed. Also for internal medicine and paediatric units one point corresponds to one justified bed, but this ratio can go up to 3.75 points for maternal intensive care beds and up to 6.25 points for neonatal intensive care beds. In addition, supplementary points are attributed to pay for intensive care beds. More specifically, the number of intensive care beds is calculated as a percentage of the number of C (surgical), D (internal medicine) and E (paediatric) beds. Three criteria are taken into account: a selected list of resuscitation interventions, the percentage of inpatient days in an intensive care units standardised per APR-DRG (Nperciz; national percentage of intensive care per APR-DRG) and intensive nursing profiles throughout the hospital whether patient care is taken up in intensive care units or not (NRGs: Nursing Resource Groups). The latter are calculated based on the Belgian Nursing Minimum Data set (B-NMDS). The minimum share of intensive care beds in C, D and E units equals 2% of justified beds in these units.

The budget that corresponds with the total of basic points and supplementary points finances three 'types of care': basic care on general C, D and E units, intensive care on these units and intensive care units. Basic care on C, D and E units is financed by basic points, intensive care on these units is financed by part of supplementary points, and intensive care units are financed by part of the basic and part of the supplementary points. A complex calculation method allocates budgets to the three types of care. However, this complex calculation is out of scope of the current study. We refer the interested reader to KCE report 229.⁴⁷

1.6.5.2 Additional budget for nursing staff

Although the B2-part of the BFM is the main source of revenue for nursing staff, other subparts provide additional revenue. However, most of these additional revenue sources are not exclusively earmarked for nursing staff and it is not possible to know which part of the budget is allocated to nursing staff.

We distinguish three types of additional budget, depending on the objective of providing additional budget on top of the B2-part. A first type of budget serves as an additional revenue source to employ extra staff in

general nursing units and can be considered as a basic financing source, just like the B2-part (e.g. budget for mobile teams, additional staff during the night). The second type allocates additional budget towards hospitals for extra staff for specific tasks or patient groups (e.g. hospital hygiene, nutrition support teams, internal transport of patients). A third type is to provide better working conditions for existing staff (e.g. continuing professional development, compensation for irregular and uncomfortable working hours, annual bonus for special professional titles (see section 1.6.6.2).

1.6.6 Attraction and retention measures

Several attraction and retention measures have been taken in the past. These were all described in detail in the previous KCE report 325.⁸ In the current chapter, we will only focus on the most recent measures, applicable to intensive care nurses and/or taken during the COVID-19 pandemic.

1.6.6.1 IFIC payment model

On 28 September 2016, the social partners in the "joint committee 330" agreed on two collective labour agreements: (i) one about the validation of the function classification for all (federal and federated) sectors of the joint committee 330 and (ii) one relating to the reporting to IF.IC (Instituut voor Functieclassificatie – Institut de Classification de Fonctions), that only applies to the federal sectors.^{48, 49} Since 2018, IFIC is the name of the new function classifications and salary scales.

The goal of IFIC was to pay the employees of the private federal health services not based on their degree/education, but on their function. For that, different IFIC codes were given to the "referentiebarema – barème de reference", i.e. reference scales (old model) and linked to a "doelbarema – barèmes cibles" i.e. payment rate (expressed in monthly salary).⁵⁰ The pay rate is affected by yearly increases based on "total years of relevant employment".

The payment rate of nurses working on an ICU is covered by IFIC code 15, regardless of their educational level (i.e. bachelor level or diploma level). ICU nurses are thus one of the disciplines that are in a higher salary



category compared to other nursing disciplines (e.g. nurses working on a geriatric nursing unit are covered by IFIC code 14).

Employees working in the healthcare sector at the time of implementation (1 May 2018), were given the choice to adopt the new IFIC payment model, while new employees are obliged to adopt the IFIC payment model. On 31 March 2021, the social partners of the joint committee 330 concluded a new collective labour agreement.⁵¹ This agreement establishes the 100% implementation of the new IFIC payment model within these sectors from 1 July 2021 on. This means that employees who start working as from 1 July 2021 cannot choose anymore and are immediately subjected to the IFIC payment model.

The bonuses for special professional titles and/or special professional competences are not incorporated into the IFIC payment model. Nevertheless, nurses with a special professional title or special professional qualification who change jobs and (i) were entitled to the annual bonus and (ii) worked as a nurse in their previous employment (the new employment should also be a nursing position) can still choose if they adopt to the IFIC payment model.

1.6.6.2 Annual bonus for nurses holding a special professional title “intensive and emergency care”

Between 2010-2018, a yearly supplementary bonus of EUR 3 341.50 submitted to indexation was allocated to nurses holding a special professional title “intensive and emergency care”. Since the implementation of the IFIC payment model, these bonuses have been integrated into this system and are no longer paid separately.

However, in December 2021, the Belgian minister of Public Health Frank Vandenbroucke announced extra budget to financially support nurses with a special professional title and special professional competence. Their

specialisation was not or insufficiently valorised in the IFIC payment model, despite the stated objective of both policy and social partners to integrate these specialisation premiums in the IFIC basic remuneration. This correction wants to reward ICU nurses who have been playing a key role in the COVID-19 pandemic for almost two years. Specifically, this correction will amount to an additional EUR 2 500 gross per year for all nurses with a special professional title and an additional EUR 830 gross per year for all nurses with a specific professional competence. This sum will be applied with recurring effect from January 2022.

1.6.6.3 Healthcare staff fund

In 2019, an alternative majority in the Parliament^c approved the law to establish the healthcare staff fund (‘Zorgpersoneelsfonds’ – ‘Fonds Blouses Blanches’).⁵² The aim of this healthcare staff fund is to expand and improve employment and training for (i) nurses by, among other things, financing the net creation of employment for healthcare personnel and (ii) the support staff directly relieving care providers. The budget of this healthcare staff fund is targeted to hospitals, home nursing and community health centres. In addition, after priority has been given to recruitments described in (i) and (ii), the resources of the healthcare staff fund can also be used for measures that improve the working conditions of the healthcare personnel and that contribute to improving quality of care. The use of the budget of the healthcare staff fund should reported by the hospital management to the local social consultation committee and the report should be also sent to the FPS Public Health.

The law that established the healthcare staff fund depicted that that a yearly additional budget of EUR 402 million (approximately EUR 300 million for the hospitals) had to be earmarked for this new fund. This budget was in 2019 EUR 67 million because there were only two remaining months. In October 2020, the new government (with a majority

^c In 2019, the outgoing federal government had no majority in Parliament and only had restricted power. In these circumstances, a system of monthly budgets is set in place until a new government is formed with a majority in Parliament.



in Parliament) reinforced the healthcare staff fund by adopting it as one of the spearheads of the Government Statement.

1.6.6.4 *Bonuses and measures in the context of the COVID-19 pandemic*

Beside structural measures (e.g. Healthcare Fund, reform and increase salary schemes) several ad-hoc initiatives were taken to award nurses (and other healthcare professionals) for their efforts during the COVID-19 pandemic. Without trying to be exhaustive we focus on 2 types of bonuses that were awarded.

Solidarity bonus for federal health sectors

The federal government awarded healthcare professionals working in the federal health sector in 2020 a one-time consumption voucher of EUR 300 to recognise the efforts of them during the COVID-19 pandemic.⁵³ These consumption vouchers were valid until 31 December 2021 and could be spend in the hospitality or events sector.

Federal incentive bonus for hospital staff

Care providers working in a general (including university and specialised general hospitals) or psychiatric hospital (private or public), a medical home ('medisch huis' – 'maison médicale'), home nursing or GP trainees in general practice are entitled to an incentive bonus to encourage and recognise the care provider's efforts during the second COVID-19 wave.⁵⁴ Care providers who worked fulltime during the period 1 September to 30 November 2020 received EUR 985 gross (adapted bonus for parttime and self-employed care providers).

Tax exemption for voluntary overtime

The law of 20 December 2020⁵⁵ increased, during the 1st quarter 2021 and the 2nd quarter 2021, the annual maximum of 100 voluntary overtime hours to 220 voluntary overtime hours for all "critical sectors" (which also includes the staff employed in hospitals). For social security purposes, these 120 additional hours are exempt from social security contributions and are also tax exempt.

2 NURSE WORKING ENVIRONMENT AND NURSE WELLBEING: RESULTS FROM AN ONLINE SURVEY AMONG ICU NURSES

2.1 Summary

- In the current chapter we describe the results of an online survey similar as the one conducted in the context of KCE report 325 that focused on nurse staffing in general hospitalisation units. The focus of the current study is on nurse staffing in ICUs with **the objective to evaluate the state of key variables (patient-to-nurse ratios, educational level of nurses, nurse-perceived staffing levels, nurse working environment, care left undone, nurse wellbeing and nurse-perceived quality of care) related to nurse staffing in Belgian ICUs after nearly 2 years of COVID-19 pandemic**. Also the variation of these variables across Belgian ICUs and their mutual relationships are evaluated.
- All hospitals with an ICU (n=100) were invited to participate. The nurse survey was conducted during the 4th and 5th wave of the COVID-19 pandemic (December 2021-February 2022) in 83 hospitals (102 hospital sites) including complete responses from 2 321 of the 4 851 invited ICU nurses (response rate of 47.8%). After applying exclusion rules (at least a response rate of 75% or at least 10 responses per hospital site) **the final sample included 68 hospitals, 78 hospital sites and 2 183 respondents: 34 hospitals, 40 hospital sites & 1 161 respondents in the Flemish Region, 27 hospitals, 30 hospital sites & 747 respondents in the Walloon Region and 7 hospitals, 8 hospital sites and 275 respondents in Brussels-Capital region**.
- In 2022, the nurse wellbeing and other job-related outcomes of ICU nursing staff are not good and worse compared to the results from the survey among nurses working in general hospital units



conducted in 2019. For all nurse outcomes we observe large variation across hospital sites and striking regional differences.

- **The risk of burnout among ICU nurses is high** on all three dimensions of the Maslach Burnout Inventory:
 - On average 43.1% of the nurses are at high risk of emotional exhaustion (Flanders: 33.1%; Wallonia: 55.3%; Brussels: 52.4%). On hospital level this varies from 0% to 88% (P25: 30.8%; P50: 42.9%; P75: 55.8%).
 - On average 43.7% of the nurses are at high risk of depersonalisation (Flanders: 31.5%; Wallonia: 58.5%; Brussels: 54.5%). On hospital level this varies from 5% to 85% (P25: 27.9%; P50: 45.0%; P75: 57.7%).
 - On average 46.1% of the nurses are at high risk of reduced personal accomplishment (Flanders: 36.0%; Wallonia: 57.7%; Brussels: 57.5%). On hospital level this varies from 14.3% to 91.7% (P25: 34.3%; P50: 46.0%; P75: 56.4%).
 - On average 20% of the nurses have a high risk in all three dimensions. (Flanders: 11.6%; Wallonia: 31.6%; Brussels: 25.8%). On hospital level this varies from 0% to 65.7% (P25: 10.0%; P50: 17.6%; P75: 28.8%).
- **The average percentage of ICU nurses dissatisfied with their job is 39%** (Flanders: 25.9%; Wallonia: 56.6%; Brussels: 47.6%). The variation across hospitals goes from 0% to 90% (P25: 25.0%; P50: 34.6%; P75: 54.5%). The aspects with the most ICU nurses indicating that being dissatisfied are:
 - Wage (Total: 75.1%; Flanders: 66.1%; Wallonia: 86.3%; Brussels: 82.9%);
 - Annual leave (Total: 56.4%; Flanders: 55.7%; Wallonia: 59.6%; Brussels: 50.5%);

- Advancement opportunity (Total: 53.1%; Flanders: 46.8%; Wallonia: 59.4%; Brussels: 62.5%);

The aspects with the least ICU nurses indicating that being dissatisfied are:

- Independence at work (Total: 11.2%; Flanders: 10.5%; Wallonia: 12.6%; Brussels: 10.5%);
- Sick leave (Total: 26.8%; Flanders: 22.7.7%; Wallonia: 32.4%; Brussels: 28.7%);
- Schedule flexibility (Total: 31.2%; Flanders: 23.9%; Wallonia: 42.2%; Brussels: 32.2%);

Also for the different aspects we see variation across regions and hospitals in the proportion of nurses being dissatisfied. Yet, apart from some exceptions (e.g. wage dissatisfaction), the regional differences are not so pronounced as with the general job dissatisfaction.

- **The average percentage of ICU nurses who have the intention to leave their job is 43.9%:** 26.5% for a non-nursing job; 5.8% for a nursing job outside the hospital setting; 8.1% for an ICU job in another unit or hospital; 3.6% for a non-ICU job in another or the same hospital. Intention to leave the job is 34.8% in Flanders; 54.8% in Wallonia and 52.7% in Brussels with substantial variation across hospital sites (Min: 7.1%; P25: 32.1%; P50: 42.9%; P75: 57.1; Max: 86.7%).
- **The average percentage of ICU nurses reporting good or excellent quality of care on their unit is 64.5%** with a higher nurse-perceived quality of care in Flanders (71.6%) compared to Wallonia (53.9%) and Brussels (63.6%). Variation between hospital sites exists: Min: 17.9%; P25: 57.9%; P50: 65.0%; P75: 57.7; Max: 100%. Nevertheless, 60.8% of the nurses (67.1% in Flanders; 74.2% in Wallonia; 69.5% in Brussels) reported that quality of care in their hospital deteriorated in the past year with



substantial variation across hospital sites (Min: 0%; P25: 66.7%; P50: 71.4%; P75: 80%; Max: 100%).

- **ICU nurses reported to often perform 'tasks below their skill level' during their last shift:** clerical duties (99.6%); ordering and/or storing medication (89.4%); clean patient rooms and equipment (80.9%); obtain supplies or equipment (69.9%); Delivering and retrieving food trays (63.1%); transport of blood samples (56.3%); transporting of patients (36.5%). Considerable variation ($IQR \geq 25\%$) exists across hospital sites for 'transport of blood samples'; 'transporting of patients', 'cleaning patient rooms and equipment'. It should be noted that there are no large differences between week- and weekend days. Also between type of shifts, differences are limited (slightly less reported tasks below skill level during night shifts). In this context it is remarkably that the availability of supporting staff is rather limited. Only 24% reported 1 or more healthcare assistants on the ICU on their last shift while logistic support staff was reported by 40% of the ICU nurses.
- **ICU nurses reported an important number of care activities left undone on their last shift.** Only 26.5% (Min: 4.8% ; P25: 17.4% ; P50: 24.2% ; P75: 32.8% ; Max: 78.9%) of the nurses reported that they could perform all care required during their last shift. Clinical activities (on average 1.8 on 9 activities) as well as planning or communication activities (on average 1.6 on 5 activities) are left undone due to a high workload. The most frequently reported clinical activities left undone are: frequent changing of patient position (35.1%); administering medications on time (29.1%); oral hygiene (28.6%); and adequate patient surveillance (24.5%). The most frequently reported 'planning and communication activities that were reported left undone were: 'emotional support for patients and family' (49.2%) and 'multidisciplinary consultation meetings' (38.8%).
- **The nurse working environment** had dimensions with favourable results ('nurse-physician relationships' and 'foundations for quality of care'). The findings for leadership are somewhat more

ambiguous since many hospital sites scored low for the item 'praise and recognition'. Overall poor findings for participation in hospital affairs and staffing and resources adequacy. For all five dimensions substantial between hospital variation was observed in the nurses agreeing or totally agreeing with presence of positive work environment aspects:

- **Nurse-physician relationships:** Min: 24.6%; P25: 62.3 %; P50: 70.4%; P75: 77.6%; Max: 98.1%;
- **Foundations for quality of care:** Min: 38.5%; P25: 57.5%; P50: 64.0%; P75: 70.4%; Max: 90.1%;
- **Leadership and management:** Min: 15.8%; P25: 46.3%; P50: 58.3%; P75: 70.0%; Max: 87.5%;
- **Staffing & resource adequacy:** Min: 8.8%; P25: 23.2%; P50: 28.5%; P75: 37.5%; Max: 87.5%;
- **Participation in hospital affairs:** Min: 9.4%; P25: 20.3%; P50: 26.7%; P75: 29.3%; Max: 69.4%;
- **The overall patient-to-nurse ratio in Belgian ICUs, in 2022, is 2.3** (2.2 during day-shifts and 2.7 during night-shifts patients per nurse (ranging from 6.1 to 2.7). The variation across hospitals is slightly higher during night shifts (from 1 - 5.2) compared to day shifts (from 1.5 – 3.6). In addition, the average ratio in hospitals in Wallonia is higher during the day shifts (2.6) compared to Flanders (2.2) and Brussels (2.1).
- **Nearly all nurses (i.e. 98%) working on ICU are Bachelor-prepared.** In addition, on average 77.2% have followed an advanced education in ICU (Hospital variation: Min: 4.8%; P25: 72.0%; P50: 80.0%; P75: 86.0%; Max: 100.0%). The results for an advanced title in ICU are similar (on average 80% of the ICU nurses).
- **There is an association between the nurse working environment and ICU nurse wellbeing.** A better nurse working environment is consistently associated with better nurse outcomes



(less job dissatisfaction, less intention to leave the job and the profession). For risk of burnout the association is only consistently observed when the hospital sites with the best nurse working environment (top 25%) are compared with hospital sites with the worst work environment. The association between the patient-to-nurse ratio and 'nurse outcomes' is less clear. For intention-to-leave the job, dissatisfaction with wage, risk of emotional exhaustion and risk of depersonalisation a significant association with patient-to-nurse ratios was observed when the best hospital sites (top 25%) are compared to the worst staffed hospital sites (bottom 25%).

- **There is an association between the nurse working environment and nurse-perceived quality of care.** Hospitals with a better nursing work environment have a better score on nurse-perceived quality of care.
- **There is an association between the nurse working environment and care left undone.** This association is consistently observed when the best hospital sites (top 25%) are compared with the hospital sites with the worst work environment (bottom 25%). The top-performing hospital have significantly less 'care left undone' activities reported by nurses compared to the worst performing hospitals.

The association between the patient-to-nurse ratio and 'nurse outcomes' is less clear. Yet, significant associations for patient-to-nurse ratios (worst compared to best staffed hospitals) with planning & communication activities and all care performed were observed.

2.2 Research questions

We studied three research questions in this chapter:

- What is the state of staffing levels, composition of the workforce, the working environment, perceived quality of care and staff wellbeing in Belgian ICUs after more than 1.5 years of COVID-19 pandemic?
- How do these key variables vary across Belgian ICUs?
- What is the association between variables on the nursing work environment and nurse staffing levels on ICU with nurse wellbeing?

2.3 Method

This part of the research includes a replication of the survey used in the context of KCE report 325⁸, conducted in ICUs. The survey instrument and design allows such a replication.^{56, 57} The changes made to the survey are limited to the addition of some COVID-related questions and ICU-specific care related questions to the list of missed care activities ('care left undone') and tasks below skills level. The research team made propositions for changes to the original questionnaire based on field expertise and a quick scan of the literature.⁵⁸⁻⁶⁰ These changes were sent to members of a professional organisation of ICU nurses for feedback. Based on their input a final selection was made (the survey instrument is available upon request).

Recruitment procedure

- Recruitment of hospitals and intensive care units.

All general acute hospitals (including university hospitals) were invited to participate (invitation to the Chief Nursing Officer – CNO and the Chief Executive Officer (CEO) / Chief Medical Officer – CMO) via an invitation letter (sent by email in first week of September 2021). After 14 days a reminder (by email) was sent to hospitals that did not respond on the initial invitation. The call to participate was open until October 1st 2021. Eighty-six hospitals have sent the CEO-CNO-CMO signed agreement to participate.



All hospitals that wanted to participate were allowed to participate with all the intensive care units of the hospital (possibility to limit the participation to one hospital site if a hospital consists of multiple sites).

For this study an intensive care unit is defined as follows *“special services staffed, designed and equipped to provide intensive care to critically ill patients requiring an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of life-threatening organ system insufficiency”*.^{1, 2} This is a broad definition. Hospitals themselves identify the units that qualify as ICUs according to this definition. It was also possible to participate with medium care units, burn care units, high-dependency units, etc. if these units correspond with the definition as mentioned above.

Participating hospitals were asked to provide a master list of all intensive care units including some general characteristics that had to be submitted to the research team (e.g. number of beds, number of nurses, caring and supporting staff [FTE-Full time equivalents], general staffing patterns: shift-types and patient-to-nurse ratios per shift type, type of patients [surgical, medical, mixed]). Hospitals were asked to submit these data for the situation on September 21st, 2021. The eligibility of the ICUs was checked by the research team (i.e. participating units correspond with the definition above, general units such as internal medicine, surgery, geriatrics were excluded). The unit level data have a unit identifier which allows to link the nurse survey data at the unit level (identical common identifier).

Hospitals did not receive a financial incentive to participate but hospitals in return for their participation receive a benchmarking report in which their data are compared to other Belgian hospitals when the scientific report is published.

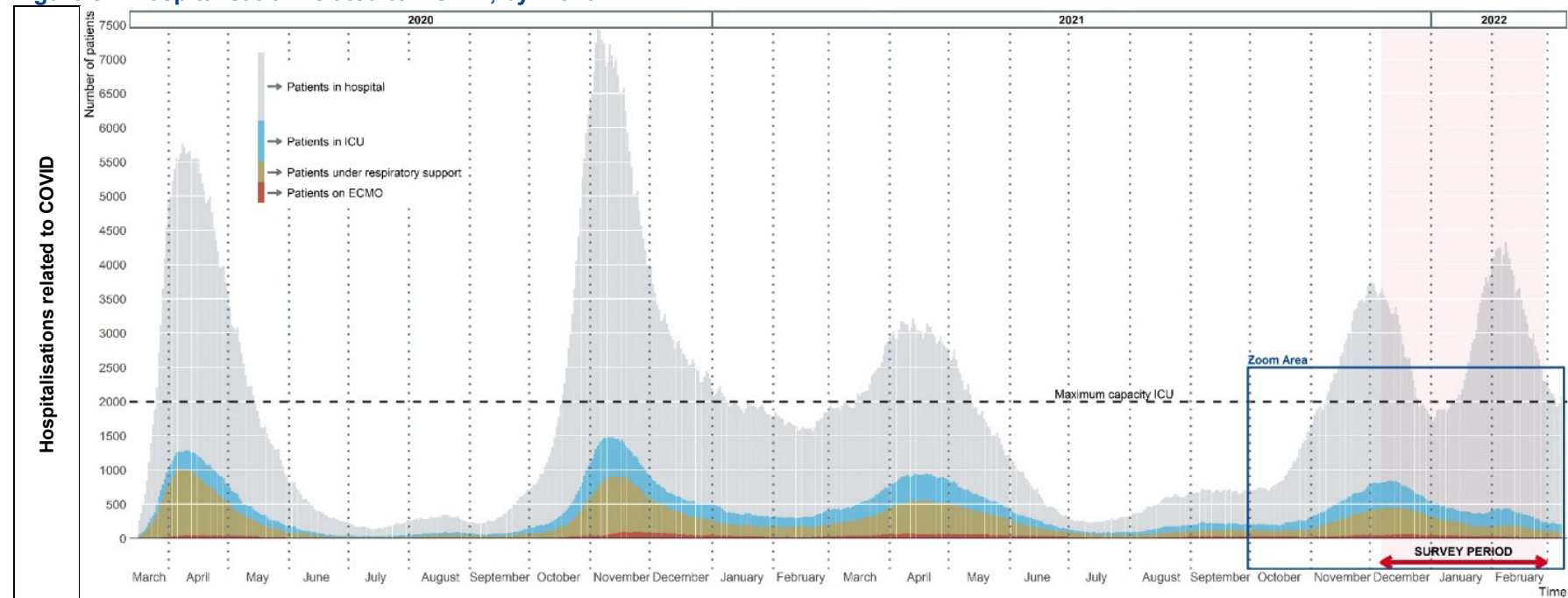
Hospitals appointed a single-point-of-contact/local field manager (e.g. CNO, nurse manager ICU, collaborator of the CNO or CMO). This person was the key contact of the research team throughout the study period.

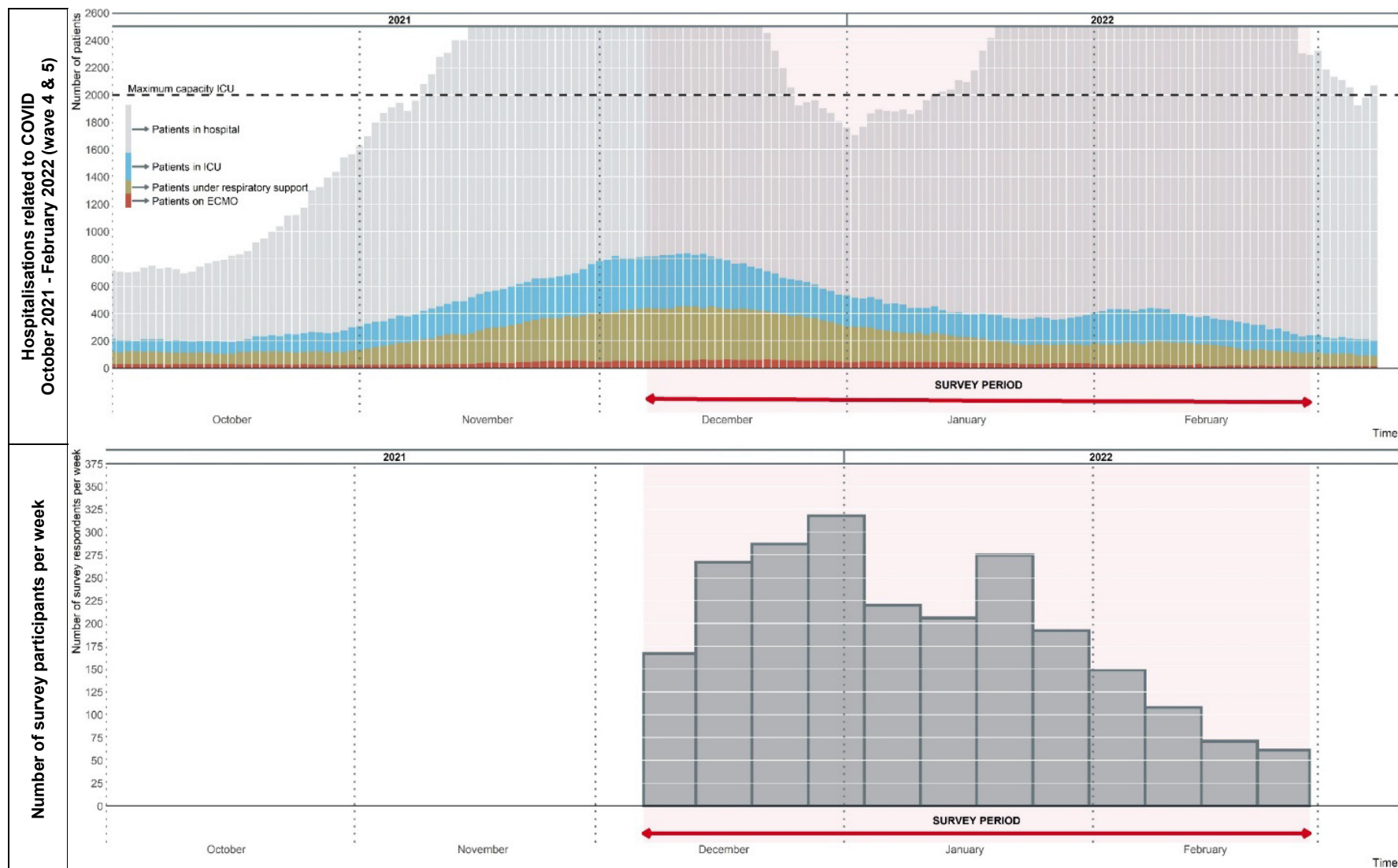
- Recruitment of nurses

All staff nurses (except nurses on sick leave, maternity leave or those who are on holiday and agency nurses) providing direct care to patients on the nursing units were included in the survey. It should be noted that we received, per participating unit, the number of eligible nurses (i.e. registered nurses as defined above; unit managers, healthcare assistants and other non-nursing staff are excluded) according to the situation of September 21st (2021). This was necessary to know (approximately) how many participation IDs (giving access to online survey) per nursing unit had to be prepared. It should be noted, however, that during the actual data collection period (i.e. December 2021-February 2022) the Belgian ICUs were confronted with the fourth and fifth wave of the COVID-19 pandemic (see below) with a higher than usual staff absenteeism. The hospital sector reported high rates of staff absenteeism (isolation, quarantine, staff leaving the job, short – and long-term sickness leave).⁶¹ The response rates might as such be influenced (e.g. overestimation of denominator due to absenteeism rates; underestimation of denominator due to surge staff).

COVID-19 waves and ICU capacity in Belgium

Figure 3 shows that this study was conducted at the time of the fourth wave of COVID-19 and the impact of this wave on ICUs. At the peak of the 4th wave, the number of hospitalisations in ICUs approached 800 patients, of which over 400 were on respiratory support (see Figure 3).

**Figure 3 – Hospitalisation related to COVID, by month**



Source: Sciensano epidemiological follow-up of the COVID-19 epidemic



Instruments and measures

The survey is thus, despite some minor modifications, the same survey that was used during KCE-report 325 (general hospitalisation units) which is available in French, Dutch and German.⁸

The instrument includes the following measures and questions⁵⁷:

- Demographic variables: educational level, years of expertise within the hospital/profession/ICU, etc.
- Nurse staffing: Each nurse was asked to give information on their qualification level, and to report the number of nurses and patients present on the nursing unit as well as the number of patients cared for during the last shift or workday. Based on the provided information patient-to-nurse ratios are calculated: overall, morning, evening, day and night shift (unless otherwise mentioned we report the shift level specific data for night-shifts versus non-night shifts [i.e. morning/evening/day]; difference between week and weekend days. The predictive validity of this method of measuring hospital nurses' workloads has been well established.^{5, 6, 62} In addition to the patient-to-nurse ratio (registered nurses and total staff on duty), the percentage of bachelor prepared nurses and the percentage of nurses with a special title in ICU will also be reported.
- The nursing work environment is measured by the Practice Environment Scale of the Nursing Work Index or PES-NWI.⁶³ This instrument is a 32-item forced-choice Likert type scale from 'strongly disagree' (1) to 'strongly agree' (4) that allows the measurement of five nurse working environment factors (i.e. staffing and resources adequacy, hospital and unit level nurse management abilities and leadership, nurse-physician relations, nursing foundations for quality of care, and nurse participation in hospital affairs). Several methods exist to calculate scores per subdimension or overall.^{8, 63-65} In this study we have calculated the average percentage per hospital site of nurses answering that they (strongly) agree with the items of the PES-NWI (overall score) of the items of a particular sub-dimension.⁸ For the regression analyses we calculated, analogue to international studies, quartiles based on the hospital composite measure differentiating hospitals with lowest quartile (poor work environment) to the highest quartile nurse practice environment scores (better work environment).⁶⁶
- The Maslach Burnout Inventory or MBI and questions about job satisfaction and intention to leave (the hospital and/or the profession). The MBI is a 22-item inventory designed to assess the risk of burnout among various professional groups. Each of the 22 items is scored by the nurses on a 7-point Likert scale from 0-6 with 0 representing "never" and 6 "everyday". It captures 3 dimensions of burnout: emotional exhaustion (EE; score from 0-54), depersonalisation (DP: score from 0-30), and reduced personal achievement (PA: score from 0-48). The cut-off points for low, moderate and high risk were respectively 0-18, 19-26, and >26 for emotional exhaustion, 0-5, 6-9, >9 for depersonalisation, and >39, 34-39, 0-33 for reduced personal accomplishment. To estimate an overall burnout risk score, we calculated a single score according to the method that is most frequently done in the literature⁶⁷: a combination of high EE, high DP and low PA.⁶⁷ It should be noted that the MBI is measuring the risk of burnout and not the clinical manifestation of burnout. For the latter other measures like the BAT or Burnout Assessment Tool have to be used.⁶⁸
- Questions about 'carrying out non-nursing tasks' and 'care left undone' during the last shift. These activities are thus measured in a subjective way (perception of nurses) which allow to quantify domains where some care is omitted and domains where some activities can be delegated to non-nursing staff. Careful interpretation of these measures, given its subjective nature, is indicated.^{7, 60}
- Nurses' perceptions about the quality of care, patient safety and evolution thereof.⁵⁷



Data collection procedures

Similar to what was done in KCE report 325, a site visit to all hospitals was conducted by the research team to launch the survey (visits scheduled between December 6th 2021 and January 17th 2022). Due to the COVID-19 restrictions, some site visits were replaced by a video-call. During this (virtual/onsite) visit, the study and privacy provisions (e.g. data of individual nurses are not reported back to the hospital, hospital staff will not know who participates in the survey, they will only be informed on the response rates; at the end of the study the hospital management will only receive feedback of results aggregated at the hospital site level and the position of its own hospital site) were explained to the contact person, CNO, nurse managers and/or nurses of the participating units.

All nurses (also those absent^d during the information session) received an envelope from the field manager with information about the study and an invitation to participate. This invitation included an individualized but anonymized link (QR-code) towards an online survey (online platform - CheckMarket). The software is Health Insurance Portability and Accountability Act (HIPAA) and General Data Protection Regulation (GDPR) compliant, allowing de-identification and encryption and allows secure communication and file exchange. The software allows nurses to report through web and mobile application.

Each nursing unit, hospital site and hospital has a unique identifier (to avoid double registrations). This unique identifier is the same as for the data that are collected at the unit level (see above). Before launching the online survey, it was pilot-tested:

- Test the functionality of the online survey: KCE/Hict staff (n=10);
- Testing the survey in the field: nurses working on ICU (n=5): with a telephone call to discuss the test.

Once the pilot was finalised and ethical committee approval was obtained (see further), the survey was launched. Nurses were asked to fill out the survey within 4-5 weeks. Yet, given the difficult context on ICUs at the

moment of the data collection, flexibility was key. In most hospitals the data collection period was extended to 8-10 weeks.

Nurses could complete the questionnaire in several rounds (i.e. thanks to the unique QR-code, Checkmarket allows respondents to fill out the questionnaire at different moments without having to restart from scratch). The response rates were monitored per nursing unit/hospital site/hospital. When response rates were below 40%, the field manager was asked to visit the nursing units to remind the nurses to fill out the survey. In addition, a general reminder was sent via e-mail with feedback about the response rates every two weeks. The field manager was asked to motivate the nurses of the nursing units with low response rates. The field manager of the hospital did not know which nurses filled out the questionnaire since the submitted questionnaires were collected via a secured platform hosted by the research team.

Ethical approval and General Data Protection Regulation (GDPR)

Even though this study did not fall under the Belgian law of 7 May 2004, approval of an ethics committee was not strictly necessary. Nonetheless, approval was sought and granted by the ethics committee of University Hospital Leuven (S65994) on 12 November 2021. The data were processed according to the Belgian law of 30 July 2018 and to EU Regulation 2016/679 of 27 April 2016, concerning the protection of natural persons in respect of processing activities and to ensure the free flow of personal data.

All nurses were informed via the information letter and electronically signed a Declaration of Consent via the software platform. By means of the unique QR-code, only the respondent can link his/her unique identification with his/her answers and has the right of inspection of their own data by contacting KCE. Neither the research team, nor the hospital knew who participated and who did not. This study design guaranteed the anonymity of the participants as the IP address was not stored. Participants were not identified and the data were analysed only at

^d Except those on sick leave, maternity leave or holiday



aggregated levels; such as the nursing unit, hospital site, hospital, regional or national level.

Statistical analysis

All measures mentioned above were described at national, regional and hospital site levels. All analyses were performed using SAS 9.4 and R 4.1.2.

Hospital site results were created by averaging answers from nurses within the same hospital site. The national results were calculated as weighted average percentages by hospital site, the weight being the number of respondents in the hospital site (see Figure 4 for the number of respondents by site). The regional results were calculated as the weighted average percentages by hospital site by region. "Average over participating hospital sites" or "Average national" as written below in the figures and in the tables should therefore be interpreted as "Weighted average...".

All graphical displays of findings consistently show hospitals of the Flemish Region in blue, hospitals of the Brussels-Capital Region in grey and hospitals of the Walloon Region in green.

Regional differences were evaluated using Tukey's pairwise comparison. A p-value below 0.05 was considered as significant.

Multiple regression analyses have been conducted to estimate the association between measures reflecting nurse working environment and patient-to-nurse ratio at the hospital site level on the one hand (independent variables) and nurse wellbeing, nurse-perceived quality of care and care left undone at the level of the nurses on the other hand (dependent variables). Multiple logistic regression analyses have been conducted in case of binary outcomes. Multiple Poisson log-linear models were conducted to estimate the association between nursing environment/patient-to-nurse ratio and care left undone in the case of count dependent variables. All analyses corrected for the clustering of nurses within hospital sites using a generalized estimation equation approach.

The choice of dependent and independent variables was guided by the empirical models estimated in KCE report 325 and the available evidence in empirical analyses in the scientific literature.^{5, 62, 64, 65, 69, 70}

- **Dependent variables**

- **Nurse wellbeing:** The nurse wellbeing variables of interest were risk of burnout, job dissatisfaction and intention-to-leave. For the analysis of the association between nurse working environment and risk of burnout, four binary variables were used as dependent variables: high risk of emotional exhaustion, high risk of depersonalisation and high risk of reduced personal accomplishment, high risk at burnout (combination of high risk in all three subscales, i.e. high emotional exhaustion, high depersonalisation and high reduced personal accomplishment). For the analysis of the association between nurse working environment and other nurse wellbeing variables, four binary variables (yes/no) were used as dependent variables: job dissatisfaction, dissatisfaction with wage, intention to leave the job and intention to leave the nursing profession.
- **Nurse-perceived quality of care:** For nurse-perceived quality of care as dependent variable the dichotomous variable 'nurses perceive the quality of care on their nursing units as good or excellent' (yes/no) was used.
- **Care-left undone:** For the analysis of the association between nurse working environment and missed care, two count dependent variables and one binary dependent variable were used: clinical care undone (max 9 items), planning & communication undone (max 5 items) and all care could be performed (yes/no).

- **Independent variables**

- **Hospital site level variables of interest:** nurse working environment and patient-to-nurse ratio: Hospital site-level covariates of the nurse working environment and the patient-to-nurse ratio were calculated by averaging responses from nurses within the same hospital site. Average hospital site-level values



were used rather than respondent-level values because working environment and staffing were considered hospital site characteristics with nurses being key informants to observe and rate these features.

We categorized hospitals into patient-to-nurse ratio quartiles based on the weighted average of the overall patient-to-nurse ratio. The median patient-to-nurse ratio was 2.3, with percentile 25 (p25) and percentile 75 (p75) equalling 2.0 and 2.5, respectively (see Table 4).

The nurse working environment was categorised into quartiles as well, based on a composite score calculated as the mean of the item scores for each hospital site. Each item of the PES-NWI was assessed on a Likert scale of 1 (*strongly disagree*) to 4 (*strongly agree*) (see above); with items being positively framed, higher scores reflect better performance. Hence, the lowest quartile consists of the 25% of hospital sites with the worst performance on nurse working environment and the highest quartile includes the 25% best performing hospital sites. Note that the items in the subdimension “staffing and resource adequacy” of the PES-NWI scale were included in the calculation of the composite score as no multicollinearity was found between this subdimension and the patient-to-nurse ratio when estimation the model.

- **Other covariates:** All analyses accounted for hospital site characteristics (university versus non-university), region (Flanders, Brussels and Wallonia), and nurse demographics. For the latter the following variable were used: education (Bachelor or postgraduate in intensive and emergency care; or not), sex (male; female; or non-binary) and age (age groups: under 25; 25-29; 30-34; 35-39; 40-44; 45-49; 50-54; 55-59; 60 or over). For the analysis of the association between care left done and nurse working environment, we added (analogue to KCE-report 325) the hospital site-level non-nursing tasks (average number of tasks often or sometimes performed), the type of day (weekday; or weekend) and the type of shift (day; or night) as covariates.

As a **robustness check**, three alternative models were estimated, with a different set of explanatory variables. To assess the goodness-of-fit of the alternative specifications, the quasi-likelihood information criterion (QIC) was used.⁷¹ The QIC presents a trade-off between the goodness fit of the model and the complexity or parsimony of the model.

1. To account for nurse working environment, the hospital site-level score for each of the 5 subdimensions was used instead of subdividing hospital sites into quartiles based on an overall composite score of nurse working environment.
2. Our base model accounts for regional differences, which may capture different effects, such as regional dynamics in the labour market, regional differences in health and educational policies, differences in the patient population, cultural differences, language differences in the survey etc. However, they may also interfere with other independent variables that show significant regional variation and bias the coefficient estimates. This might be the case e.g. for patient-to-nurse ratio or the density of university hospitals. To correct for such potential bias, a model without regional variables was estimated.
3. Casemix variables at the hospital site level were added to the model. Without casemix correction, it is possible that higher staffing levels are associated with worse outcomes (e.g. lower perceived quality, more care left undone), simply because higher staffing levels are observed because the patient population is more severe and represent a higher workload. In this case better staffing levels at the ICU-level might still result in a higher workload at the level of an individual nurse. There is, however, only limited information available in the survey that allows to correct for casemix difference. The following three variables were used: the average number of patients-per-nurse (1) on ECMO, (2) requiring kidney dialysis, (3) with intracranial pressure measurement.



2.4 Study population

2.4.1 Participating hospitals and intensive care units

Eighty-six out of 100 Belgian acute hospitals (123 hospital sites) with ICU agreed to participate to this survey. A total of 3 hospitals that initially agreed to participate decided not to take part at the time the data collection started due to the extra burden caused by the 4th and 5th wave of the COVID-19 pandemic. The sample therefore included 83 hospitals: 40 hospitals (48 hospital sites) in the Flemish Region, 10 hospitals (13 hospital sites) in the Brussels-Capital Region and 33 hospitals (41 hospital sites) in the Walloon Region. Six out of seven university hospitals agreed to participate.

The sample included 152 care units (ICU), among them 150 (98.7%) were intensive care unit (ICU) and 2 (1.3%) were medium care units. Totalling 1 721 operational beds or around 86.4% of the estimated operational ICU beds in Belgium (see Table 1).

Table 1 – Main characteristics of participating hospitals

	ICU*		Medium		Total	
	Beds	Units	Beds	Units	Beds	Units
University	278	25	6	1	284	26
Non University	1431	125	6	1	1437	126
Total	1709	150	12	2	1721	152

*18 units were both ICU and medium care

Number of participating nurses – hospital sites and hospitals

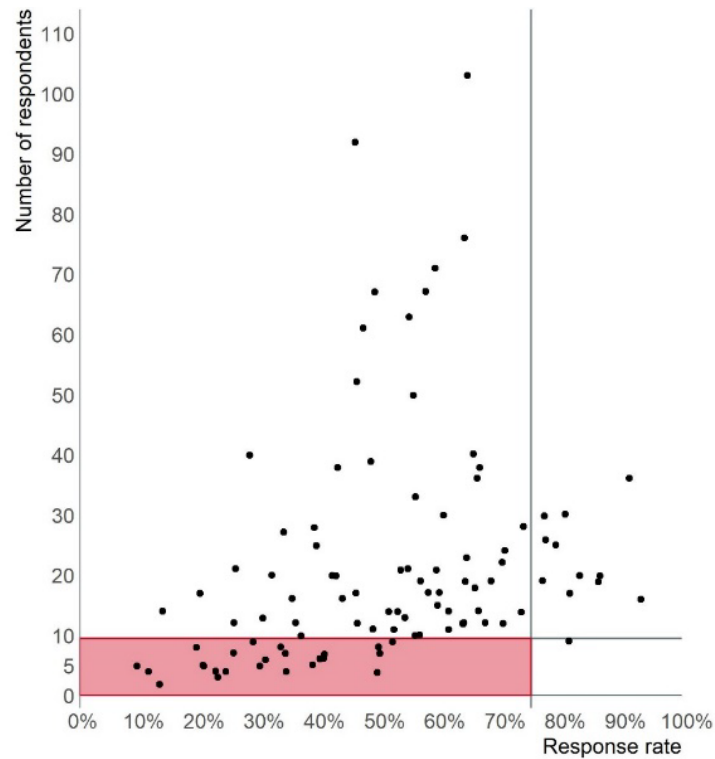
The questionnaire was completed by 2 321 of 4 851 invited nurses, corresponding to a response rate of 47.8%. Among them 1 211 nurses worked in the Flemish Region, 300 in the Brussels-Capital Region and 810 in the Walloon Region. A response rate between 75% and 100% was attained in 12 of 102 participating hospital sites, 44 hospital sites reached a response rate between 50% and 74%, 35 hospital sites reached a response rate between 25 and 49% and, 11 hospital sites reached a response rate below 25%.

When at the level of a hospital site neither a minimum of 10 respondents nor a response rate of 75% was attained, the hospital site was excluded from the final sample (see Figure 4).

We excluded 24 hospital sites with a total of 138 respondents based on this arbitrarily determined exclusion criterion. Hence, the final sample includes 68 hospitals, 78 hospital sites and 2 183 respondents (see Table 2): 34 hospitals, 40 hospital sites & 1 161 respondents in the Flemish Region, 27 hospitals, 30 hospital sites & 747 respondents in the Walloon Region and 7 hospitals, 8 hospital sites and 275 respondents in Brussels-Capital region (see Figure 5 with included and excluded sites and Figure 6 for respondents selection process).



Figure 4 – Number of respondents and response rates per hospital site



Excluded hospitals are those included in the red cell

Table 2 – Description of the participating hospitals and nurses

	Average over participating hospital sites				Distribution score hospital sites				
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max
Number of hospitals	68	34	27	7					
Number of hospital sites	78	40	30	8					
Number of nurses	2 183	1 161	747	275	9	14	20	30	140
Mean age (years)	37.9	38.1	37.4	38.6	30.2	36.4	37.6	40.3	45.8
Mean experience in nursing (years)	15.2	15.5	14.6	15.3	8.2	13.3	15.2	17.2	23.4
Mean experience in ICU (years)	13.7	13.8	13.3	14.1	6.3	11.9	13.6	15.9	21.3
Mean years employed in the hospital (years)	13.6	13.9	13.1	13.8	7.1	11.8	13.6	15.9	21.0
Full-time employed (%)	59.8%	59.9%	61.4%	54.9%	21.4%	52.2%	60.0%	66.7%	94.7%
Female (%)	74.5%	74.2%	74.4%	75.6%	47.6%	69.0%	75.0%	81.6%	100.0%



Figure 5 – Participating hospital sites

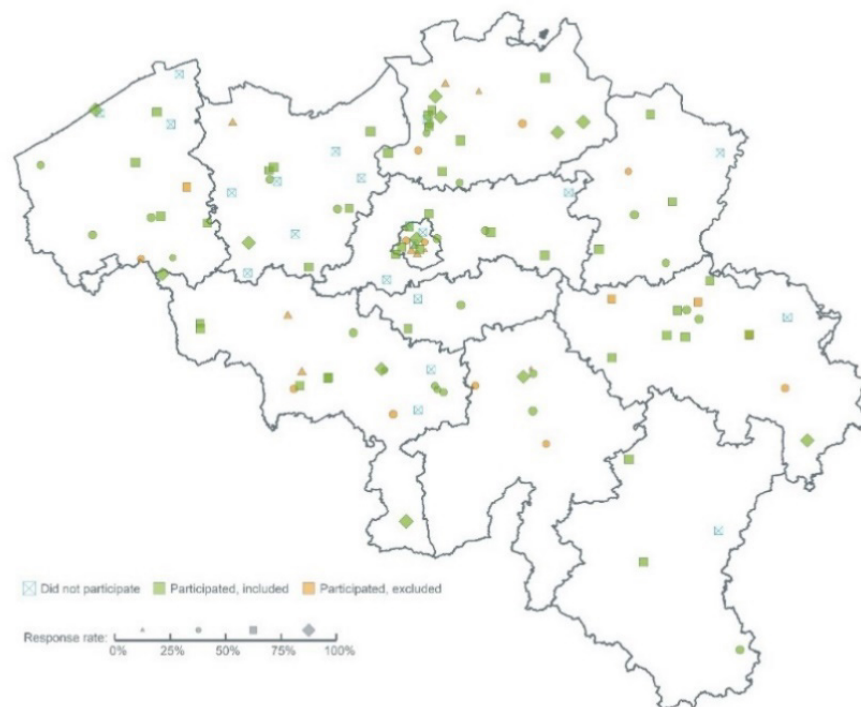
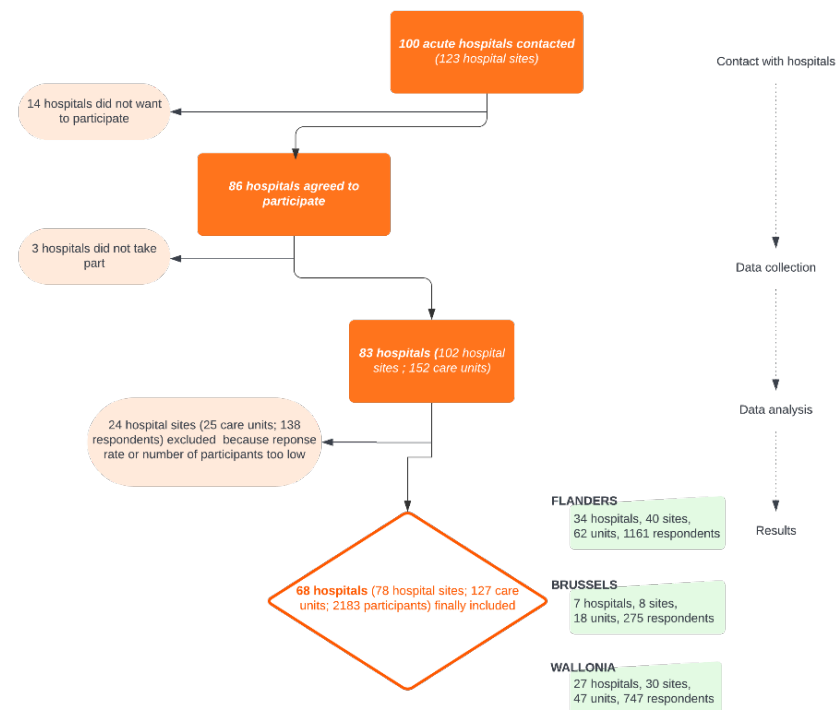


Figure 6 – Hospital, hospital sites, and respondents selection process





2.5 Descriptive Results

All figures in this section that present hospital site level information can be [downloaded in high resolution](#) via the KCE website.

2.5.1 Sample Characteristics

Eighty percent of the nurses had an advanced professional title in ICU (bijzondere beroepstitel intensieve zorg en spoedgevallenzorg/ titre professionnel particulier d'infirmier spécialisé en soins intensifs et d'urgence). Table 2 indicates that the mean age of the participating nurses working in ICU was 37.9 years (Standard Deviation (SD) 11.4). The mean number of years that the participating nurses had worked as a registered nurse in their career was 15.2 years (SD 11.6) and 13.7 years (SD 11.1) on ICU. It is remarkably that the latter corresponds to the mean years employed in the hospital (i.e. 13.6 years). The majority of nurses (74.5%) were female (see Figure 7) and 59.8% nurses were working full time (see Table 2).

2.5.2 The nurse working environment

Heatmap nurse working environment

In Figure 8 a heatmap is used to illustrate the nurse working environment scores for the participating hospitals (overall, per dimension and per item). Hospital sites are on the x-axis and are ranked by the average percentage for all 32 items from left (highest percentage, i.e. 78%) to right (lowest percentage, i.e. 30%). The higher the score, the better. A heatmap is used to express percentages between a range of colours that moves from green (high percentage) over blue (medium percentage) to red (low percentage).

This clearly shows overall favourable percentages (except for some hospital sites on the right hand side of the figure) for items related to foundations for nursing quality and for items related to nurse-physician

relations. The findings for leadership are somewhat more ambiguous since many hospital sites scored low for the item 'praise and recognition'. Overall poor findings are observed for participation in hospital affairs and staffing and resources adequacy. Variation across hospitals is substantial, and suggests that several hospital sites have implemented successful strategies to optimize aspects of nurses' work environment. Also variation within organisations is often high on items of the same subscale, and this pattern is divergent across hospitals.

Figure 7 – Age distribution of respondents by gender

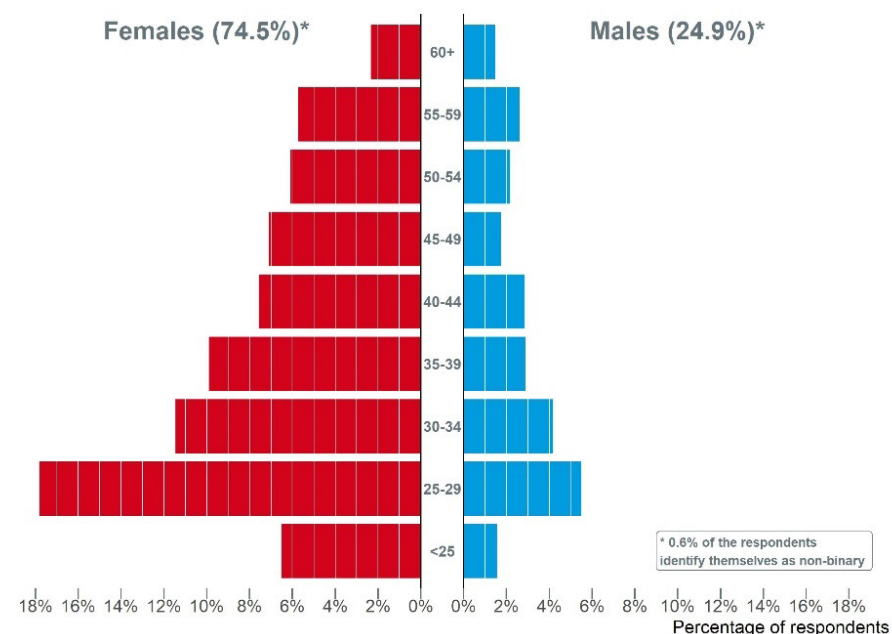




Figure 8 – Percentage of nurses agreeing or totally agreeing with presence of positive work environment aspects, at hospital site level

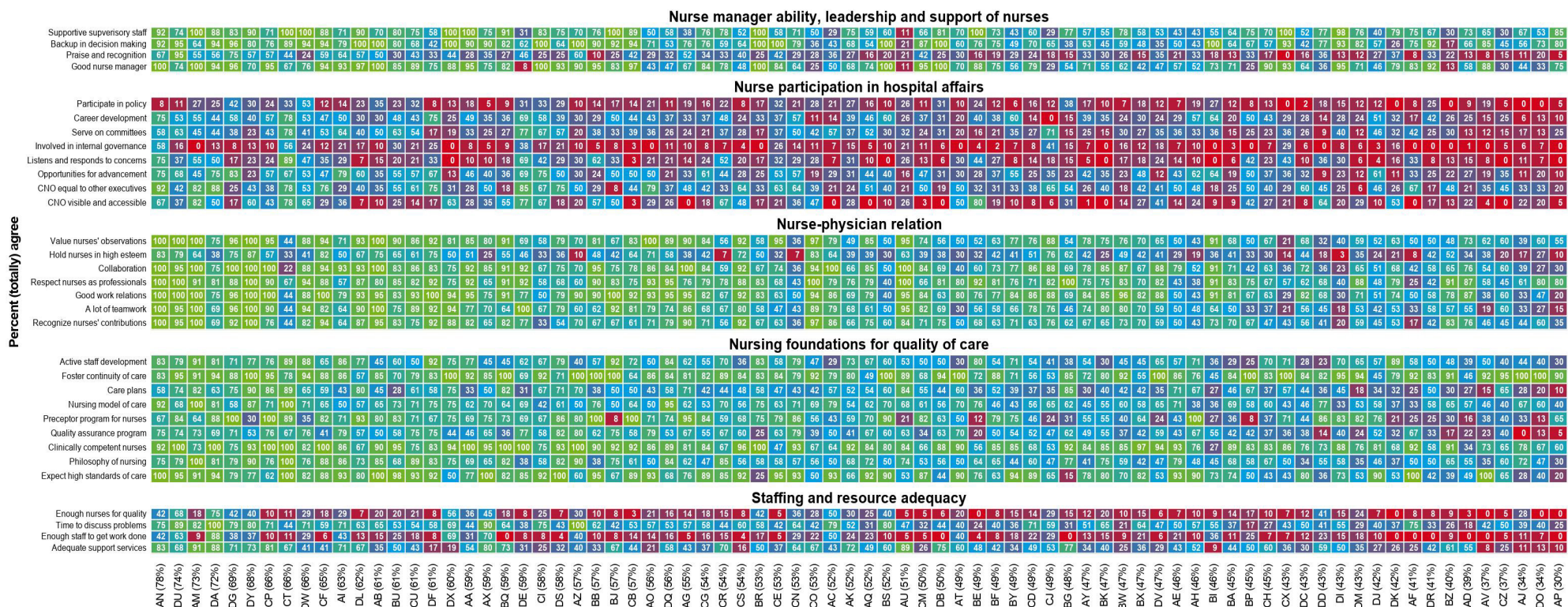


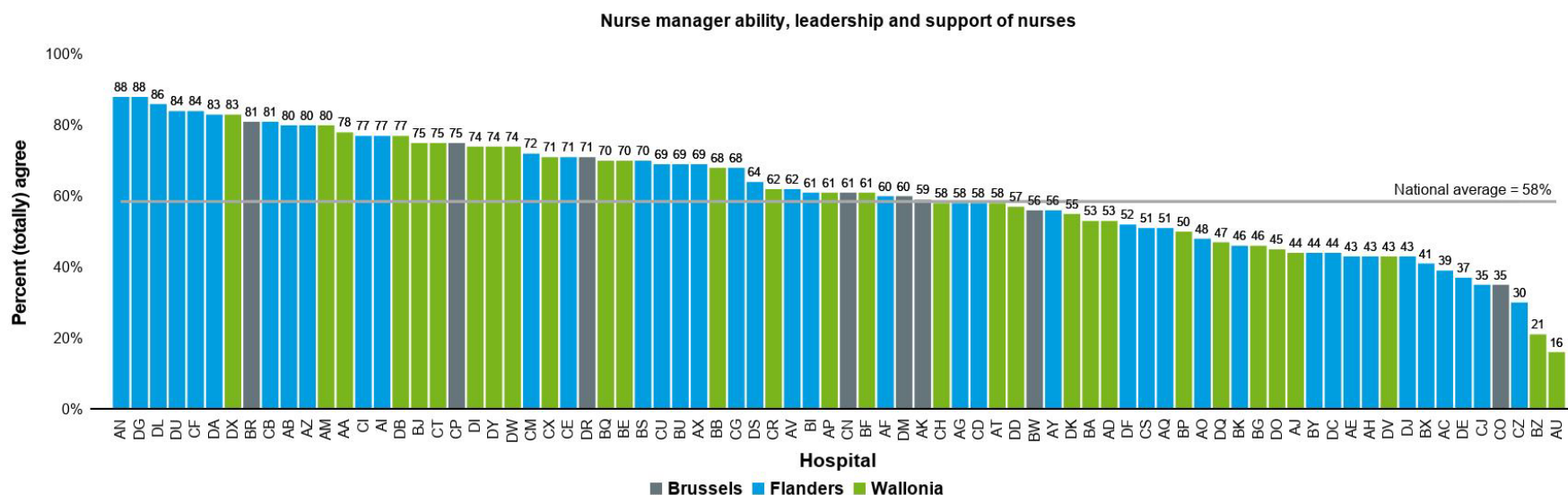


Figure 9 to Figure 13 illustrate the findings for each of the five dimensions of the PES-NWI: nurse manager ability, leadership, and support of nurses (Figure 9), nurse participation in hospital affairs (Figure 10), nurse foundations for quality of care (Figure 11), nurse-physician relations

(Figure 12), and staffing and resource adequacy (Figure 13). The higher the score, the better.

The average percentage of nurses who (totally) agreed with items about manager ability, leadership and support is 58% (16% to 88%) (Figure 9).

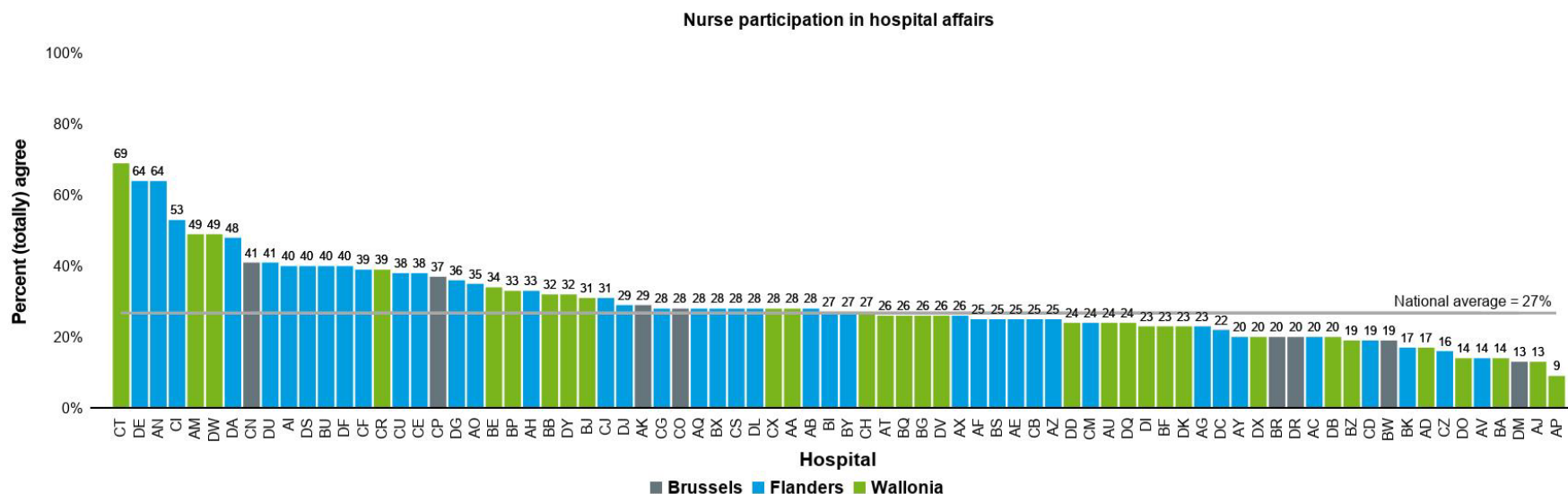
Figure 9 – Percentage of nurses agreeing or totally agreeing with the presence of positive work environment aspects related to manager ability, leadership and support, at hospital site and regional level





The average percentage of nurses who (totally) agreed with items about participation of nurses in hospital affairs is 27% (9% to 69%) (Figure 10).

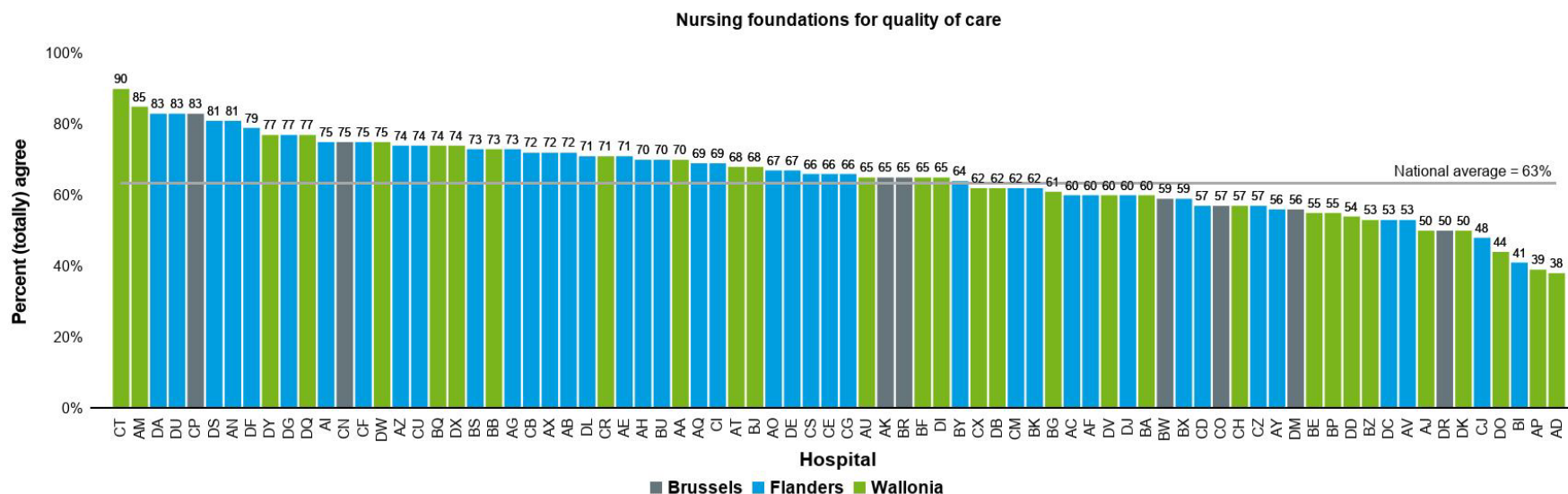
Figure 10 – Percentage of nurses agreeing or totally agreeing with the presence of positive work environment aspects related to participation in hospital affairs, at hospital site and regional level





The average percentage of nurses who (totally) agreed with items about foundations of quality care is 63% (38% to 90%) (Figure 11).

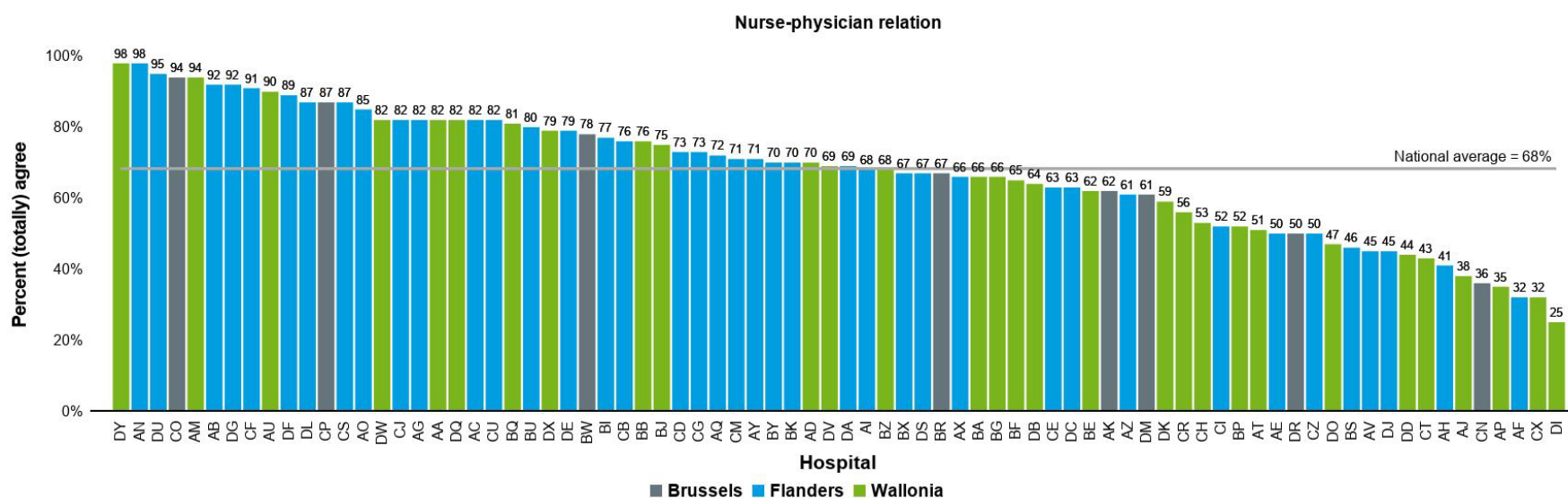
Figure 11 – Percentage of nurses agreeing or totally agreeing with presence of positive work environment aspects related to foundations of nursing quality care, at hospital site and regional level





The average percentage of nurses who (totally) agreed that a good and collegiate nurse-physician relationship is present at their nursing unit is 68% (25% to 98%) (Figure 12).

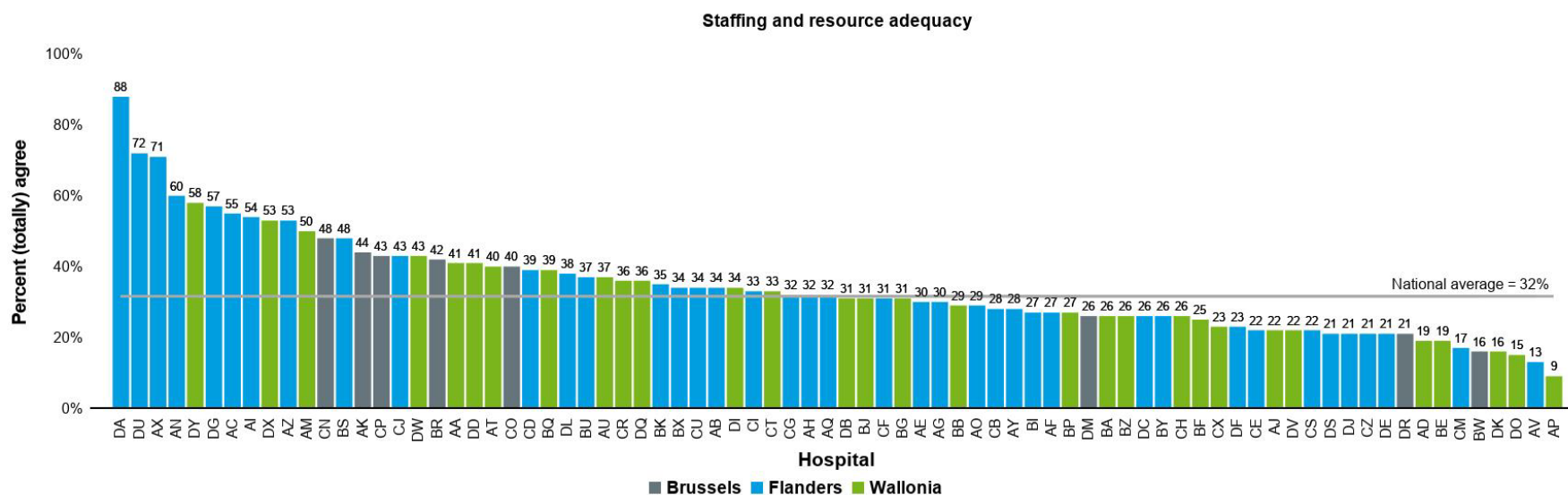
Figure 12 – Percentage of nurses agreeing or totally agreeing with the presence of positive work environment aspects related to nurse-physician collegial relations, at hospital site and regional level





The average percentage of nurses who (totally) agreed that nurse staffing and the presence of resources are adequate is 32% (9% to 88%) (Figure 13).

Figure 13 – Percentage of nurses agreeing or totally agreeing with presence of positive work environment aspects related to staffing and resource adequacy, at hospital site and regional level





There are three subscales with a higher score (nurse-physician collegial relationship - 68.3%; foundations for nursing quality of care - 63.4%; manager ability, leadership and support – 58.5%) and two subscales with

lower scores (staffing and resource adequacy – 31.6%; participation in hospital affairs – 26.8%). Yet, for ‘manager ability, leadership and support’ the ‘praise and recognition’ item scored low (29.0%). The highest and lowest subscales scores were the same between regions. The same variation across hospital sites and between regions can be observed for all 5 subscales. No significant differences between regions were observed.

Nurse work environment (Percent (totally) agree) the higher the better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Overall score	50.7%	52.3%	48.3%	50.7%	29.7%	44.8%	49.0%	55.8%	78.4%	
Manager ability, leadership and support	58.5%	58.2%	59.1%	57.8%	15.8%	46.3%	58.3%	70.0%	87.5%	
Participation in hospital affairs	26.8%	28.8%	24.3%	24.9%	9.4%	20.3%	26.7%	29.3%	69.4%	
Nurse-physician collegial relations	68.3%	70.4%	64.0%	71.6%	24.6%	62.3%	70.4%	77.6%	98.1%	
Nursing quality care	63.4%	65.3%	60.8%	62.5%	38.5%	57.5%	64.0%	70.4%	90.1%	
Staffing and resource adequacy	31.6%	32.7%	29.8%	32.1%	8.8%	23.2%	28.5%	37.5%	87.5%	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts ^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia



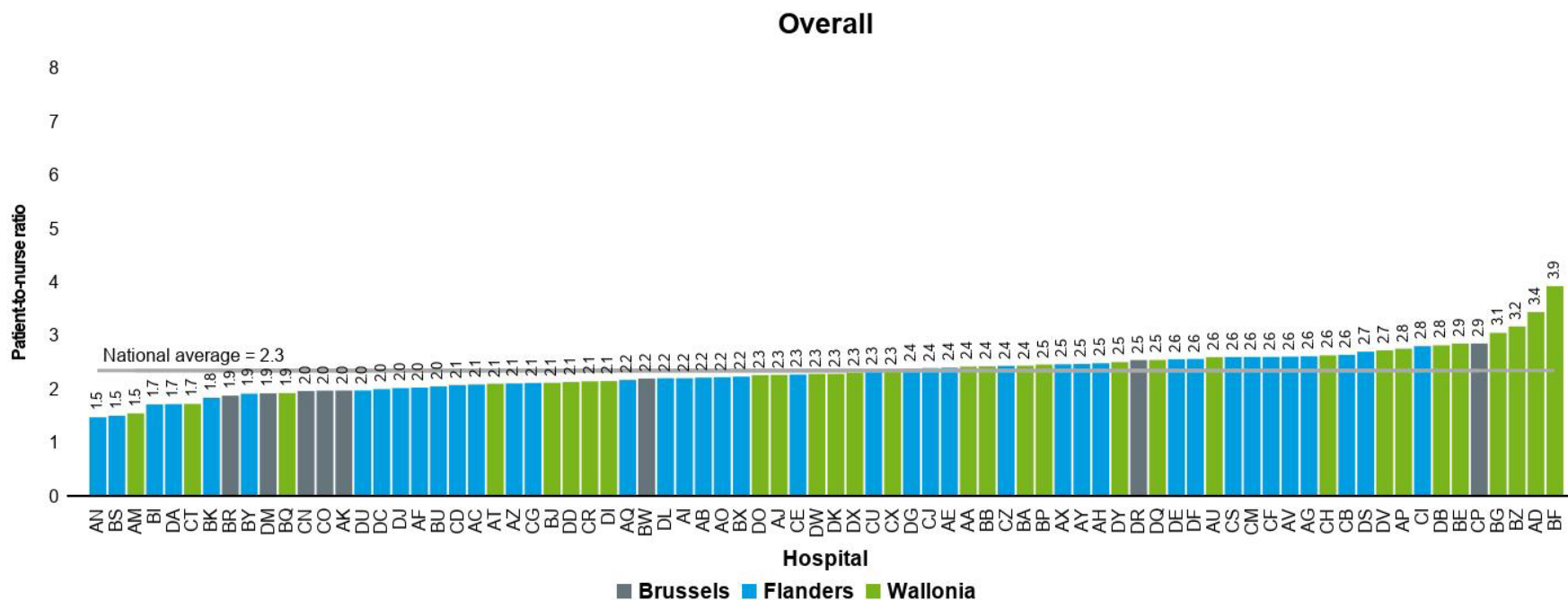
2.5.3 Staffing levels

2.5.3.1 Patient-to-nurse ratio in ICU

Figure 14 to Figure 16 display the overall patient-to-nurse ratio and the patient-to-nurse ratio by shift. The lower the patient-to-nurse ratio is, the lower the caseload.

The overall patient-to-nurse ratio is 2.3 patients per nurse (1.5 to 3.9) (Figure 14). For university hospitals a lower overall patient to nurse ratio could be observed compared to general hospitals (2.1 versus 2.4).

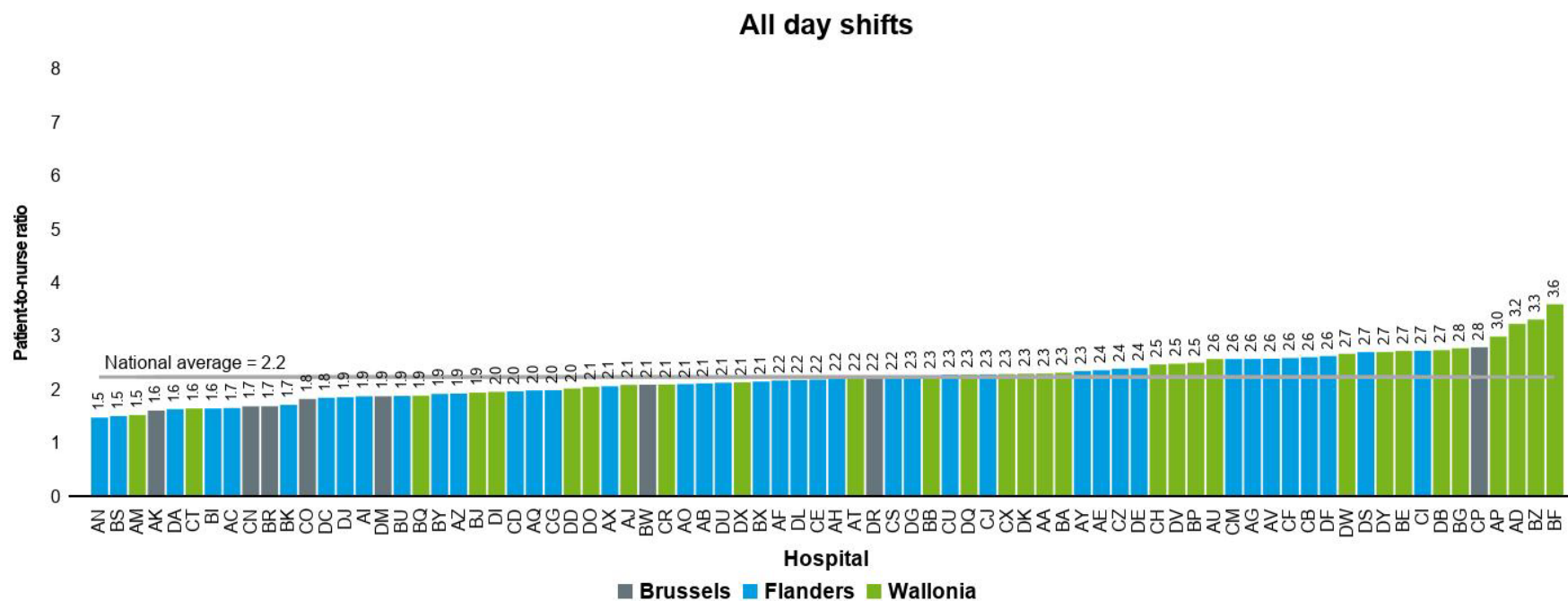
Figure 14 – Overall patient-to-nurse ratio, at hospital site and regional level





The average patient-to-nurse ratio for the day shift is 2.2 (1.5 to 3.6)
(Figure 15).

Figure 15 – Patient-to-nurse ratio during the day, at hospital site and regional level



Note: we grouped morning/day/afternoon& evening shifts together.



The average patient-to-nurse ratio for the night shift is 2.7 (1.0 to 5.2)
(Figure 16).

Figure 16 – Patient-to-nurse ratio during the night shift, at hospital site and regional level

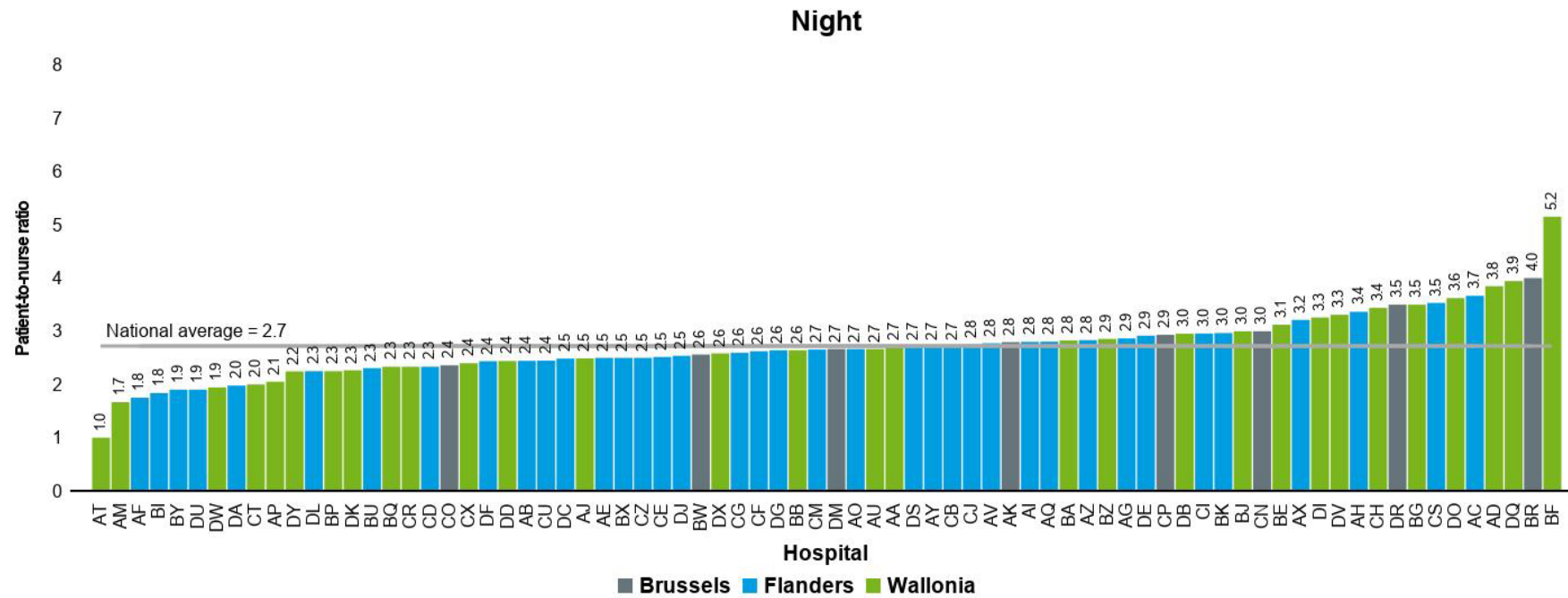
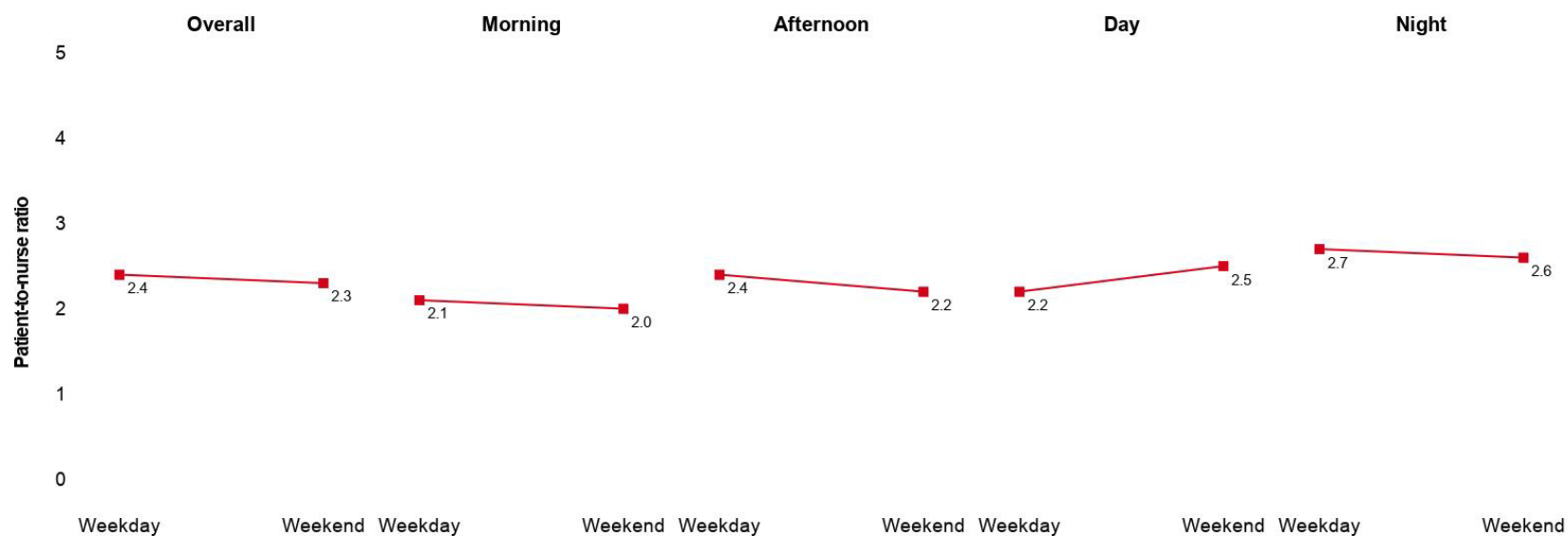




Figure 17 displays the patient-to-nurse ratio for weekdays versus weekend, by type of shift. It can be observed that, overall, patient-to-nurse ratios remain relatively stable when the different shift types (with a split between week and weekend days) are compared.

Figure 17 – Patient-to-nurse ratio during weekday versus weekend, by shift





In Table 4 a summary of the patient-to-nurse ratios is given per region and across hospital sites. It is shown that the overall and day-time shift patient-to-nurse ratios in Wallonia are significantly higher compared to Brussels and Flanders. In addition, for the night shifts the patient-to-nurse ratio is significantly higher in Wallonia compared to Flanders. It is worthwhile to

note that the questions about the type of patients taken care of during the last shift (e.g. COVID-19; Ventilated patients; ECMO) are not clearly linked to the observed patient-to-nurse ratios per hospital site (more detailed analysis available upon request).

Table 4 – Patient-to-nurse ratio by shift, at hospital site and regional level

Patient to nurse ratio lower ratio equals lower workload	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Overall ratio	2.3	2.2 ^W	2.6 ^{F,B}	2.1 ^W	1.5	2.0	2.3	2.5	3.9	
Day shifts (morning to evening)	2.2	2.1 ^W	2.5 ^{F,B}	1.9 ^W	1.5	1.9	2.1	2.4	3.6	
Night shift	2.7	2.5 ^W	2.9 ^F	2.7	1.0	2.3	2.6	2.8	5.2	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts

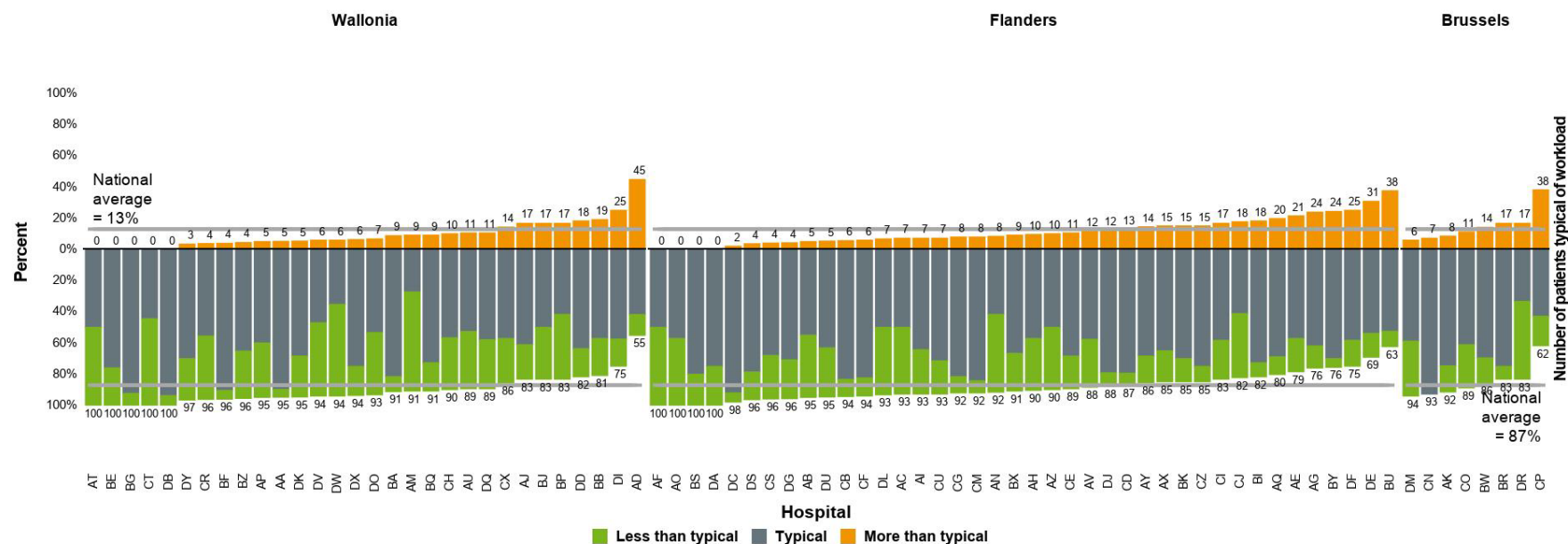
^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia



2.5.3.2 Typical workload

For 67% of the nurses, the workload on their shift was the same as usual, while 20% reported a lower than usual and 13% a higher than usual workload. From Figure 18 it is clear that this varies across hospital sites. Although there are regional differences in patient-to-nurse ratio (see Table 4), no significant regional differences were found regarding the typical workload.

Figure 18 – Workload on the last shift perceived as the same, lower or higher than usual per hospital site, region





2.5.3.3 Educational level and special ICU certification

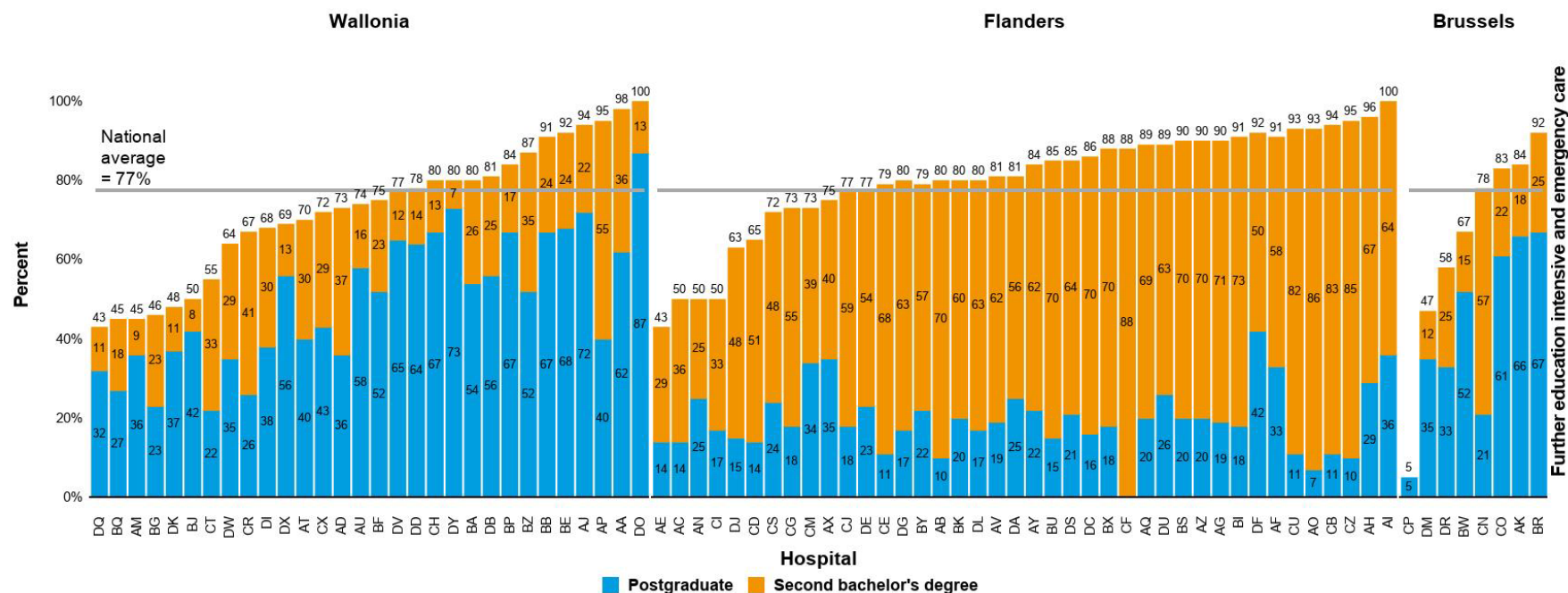
Bachelor-prepared

Most nurses working on ICU are Bachelor-prepared. The average percentage across hospital sites is 98% with only 6 hospital sites with a percentage <90% (see Figure 43 in Appendix 1.1).

Advanced ICU education

The average percentage of nurses with an advanced education in ICU (Bachelor-after-Bachelor or Postgraduate education) across hospital sites is 77% (ranging from 43% to 100% in Wallonia and Flanders and from 5% to 92% in Brussels. In Brussels and Wallonia this is more often a postgraduate education (blue bars) while in Flanders this is usually a second Bachelor degree (orange bars) (see Figure 19).

Figure 19 – Percentage of nurses with an advanced education, at hospital site and regional level

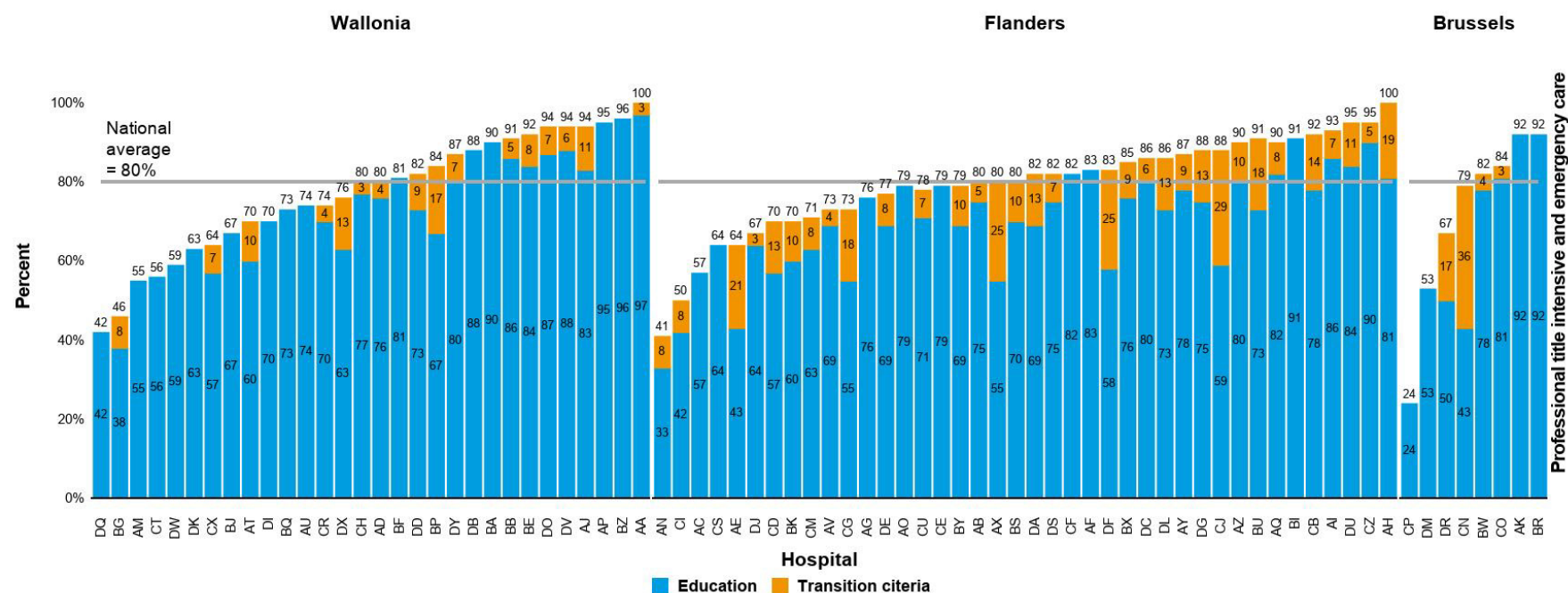




The average percentage of nurses with an ICU-nursing certificate (professional title in ICU and emergency care) across hospital sites is 81% (ranging from: 42%-100% in Wallonia; 41%-100% in Flanders and 24% to

92% in Brussels). Except in some hospital sites, the vast minority of nurses has obtained this certificate via transitional measures (see Figure 20).

Figure 20 – Percentage of nurses with an additional ICU certificate, at hospital site and regional level



In Table 5 we describe a summary of results regarding the advanced education and special title in ICU/emergency care per region and across hospitals. It can be observed that there are no significant differences between regions.

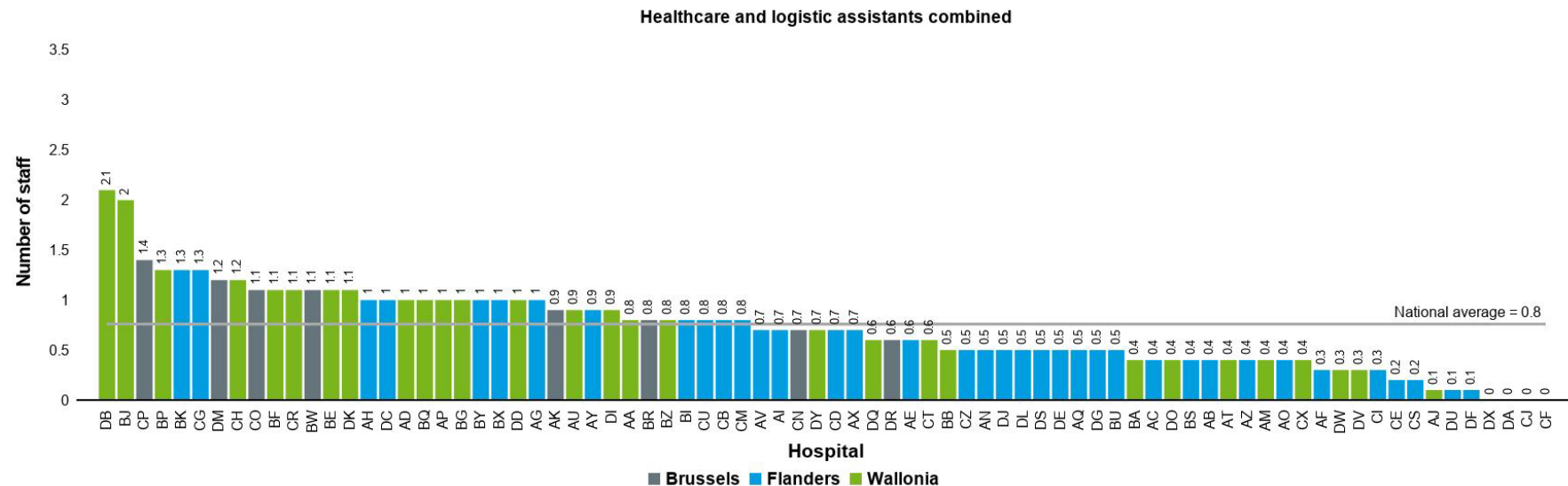


Table 5 – Percentage of nurses with further ICU education, at hospital site and regional level

Nurse education (Percent) higher share is better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Further education in intensive / emergency care	77.2%	80.1%	75.6%	69.1%	4.8%	72.0%	80.0%	86.0%	100.0%	
Professional title in intensive / emergency care	80.0%	80.0%	80.7%	78.2%	23.8%	73.7%	81.8%	90.2%	100.0%	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts ^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia

Figure 21 – Number of healthcare assistants and other supporting staff during last shift





2.5.3.4 Supporting staff

Staffing ICUs with healthcare assistants and logistic support staff is rather limited in Belgium. Overall, the average number of support staff per shift is 0.8 (from 0-2.1) (Figure 21). Supporting staff is more frequent in day shifts (national average 0.99: 0.39 healthcare assistants, 0.60 logistic assistants) than in night shifts (0.11: 0.05 healthcare assistants, 0.05 logistic assistants). Also differences between weekdays (0.81: 0.31

healthcare assistants, 0.51 logistic assistants) and weekend days are observed (0.42: 0.25 healthcare assistants, 0.17 logistic assistants).

As summarized in Table 6, minor regional variation is observed in the logistic support staff, but nurses from hospital sites in Brussels and Wallonia reported significantly more frequently healthcare assistants than nurses from hospital sites in Flanders.

Table 6 – Number of supporting staff, at hospital site and regional level

Number of supporting staff	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Healthcare assistants (all shifts and days)	0.30	0.20 ^{B,W}	0.35 ^F	0.56 ^F	0.00	0.10	0.21	0.43	1.44	
Logistic support assistants (all shifts and days)	0.46	0.46	0.46	0.48	0.00	0.26	0.42	0.69	1.24	
Healthcare assistants (day shifts on weekdays)	0.40	0.29 ^B	0.49	0.62 ^F	0.00	0.12	0.38	0.59	2.11	
Logistic support assistants (day shifts on weekdays)	0.69	0.67	0.71	0.71	0.00	0.39	0.67	0.97	2.36	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts

^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia

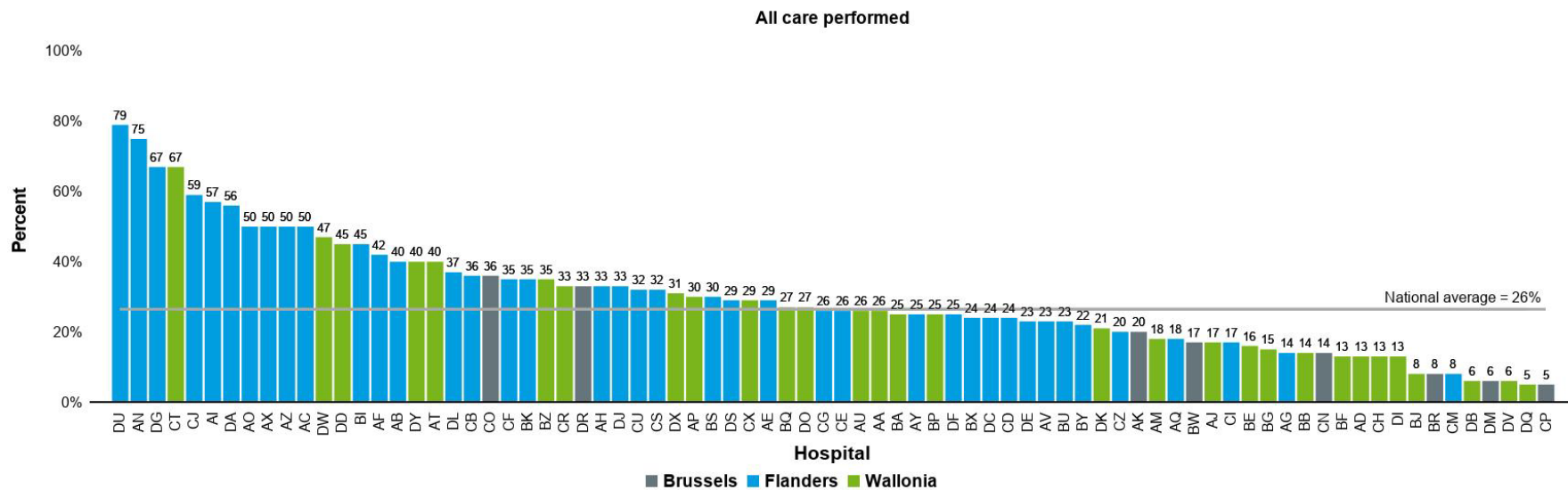


2.5.4 Nursing activities

2.5.4.1 Care left undone

The average percentage of nurses across hospital sites who indicated that they could perform all care that was required during their last shift was 26% (ranging from 79% to 5%) (see Figure 22).

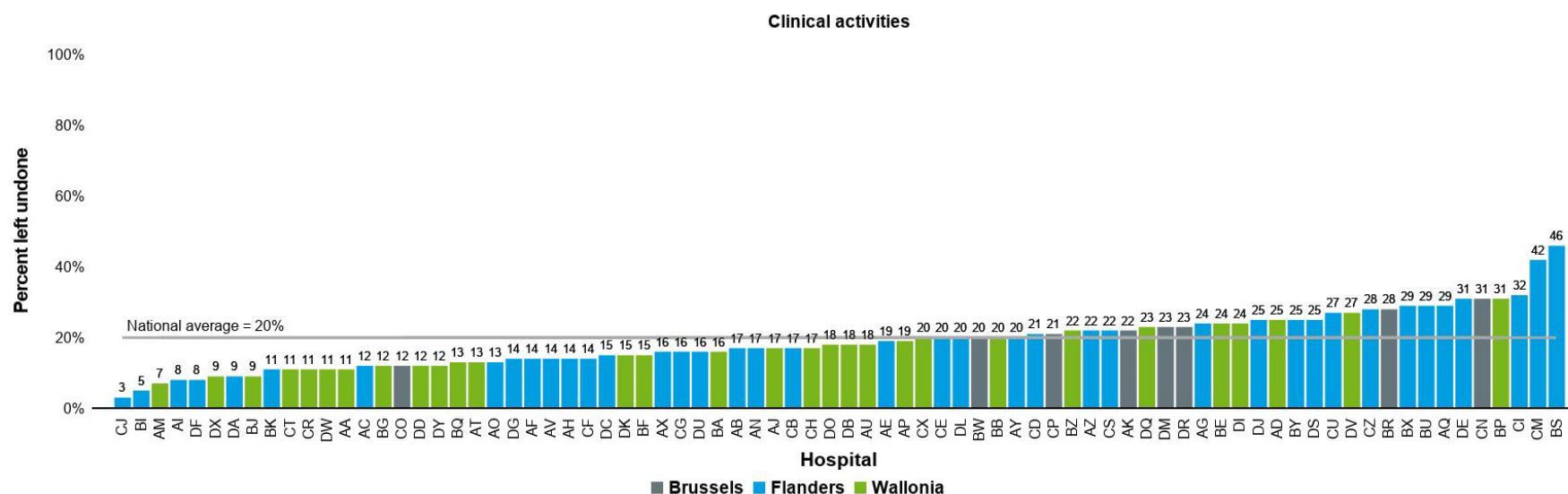
Figure 22 – Percentage of nurses who reported they could perform all care as needed during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving clinical activities left undone during their last shift was 20% (3% to 46%) (Figure 23).

Figure 23 – Percentage of who reported leaving clinical care activities left undone, at hospital site and regional level



In Table 7, we observe that only 26.5% of nurses reported having performed all care during their last shift. There are important variations between hospitals sites (Min:4.8%; P25:17.4%; P50:24.2%; P75:32.8%; Max:78.9%) and between regions. Indeed the proportion of nurses who reported having performed all care during the last shift is significantly higher in Flanders (30.7%) than in Wallonia (22.8%) and Brussels (18.9%).

The most frequently reported care left undone are (see also Figure 44 to Figure 52 in Appendix 1.2): frequent changing of patient position (35.1%), administration of medications on time (29.1%) and oral hygiene (28.6%). Skin care, pain management, treatments and procedures, hand hygiene and aspiration of airways are reported more frequently as left undone in Flanders than in Wallonia. On average 1.8 out of 9 clinical care activities (or 20.0%) are reported as left undone.


Table 7 – Percentage of nurses who reported care left undone in document and clinical care during the last shift, at hospital site and regional

Care left undone (Percentage)	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
All care performed^e (the higher – the better)	26.5%	30.7% ^{B,W}	22.8% ^F	18.9% ^F	4.8%	17.4%	24.2%	32.8%	78.9%	
Dimension clinical care undone (the lower – the better)	20.0%	21.5%	17.4%	20.9%	3.3%	15.4%	20.0%	24.5%	45.6%	
Adequate patient surveillance	24.5%	25.2%	23.3%	24.7%	0.0%	19.2%	23.3%	30.3%	65.8%	
Skin care	17.8%	21.2% ^W	12.4% ^F	18.2%	0.0%	9.1%	17.4%	23.8%	58.3%	
Oral hygiene	28.6%	27.3%	29.9%	30.5%	0.0%	21.1%	28.4%	36.1%	64.7%	
Pain management	12.6%	15.7% ^W	8.4% ^F	10.9%	0.0%	7.6%	11.9%	18.4%	50.0%	
Treatments and procedures	10.2%	14.0% ^W	4.8% ^F	9.1%	0.0%	5.1%	10.0%	15.7%	50.0%	
Administer medications on time	29.1%	29.8%	25.6%	35.6%	0.0%	21.1%	30.6%	35.2%	60.5%	
Frequent changing of patient position	35.1%	31.7%	38.4%	40.4%	0.0%	30.0%	35.0%	41.7%	75.0%	
Hand hygiene	12.6%	15.2% ^W	9.0% ^F	11.3%	0.0%	7.8%	10.5%	17.5%	50.0%	
Aspiration of airways	9.7%	13.1% ^{B,W}	5.2% ^F	7.3% ^F	0.0%	4.9%	8.3%	14.3%	40.0%	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts

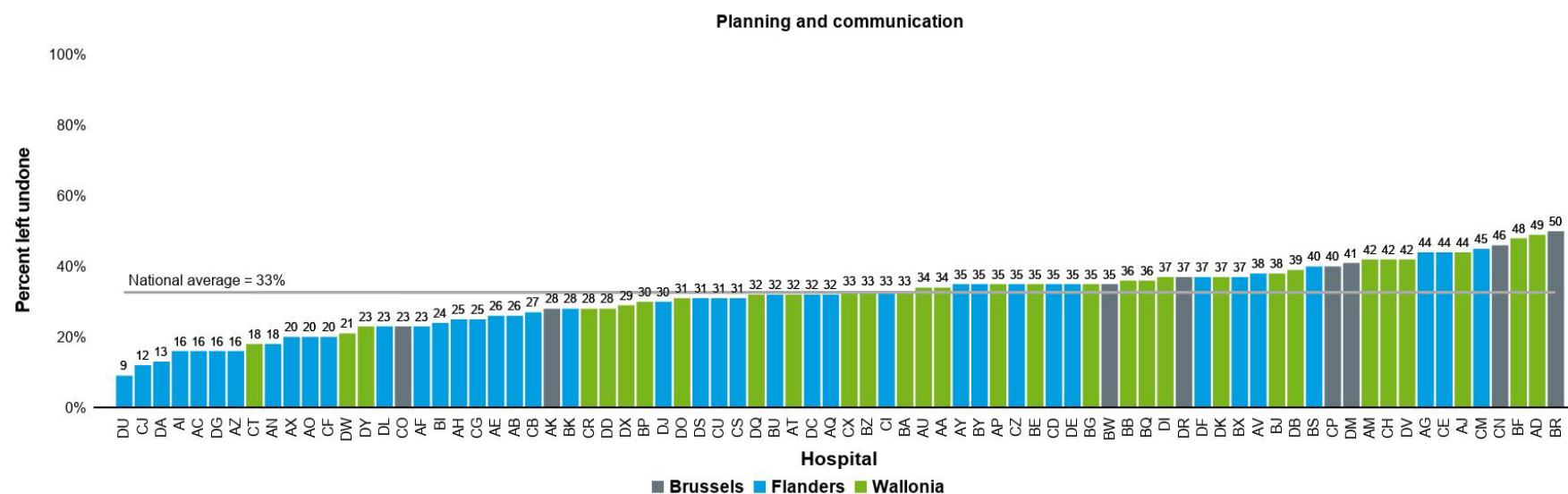
^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia

^e Single question asking if nurses could perform all necessary care during their last shift



On average, nurses reported leaving 33% (9% to 50%) of the 5 planning and communication tasks left undone during their last shift (Figure 24).

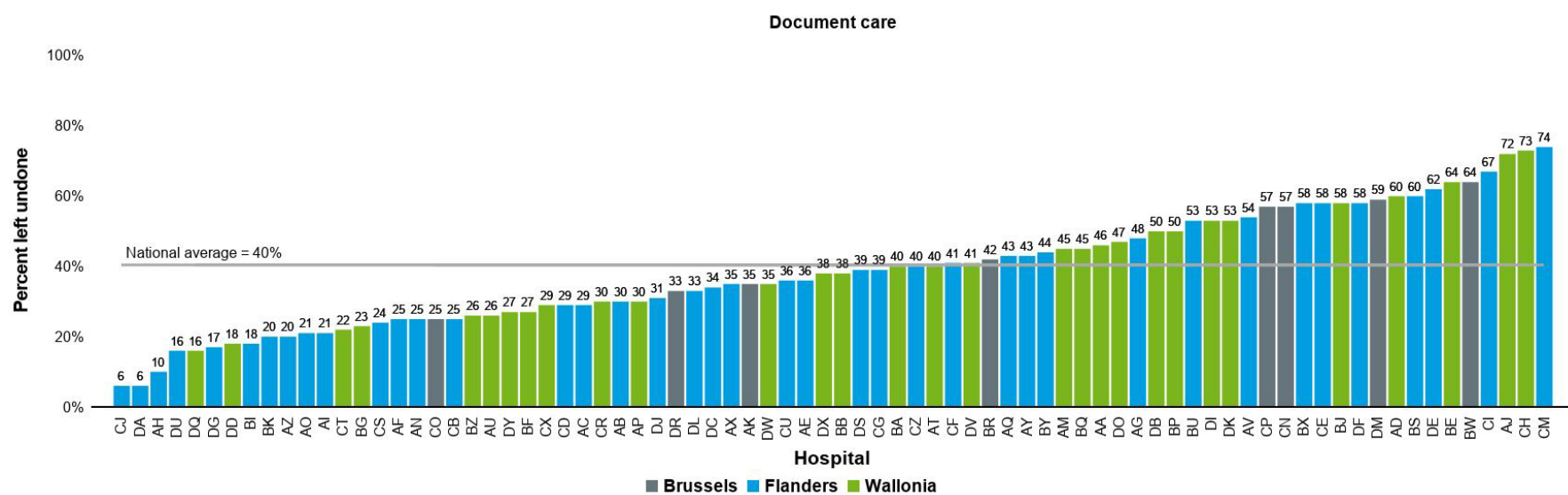
Figure 24 – Percentage of planning and communication activities left undone, at hospital site and regional level





The survey item about documenting care left undone is not part of the dimension of clinical care nor planning and communication. The average percentage of nurses who reported leaving documenting care undone during their last shift due to lack of time is 40% (6% to 74%) (Figure 25).

Figure 25 – Percentage of nurses who reported leaving documenting care undone during the last shift, at hospital and regional level





From Table 8 it can be observed that about one third of the nurses reported care left undone in planning and communication during the last shift (32.7%) and that the phenomena is more frequent in Wallonia (36.0%) than in Flanders (30.3%). Moreover, it can be observed that the emotional support of patients and family (49.2%), the multidisciplinary consultation meetings (38.8%) and the development or update of care plans or pathways (37.2%) are the most frequently reported care left undone activities at a national level and in all regions (see also Figure 53 to Figure 57 in Appendix 1.3). On average 1.6 out of 5 planning and communication activities are reported as left undone.

Table 8 – Percentage of nurses who reported care left undone in planning and communication during the last shift, at hospital site and regional

Care left undone (Percentage)	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Document care undone	40.4%	37.7%	41.9%	48.0%	5.9%	28.6%	39.8%	52.5%	73.7%	
Dimension planning and communication undone (the lower the better)	32.7%	30.3% ^W	36.0% ^F	33.7%	9.5%	28.1%	33.4%	36.2%	50.0%	
Emotional support patients and family	49.2%	46.0%	51.8%	55.6%	14.3%	40.0%	50.0%	58.3%	83.3%	
Prepare for discharge from ICU	17.7%	18.1%	17.0%	18.2%	0.0%	12.5%	16.7%	23.8%	42.9%	
Develop or update care plans or pathways	37.2%	33.8% ^W	42.7% ^F	37.1%	5.9%	30.0%	38.1%	45.0%	73.7%	
Planning care	20.4%	21.6%	19.7%	17.1%	0.0%	14.3%	18.4%	23.7%	60.0%	
Multidisciplinary consultation meetings	38.8%	32.0% ^W	48.6% ^F	40.7%	0.0%	31.6%	37.5%	46.1%	81.8%	

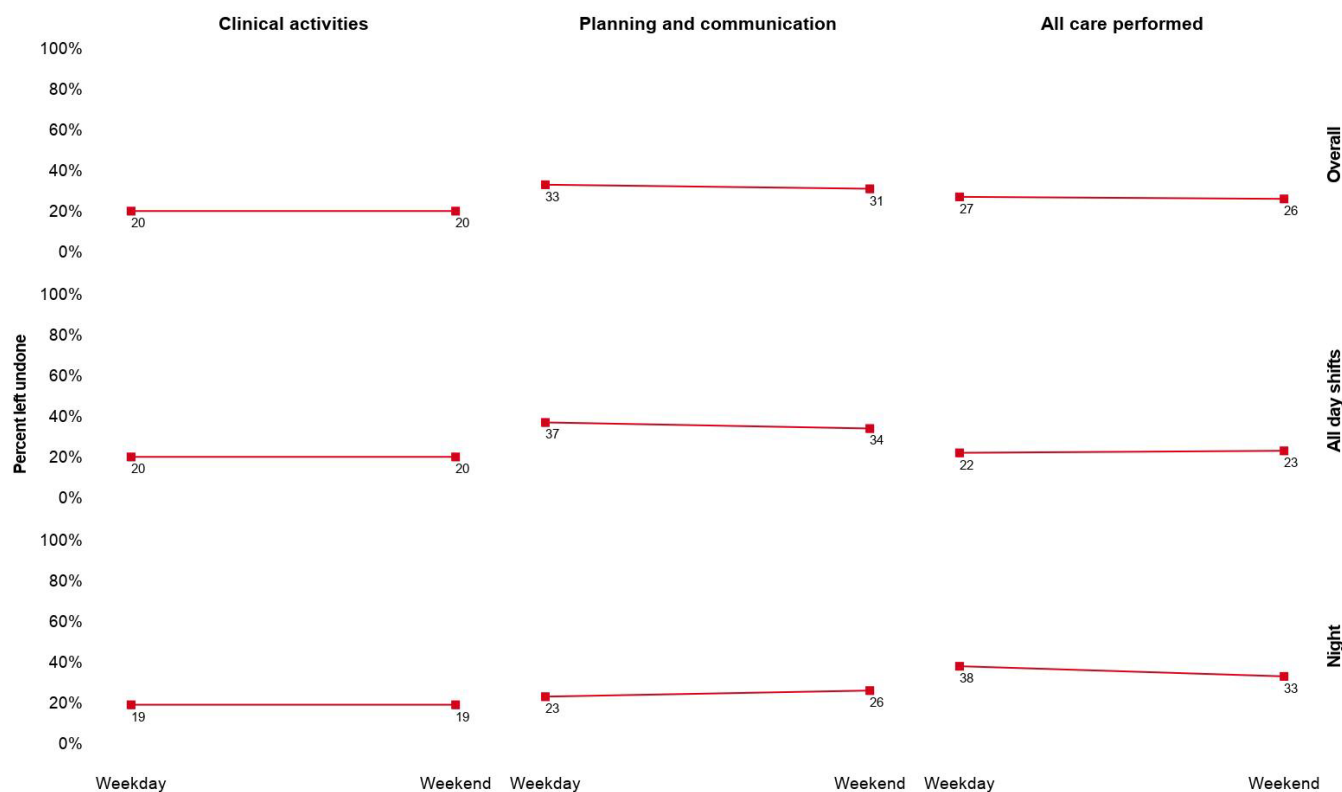
Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts

^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia



Figure 26 displays the percentage of care activities left undone for weekdays versus weekend, by type of shift. There are only minor differences between night, morning and afternoon/evening shifts. For day shifts, care left undone is reported differently (lower for clinical and higher for planning & communication activities). On average 1.8 care tasks out of 9 were not performed and for planning and communication, on average 1.6 planning & communication tasks out of 5 were not performed.

Figure 26 – Care left undone during weekday versus weekend, by shift





2.5.4.2 Tasks below nurses' skill level

Figure 27 displays the average number of tasks below nurses' skill level for weekdays versus weekend, by type of shift. Overall, the number of tasks below nurses' skill level is lower in the weekend versus weekday and the observation is the same in all day and night shifts.

Figure 27 – Tasks below skill level during weekday versus weekend





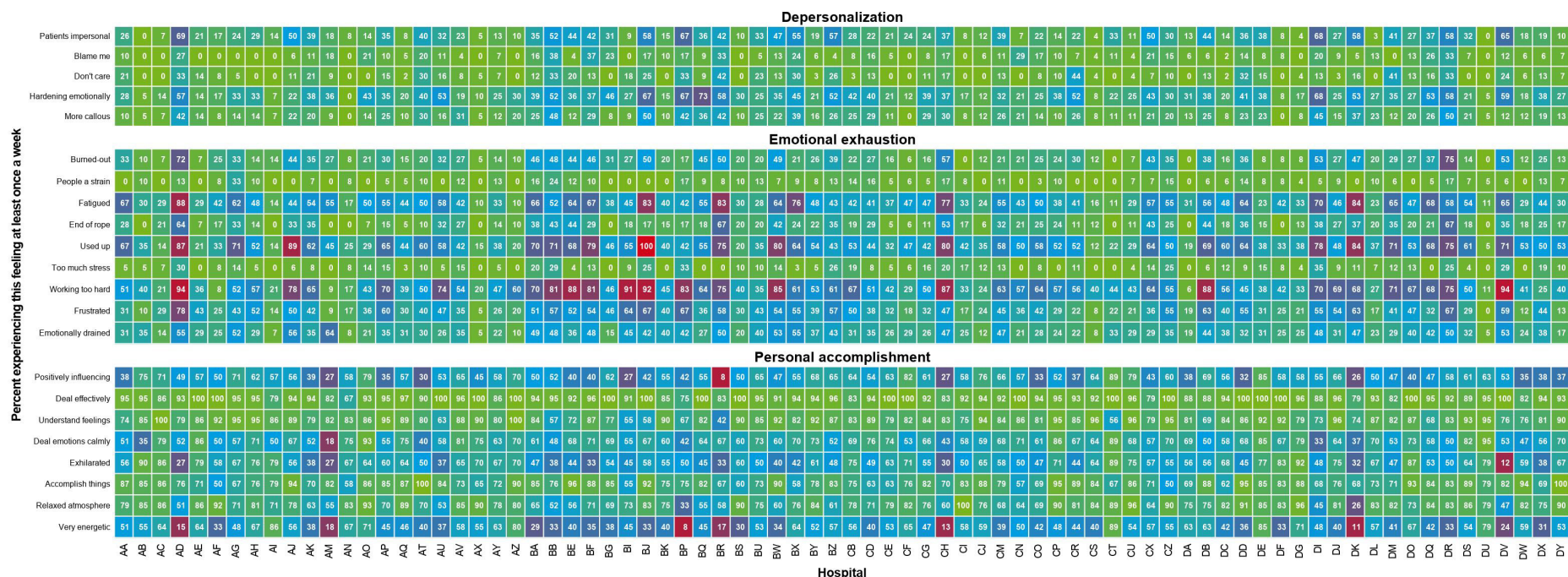
In Table 9 an overview is given of ‘tasks below skill level’. Figure 58 to Figure 64 in Appendix 1.4 also display the findings for the seven items measuring tasks below nurses’ skill level. The most frequent tasks below nurses’ skill level reported are: performing clerical duties (100%) ordering or storing medication discharge (89.4%) and cleaning (81%).

Table 9 – Percentage of nurses who reported “Sometimes / often” for tasks below skill level during the last shift, at hospital site and regional level

Non-nursing tasks sometimes/often performed (Percent) the lower the better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Delivering and retrieving food trays	63.1%	61.9%	65.6%	61.5%	12.5%	56.3%	65.0%	70.0%	91.7%	
Transport of blood samples	56.3%	56.1%	62.8% ^B	39.3% ^W	7.9%	41.7%	56.7%	73.3%	100.0%	
Transporting of patients	36.5%	40.5%	32.1%	31.6%	6.3%	25.0%	36.6%	50.0%	83.3%	
Clean patient rooms and equipment	80.9%	92.8% ^{B,W}	63.6% ^{F,B}	78.2% ^{F,W}	8.0%	70.6%	88.2%	95.2%	100.0%	
Ordering and/or storing medication	89.4%	94.5% ^{B,W}	82.9% ^F	85.8% ^F	53.8%	82.4%	92.1%	97.9%	100.0%	
Obtain supplies or equipment	69.9%	60.2% ^{B,W}	80.1% ^F	83.3% ^F	7.7%	59.2%	70.0%	83.3%	100.0%	
Clerical duties	99.6%	99.7%	99.5%	99.6%	90.9%	100.0%	100.0%	100.0%	100.0%	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts
^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia

Figure 28 – Percentage of nurses indicating they experience feelings about depersonalisation, emotional exhaustion and personal accomplishment at least once a week, several days a week or every day, at hospital site level





2.5.5 Nurse wellbeing

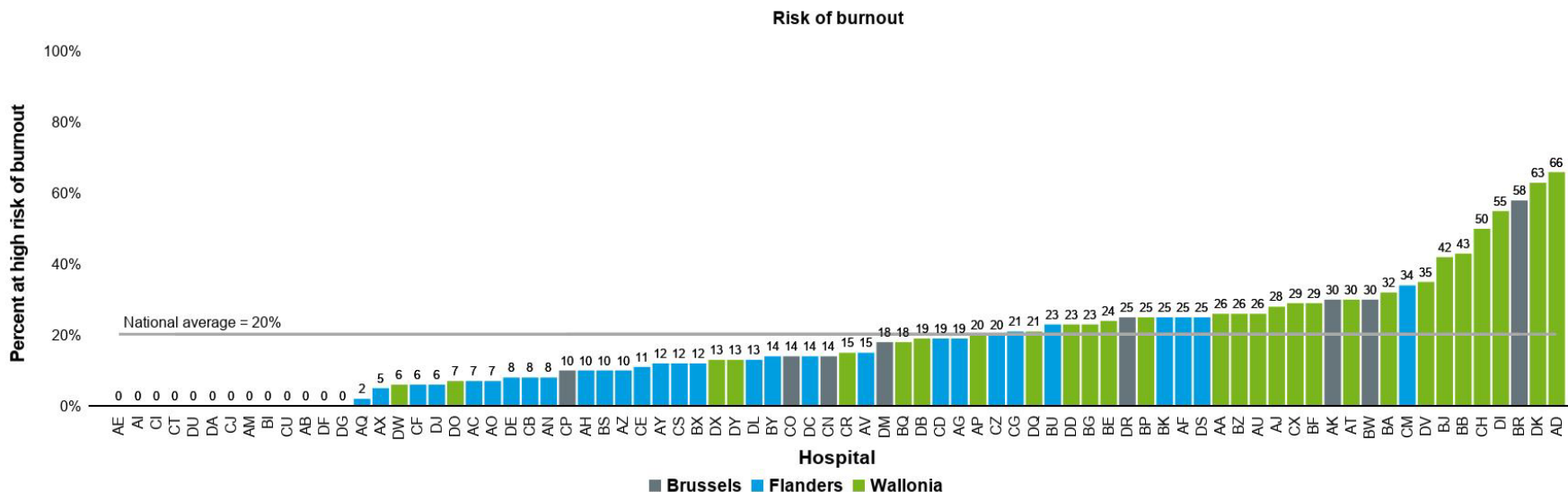
Risk of burnout

Figure 28 displays the percentage of nurses indicating that they experience feelings about depersonalisation, emotional exhaustion and personal accomplishment at least once a week, several days a week or every day. For depersonalisation and emotional exhaustion, the lower the score, the better. For personal accomplishment, the higher the score, the better. Hospital sites are on the x-axis and are sorted on their pseudonymized code. A heatmap is used to express percentages between a range of colours that moves from green (high percentage) over blue (medium percentage) to red (low percentage).

Using a validated scoring algorithm, dimensional scores are calculated and expressed as high risk of burnout or not (Figure 29 to Figure 32). Here, the items related to personal accomplishment transform into a dimension expressed as reduced personal accomplishment. Thus, for all three dimensions, the lower the score, the better. In addition, a single risk of burnout score is calculated by combining high emotional exhaustion, high depersonalisation and low personal accomplishment.

In Figure 29, it can be observed that a high composite risk of burnout is prevalent among 20% of the ICU nurses (varying from 0% to 66% across hospital sites).

Figure 29 – Percentage of nurses at high risk of burnout, at hospital site and regional level

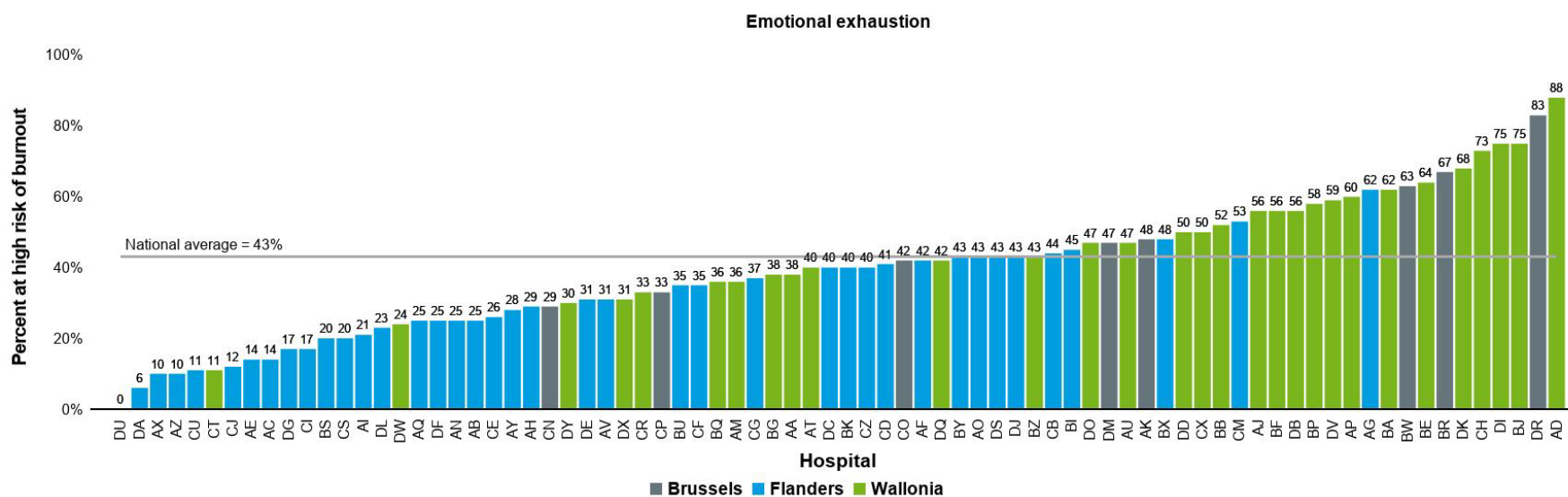


Legend: this is a composite measure on risk of burnout (high risks on emotional exhaustion & depersonalisation & reduced personal accomplishment)



The average percentage of nurses at high risk of emotional exhaustion is 43% (0% to 88%) (Figure 30).

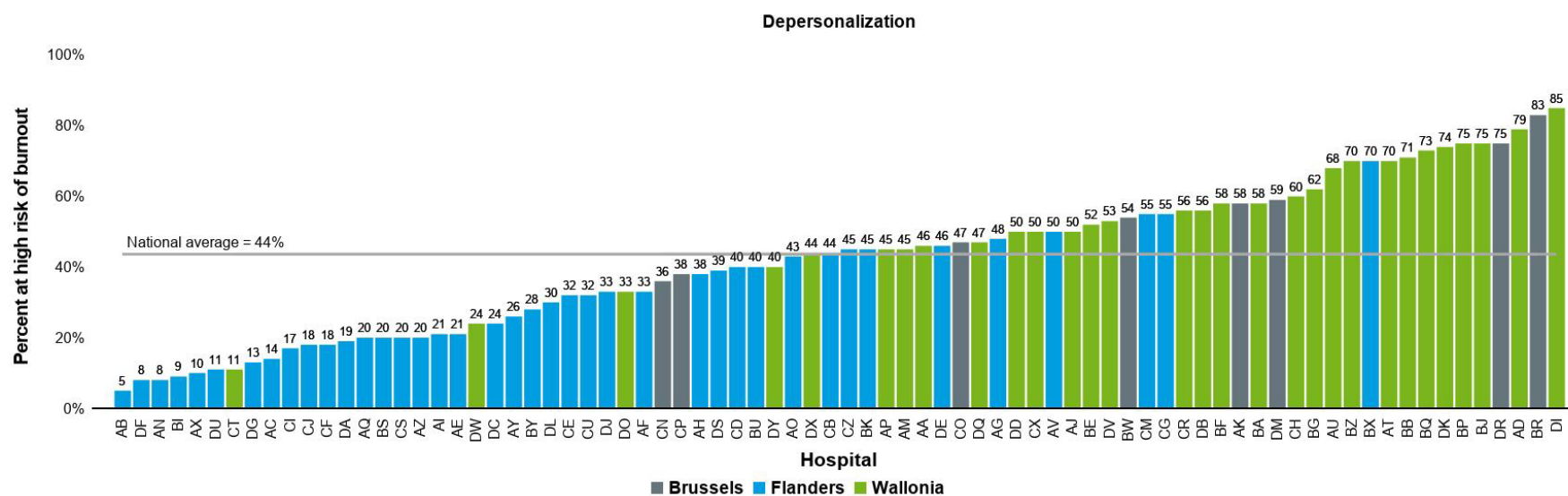
Figure 30 – Percentage of nurses at high risk of emotional exhaustion, at hospital site and regional level





The average percentage of nurses at high risk of depersonalisation is 44% (5% to 85%) (Figure 31).

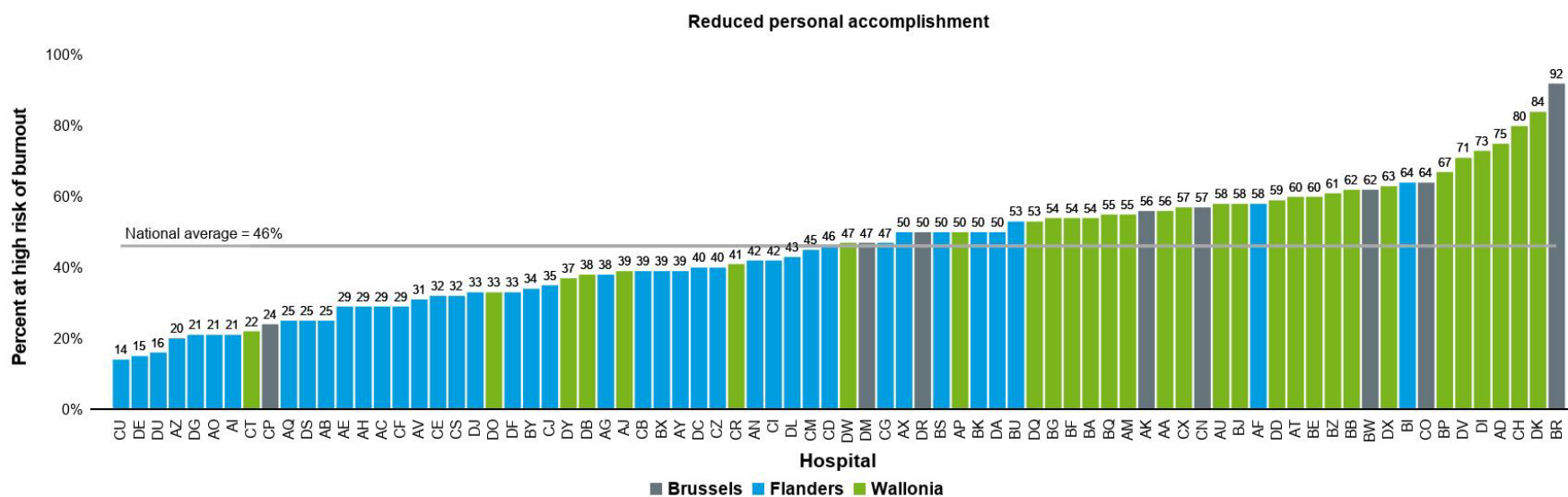
Figure 31 – Percentage of nurses at high risk of depersonalisation, at hospital site and regional level





The average percentage of nurses at high risk of reduced personal accomplishment is 46% (14% to 92%) (Figure 32).

Figure 32 – Percentage of nurses at high risk of reduced personal accomplishment, at hospital site and regional level





From Table 10 it can be observed that the risk of burnout among ICU nurses is high with considerable variation across hospital sites: 43.1% high emotional exhaustion (P25: 30.8% - P75: 55.8%) ; 43.7% high depersonalisation (P25: 27.9% - P75: 57.7%); 46.1% high reduced personal accomplishment (P25: 34.3% - P75: 56.4%). Moreover, it can be observed that all three dimensions have a significant lower score in Flanders compared to Wallonia and Brussels: 33.1% high emotional

exhaustion compared to 52.4% in Brussels and 55.3% in Wallonia; 31.5% high depersonalisation compared to 54.5% in Brussels and 58.5% in Wallonia; 36% high reduced personal accomplishment compared to 57.5% in Brussels and 57.7% in Wallonia. The average percentage on the combined score is 11.6% in Flanders compared to 25.8% in Brussels and 31.6% in Wallonia.

Table 10 – Percentage of nurses at risk of burnout, at hospital site and regional level

Risk of burnout (Percent) the lower the better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
At high risk of emotional exhaustion	43.1%	33.1% ^{B,W}	55.3% ^F	52.4% ^F	0.0%	30.8%	42.9%	55.8%	88.1%	
At high risk of depersonalisation	43.7%	31.5% ^{B,W}	58.5% ^F	54.5% ^F	5.0%	27.9%	45.0%	57.7%	85.0%	
At high risk of reduced personal accomplishment	46.1%	36.0% ^{B,W}	57.7% ^F	57.5% ^F	14.3%	34.3%	46.0%	56.4%	91.7%	
At risk of burnout (high risk in 3 subscales)	20.2%	11.6% ^{B,W}	31.6% ^F	25.8% ^F	0.0%	10.0%	17.6%	28.8%	65.7%	

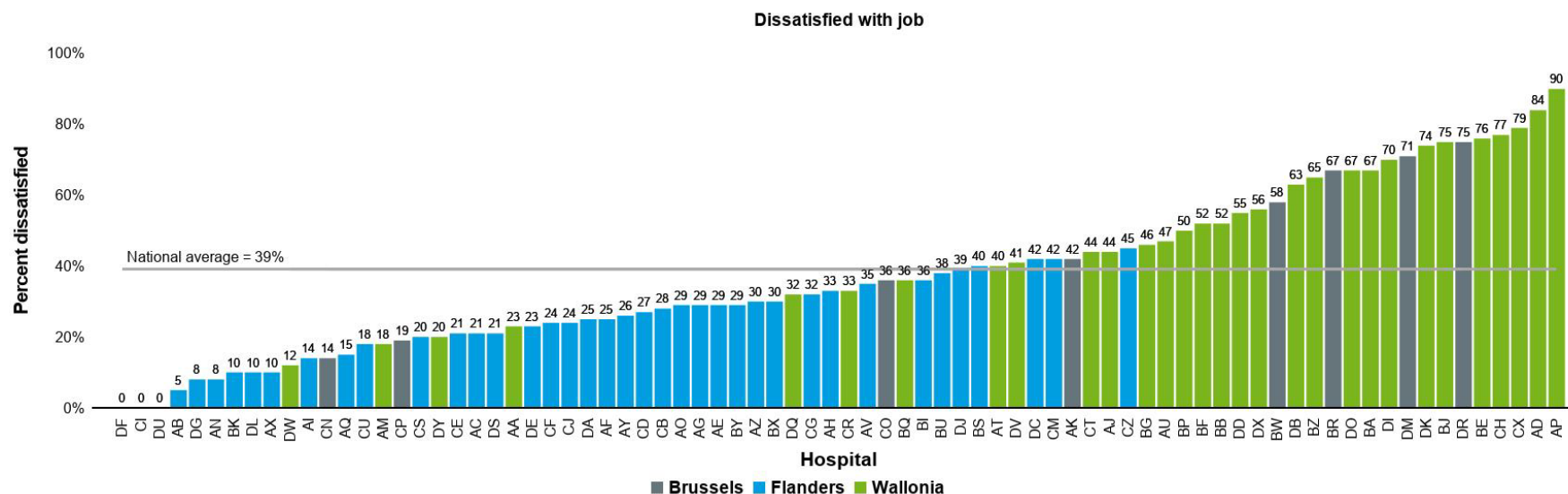
Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts
^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia



Job dissatisfaction

The average percentage of nurses dissatisfied with their job is 39% (0% to 90%) (Figure 33).

Figure 33 – Percentage of nurses dissatisfied with their job, at hospital site and regional level

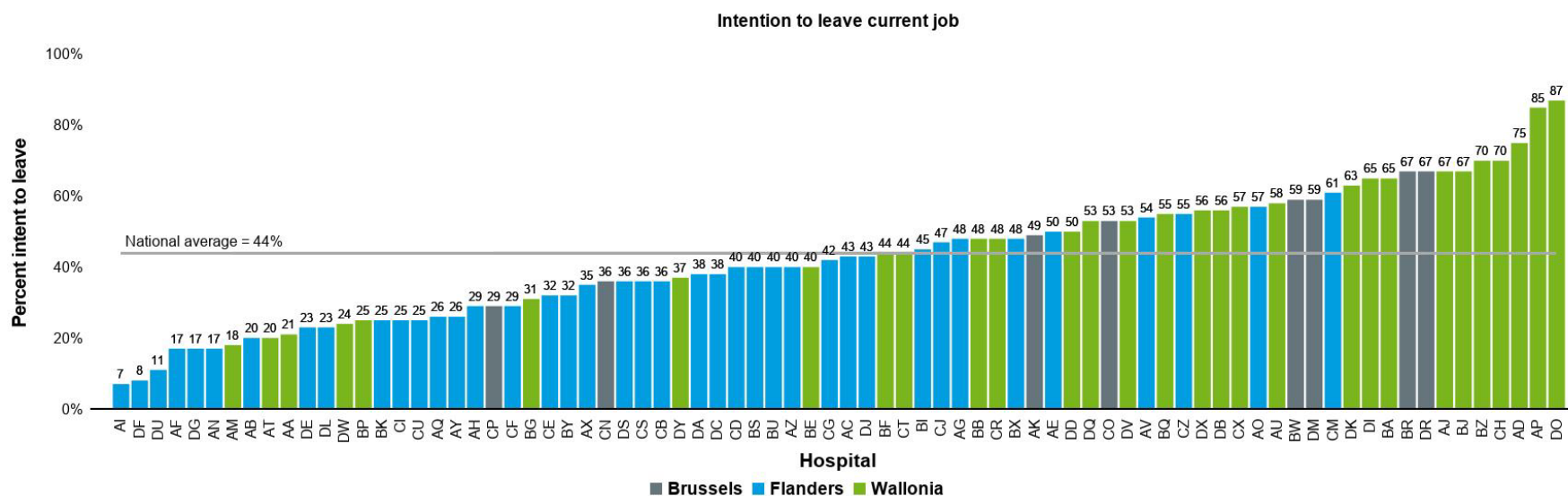




Intention to leave

The average percentage of nurses reporting an intention to leave the hospital in the next year is 44% (7% to 87%) (Figure 34). The lower the score, the better.

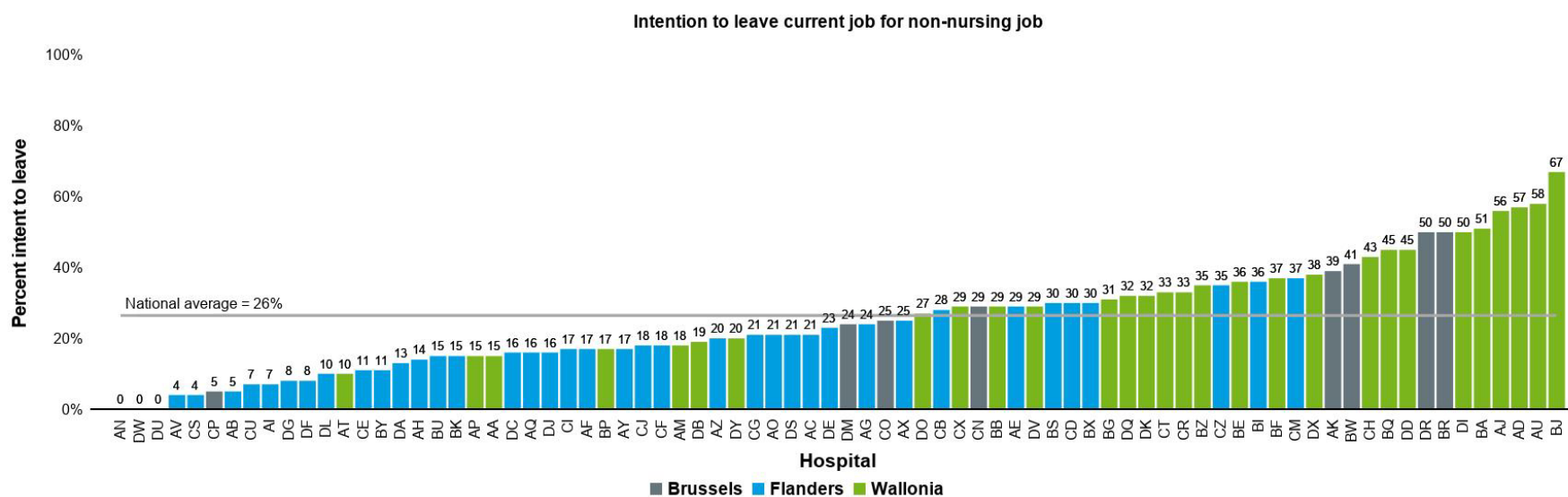
Figure 34 – Percentage of nurses indicating they intend to leave the hospital in the next year, at hospital site and regional level





The average percentage of nurses considering to leave the nursing profession is 26% (0% to 67%) (Figure 35).

Figure 35 – Percentage of nurses indicating they intend to leave the hospital in the next year for a non-nursing job, at hospital and regional level



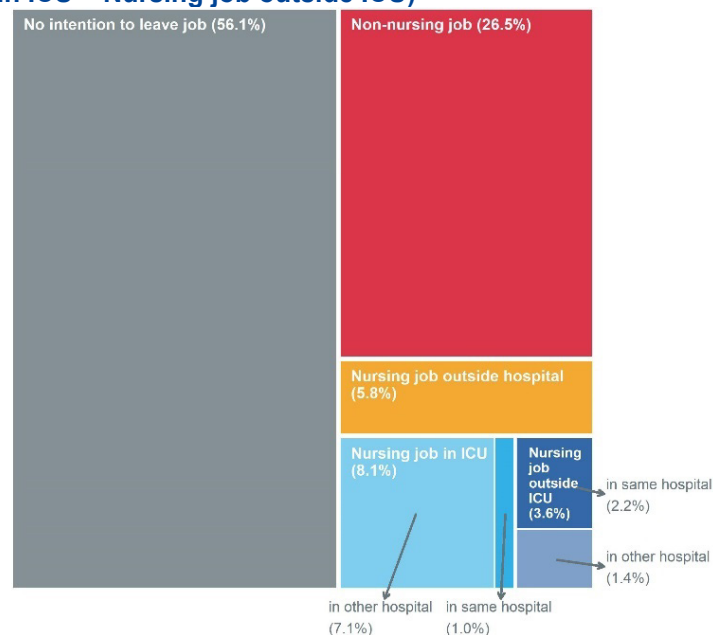


Overall results Intention to leave and job dissatisfaction

Similar as for burnout it can be observed that also for intention-to-leave the job and job dissatisfaction the percentages are high, vary considerable across hospital sites and are worse in Wallonia and Brussels compared to Flanders.

Indeed, 43.9% of the nurses have an intention to leave the job: 26.5% for a non-nursing job; 5.8% for a nursing job outside the hospital setting; 8.1% for an ICU job in another unit or hospital; 3.6% for a non-ICU job in another or the same hospital (see Figure 36 and Figure 74 and Figure 75 in Appendix 1.6). The average percentage of nurses differ significantly per region: 34.8% in Flanders; 54.8% in Wallonia and 52.7% in Brussels (see Table 11).

Figure 36 – Intention to leave the job: different destinations (non-nursing job – nursing job outside the hospital setting – Nursing job in ICU – Nursing job outside ICU)



From Figure 37 it can be observed that the intention to leave the job is the highest in age groups situated between 30-40 years old.

Nearly 40% of the nurses are dissatisfied with their job. The averages vary considerably across hospital sites (Min:0%; P25:25.0%; P50:34.6%; P75:54.5%; Max: 90%). The average results are significantly worse in hospital sites located in Brussels (47.6%) or Wallonia (56.6%) compared to Flanders (25.9%). Nurses are most dissatisfied with their wages (75.1%), annual leave (56.4%) and advancement opportunities (53.1%) and the least dissatisfied with independence at work (11.2%) and sick leave (26.8%) (Table 11 and Figure 65 to Figure 73 in Appendix 1.5).

Figure 37 – Intention to leave the job by age and sex

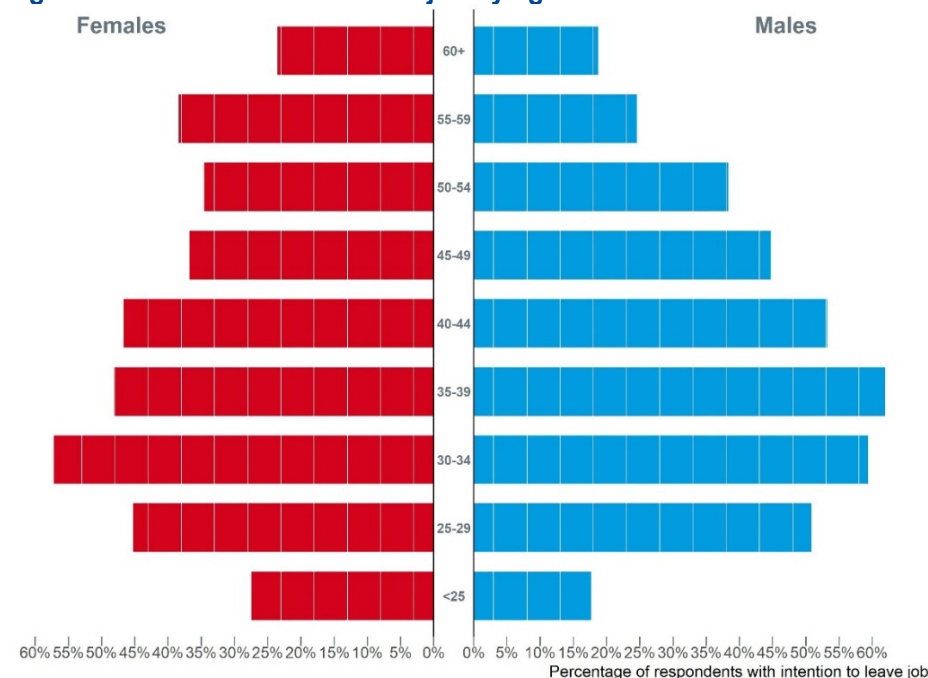




Table 11 – General overview results nurse well-being and job satisfaction

Wellbeing (Percent) the lower the better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Intention to leave job	43.9%	34.9% ^{B,W}	54.8% ^F	52.7% ^F	7.1%	32.1%	42.9%	57.1%	86.7%	
Intention to leave nursing profession	26.5%	17.4% ^{B,W}	37.5% ^F	34.9% ^F	0.0%	15.4%	23.8%	36.8%	66.7%	
Intention to leave ICU, but continue as hospital nurse	3.6%	4.2%	2.7%	3.3%	0.0%	0.0%	3.0%	5.3%	16.0%	
Dissatisfied with job	39.2%	25.9% ^{B,W}	56.6% ^F	47.6% ^F	0.0%	25.0%	34.6%	54.5%	90.0%	
Dissatisfied with advancement opportunity	53.1%	46.8% ^{B,W}	59.4% ^F	62.5% ^F	11.1%	41.4%	55.0%	67.0%	80.0%	
Dissatisfied with schedule flexibility	31.2%	23.9% ^W	42.2% ^F	32.0%	0.0%	18.2%	28.6%	43.6%	66.7%	
Dissatisfied with independence at work	11.2%	10.5%	12.6%	10.5%	0.0%	4.8%	9.5%	17.5%	35.7%	
Dissatisfied with annual leave	56.4%	55.7%	59.6%	50.5%	8.0%	47.4%	56.3%	70.0%	90.0%	
Dissatisfied with educational opportunity	47.5%	38.4% ^{B,W}	59.4% ^F	53.5% ^F	9.1%	31.6%	47.4%	63.3%	85.7%	
Dissatisfied with sick leave	26.8%	22.7% ^W	32.4% ^F	28.7%	4.8%	16.7%	25.0%	34.9%	65.0%	
Dissatisfied with professional status	38.7%	24.0% ^{B,W}	56.0% ^F	53.5% ^F	0.0%	22.5%	34.2%	60.0%	75.0%	
Dissatisfied with study leave	44.0%	34.7% ^{B,W}	56.1% ^F	50.5% ^F	0.0%	28.4%	42.9%	60.0%	90.9%	
Dissatisfied with wages	75.1%	66.1% ^{B,W}	86.3% ^F	82.9% ^F	25.0%	64.2%	77.8%	89.3%	100.0%	

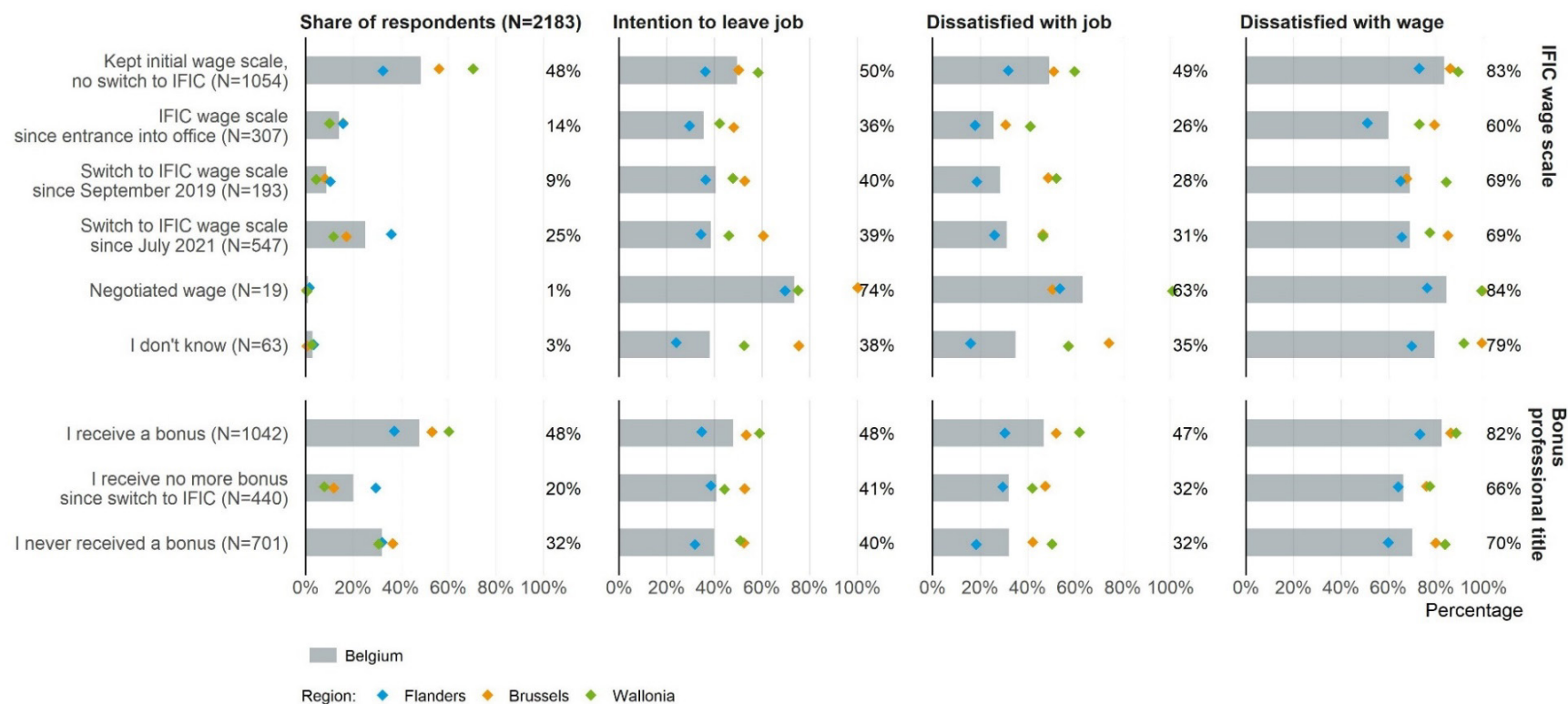
Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts
^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia



IFIC and satisfaction with the job, intention-to-leave and/or salary

In Figure 38 the share of respondents that are dissatisfied with their job or wage and have an intention to leave the job is depicted per salary scheme. It can be observed that the highest share of nurses who are dissatisfied (with job and salary) as well as who have an intention to leave the job is situated in the group of nurses that did not switch to the new IFIC scheme or has a negotiated salary.

Figure 38 – Share of respondents with intention to leave the job –dissatisfaction with job and wage according to salary scheme





2.5.6 Nurses' perceptions of quality of care and reports on adverse events and errors

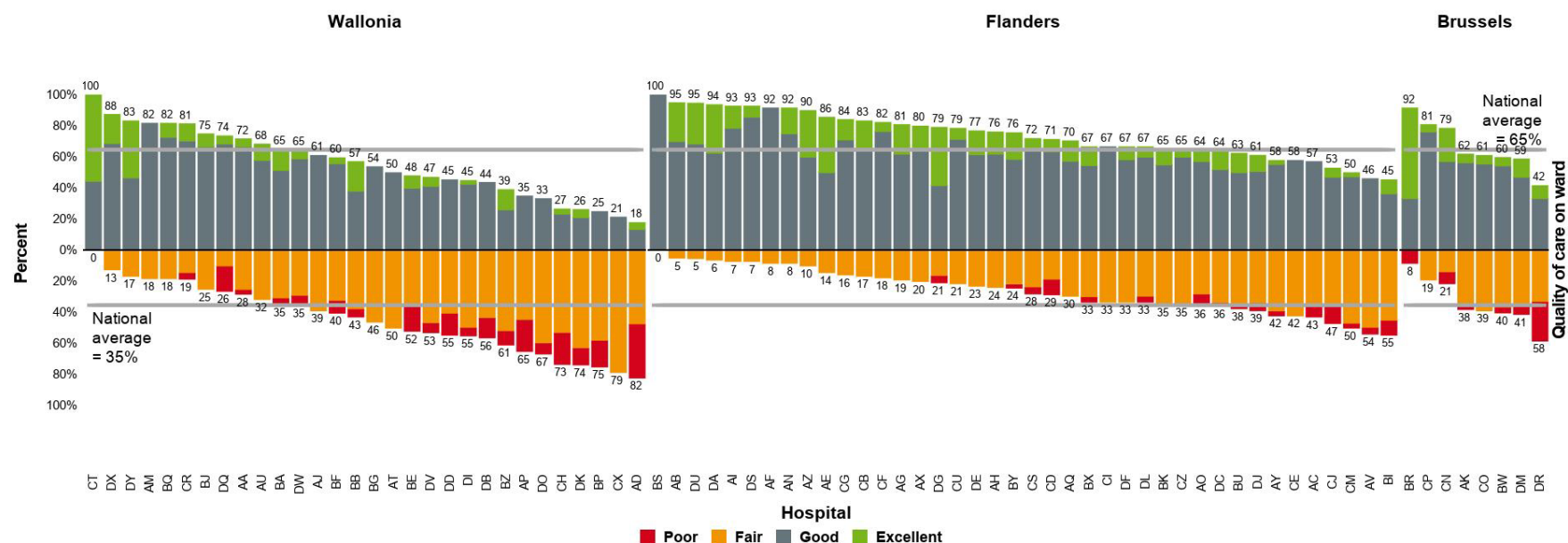
Nurse-perceived quality of care

Figure 39 to Figure 42 display various aspects of nurses' perception of quality of care: perceived quality of care on the nursing unit, a nursing unit safety grade, the evolution in the quality of patient care in the hospital compared to before the COVID-19 pandemic, and nurses' confidence that management acts to resolve problems in patient care.

Details for all response categories are displayed, with negative responses below the x-axis and positive responses above the x-axis. Hospital sites are subdivided by region and ranked from better results (on the left) to worse results (on the right).

The average percentage of nurses reporting good or excellent quality of care on their unit is 65% (18% to 100%). Accordingly, 35% (0% to 82%) of nurses report that quality of care on their unit is poor or fair (Figure 39).

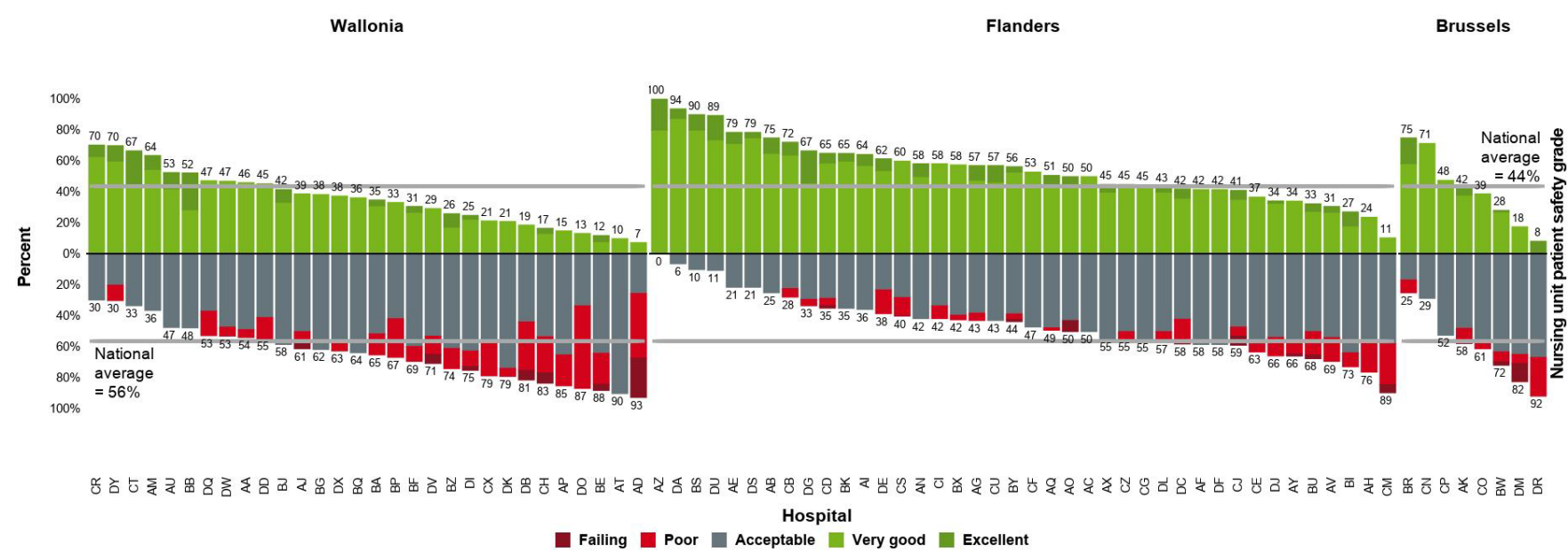
Figure 39 – Nurses' reports on quality of care on their unit, at hospital site and regional level





The average percentage of nurses reporting a very good or excellent nursing unit patient safety grade is 44% (7% to 100%). Accordingly, 56% (0% to 93%) of nurses report a failing, poor or acceptable patient safety grade (Figure 40).

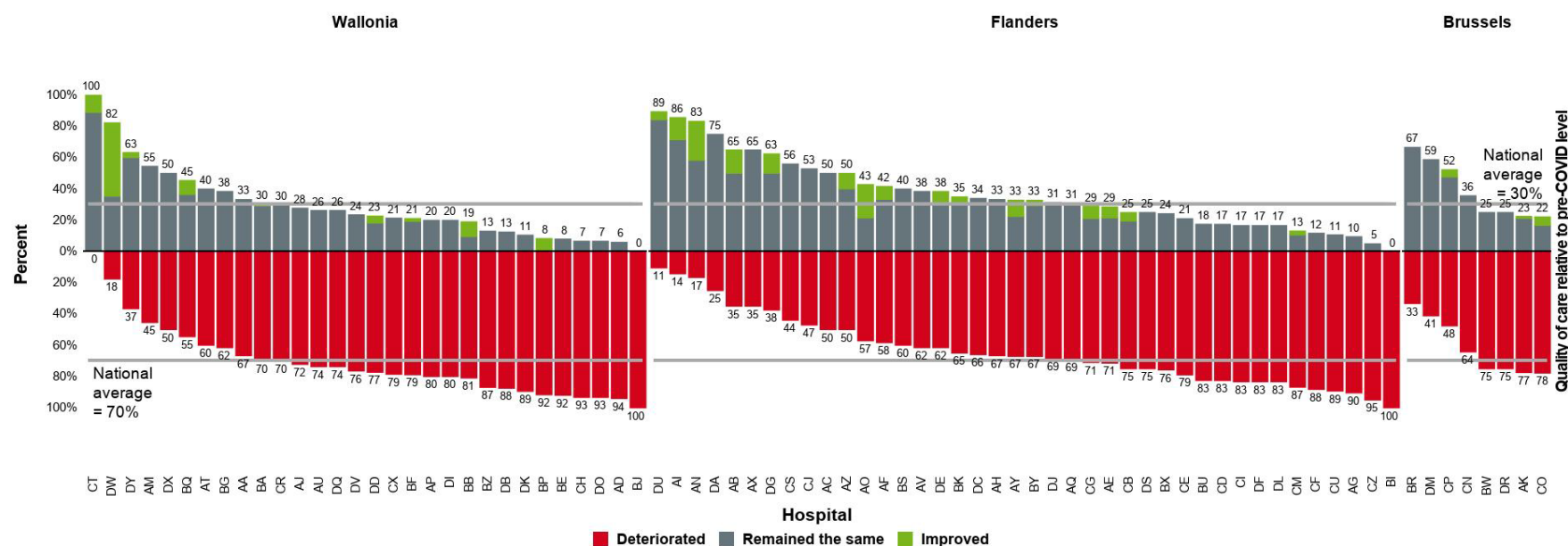
Figure 40 – Nurses’ reports on their nursing unit safety grade, at hospital site and regional level





The average percentage of nurses reporting quality of care in their hospital remained the same or improved compared to the period before the COVID-19 pandemic is 30% (0% to 100%). Accordingly, 70% (0% to 100%) of nurses report that quality of care in their hospital deteriorated compared to pre-COVID levels (Figure 41).

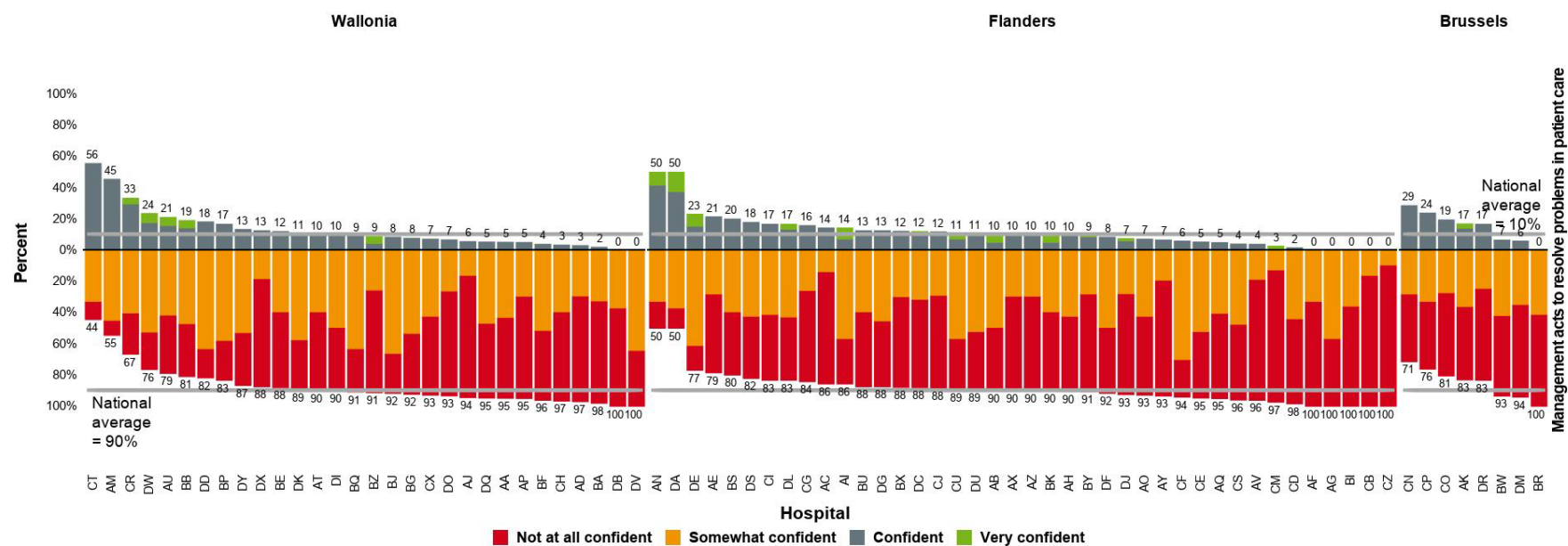
Figure 41 – Nurses' reports on quality of care in their hospital compared to before COVID-19, at hospital site and regional level





The average percentage of nurses reporting to be not at all confident or somewhat confident that management acts to resolve problems in patient care is 90% (44% to 100%). Accordingly, 10% (0% to 56%) of nurses report that they are confident or very confident that management acts to resolve problems in patient care (Figure 42).

Figure 42 – Nurses' reports on their confidence that management acts to resolve problems in patient care, at hospital site and regional level





From Table 12, it appears that 64.5% of the respondents perceived a good or excellent quality of care on unit. The perceptions vary considerably across hospital sites (Min:17.9%; P25:57.9%; P50:65.0%; P75:75.7%; Max: 100%). Nurses from hospital sites located in Flanders reported more frequently a good or excellent quality of care (71.6%) than nurses working in hospital sites located in Wallonia (53.9%). The proportion of nurses who reported very good or excellent safety patient grade is 43.6% and also significantly higher in Flanders (51.3%) than in Wallonia (33.7%).

The perceived confidence in management actions to resolve problems in patient care is very low (10.1%) and more or less the same in all regions (Table 12).

Table 12 – Nurses' perceived quality of care, at hospital site and regional level

Nurse-perceived quality of care (Percentage) the higher the better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Good or excellent quality of care on unit	64.5%	71.6% ^W	53.9% ^F	63.6%	17.9%	57.9%	65.0%	75.7%	100.0%	
Very good or excellent patient safety grade	43.6%	51.3% ^W	33.7% ^F	37.5%	7.5%	30.8%	42.3%	56.4%	100.0%	
Quality of care remained the same or improved	30.2%	32.9%	25.8%	30.5%	0.0%	20.0%	28.6%	33.3%	100.0%	
Confident or very confident in management actions	10.1%	9.6%	9.6%	13.5%	0.0%	4.0%	8.7%	12.5%	55.6%	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts
^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia

Nurses' reports on adverse events, errors and incidents

Nurses were asked to report on the frequency of twelve adverse events, errors and incidents in which they or their patients were involved during the past year: wrong medication, time or dose; pressure ulcers after admission; patient falls with injury; urinary tract infections; bloodstream infections; pneumonia; work related physical injuries; complaints from patients/family; verbal abuse by patients/family; physical abuse by patients/family; verbal abuse by staff; physical abuse by staff.

From Table 13, we observe that pneumonia (35.0%), verbal abuse by patients/family (31.1%) and pressure ulcers after admission (26.5%) are the most reported adverse events (see also Figure 76 to Figure 87 in Appendix 1.7). This is the same top three of adverse events in all regions. The "patient falls with injury" adverse event is significantly higher in Flanders (2.5%) than in Brussels (0.4%) and the "work related physical injuries" adverse event is significantly higher in Wallonia (17.8%) and Brussels (15.8%) than in Flanders (8.8%).



Table 13 – Percentage of nurses reporting adverse events and incidents at least once a month at least once a month during the past year, at hospital site and regional level

Adverse events and incidents at least once a month (Percentage) the lower the better	Average over participating hospital sites				Distribution score hospital sites					Boxplot (hospital sites)
	National	Flanders	Wallonia	Brussels	Min	P25	P50	P75	Max	
Wrong medication, time or dose	19.1%	18.1%	20.3%	20.0%	0.0%	11.5%	18.4%	23.1%	63.6%	
Pressure ulcers after admission	26.5%	28.3%	22.4%	30.2%	0.0%	13.1%	22.4%	33.3%	80.0%	
Patient falls with injury	1.8%	2.5% ^B	1.3%	0.4% ^F	0.0%	0.0%	0.0%	3.2%	11.8%	
Urinary tract infections	16.7%	16.3%	17.8%	15.3%	0.0%	9.1%	15.4%	23.3%	42.9%	
Bloodstream infections	19.5%	20.9%	16.9%	20.7%	0.0%	9.1%	19.4%	27.5%	55.0%	
Pneumonia	35.0%	36.8%	32.9%	33.1%	4.8%	21.1%	37.9%	42.9%	71.4%	
Complaints from patients/family	19.5%	19.5%	17.3%	25.5%	0.0%	13.0%	18.6%	23.8%	47.1%	
Verbal abuse by patients/family	31.1%	32.6%	28.6%	31.3%	0.0%	20.0%	30.0%	38.9%	75.8%	
Verbal abuse by staff	7.4%	8.1%	6.4%	7.3%	0.0%	3.6%	7.5%	10.5%	28.6%	
Physical abuse by patients/family	7.3%	7.6%	7.5%	5.5%	0.0%	3.7%	7.1%	10.5%	23.8%	
Physical abuse by staff	0.5%	0.3%	0.8%	0.4%	0.0%	0.0%	0.0%	0.0%	10.0%	
Work related physical injuries	12.7%	8.8% ^{B,W}	17.8% ^F	15.3% ^F	0.0%	7.7%	11.1%	17.6%	43.3%	

Note: significant differences at $p=0.05$ (Tukey's pairwise comparison) between regional averages are indicated by superscripts

^B = differs from Brussels, ^F = differs from Flanders, ^W = differs from Wallonia



2.6 Association between nurse working environment and nurse wellbeing – nurse-perceived quality of care and missed care

Table 14 and Table 15 present findings from the multiple logistic regression analysis to estimate the association between measures reflecting nurse working environment and patient-to nurse ratio on the one hand and nurse wellbeing (risk of burnout in Table 14 and other wellbeing in Table 15) on the other hand.

In addition, Table 18 in Appendix 1.8 presents a descriptive overview of the difference in performance between hospital sites in the best and worst performing 25% with respect to the overall score on nurse working environment.

High risk of burnout

As an example to interpret the findings, for high risk of burnout (combined measure) (Table 14), the first column presents the model coefficients (Coef.) and the second column presents the standard error and an indication of the significance level (p-value) which should be interpreted alongside the coefficient. Compared to nurses working in hospitals in quartile 1 of the NWI (lowest/worst score), nurses working in hospital sites

in quartile 4 (highest/best score) have a statistically significantly lower log-odds (Coef. = -1.41; standard error 0.42; significance level *** implying a p-value < 0.001) of high risk of burnout (combined measure, but also in all three subdimensions), holding all other covariates in the model constant. In addition for high risk of emotional exhaustion and the combined measure (borderline) this association with work environment is also significantly lower for hospitals in quartile 3. Compared to hospital sites with a patient-to-nurse ratio in quartile 1 (lowest/best score), hospital sites in quartile 4 have a statistically significantly higher risk of emotional exhaustion and depersonalisation.

The region also plays a role in the risk of burnout. Indeed, nurses who are working in hospitals situated in Wallonia or Brussels report significantly higher risks of burnout (combined measure), as well as on each subscale compared to the nurses who are working in hospitals sites in Flanders. It also appears that males have a higher risk of depersonalisation compared to female nurses (Coef. = 0.52, p-value < 0.001) and that older nurses (≥55 years) have significantly lower risk of depersonalisation compared to younger nurses. In contrast, older nurses (55-59 years) have a significantly higher risk of reduced personal accomplishment. For nurses 60 years and older, a significantly lower risk of burnout (combined measure) could be observed compared to nurses up to 54 years old.

Table 14 – Association between nurse working environment and burnout

Sample N = 2 183	At high risk of burnout (combined measure)		At high risk of emotional exhaustion		At high risk of depersonalisation		At high risk of reduced personal accomplishment	
	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]
Region								
Flanders [REF]	.	.	.	.	.	.	.	.
Brussels	0.80	(0.24)***	0.56	(0.16)***	0.93	(0.18)***	0.83	(0.19)***
Wallonia	0.97	(0.20)***	0.69	(0.14)***	0.98	(0.16)***	0.89	(0.12)***
Hospital type								
General hospital [REF]	.	.	.	.	.	.	.	.



Sample N = 2 183	At high risk of burnout (combined measure)		At high risk of emotional exhaustion		At high risk of depersonalisation		At high risk of reduced personal accomplishment	
	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]
University hospital	0.31	(0.26)	0.35	(0.12)**	0.10	(0.18)	-0.11	(0.18)
Hospital-level patient-to-nurse ratio								
Quartile 1 - lowest/best PTN [REF]	.	.	.	.	.	.	.	.
Quartile 2	0.19	(0.22)	0.17	(0.12)	0.30	(0.19)	-0.10	(0.15)
Quartile 3	0.08	(0.24)	-0.10	(0.15)	0.10	(0.19)	-0.19	(0.15)
Quartile 4 - highest/worst PTN	0.45	(0.33)	0.43	(0.20)*	0.40	(0.19)*	-0.22	(0.18)
Nurse Working Environment								
Quartile 1 - lowest/worst score [REF]	.	.	.	.	.	.	.	.
Quartile 2	-0.32	(0.23)	-0.27	(0.17)	-0.07	(0.17)	-0.03	(0.14)
Quartile 3	-0.48	(0.24)*	-0.64	(0.17)***	-0.29	(0.19)	-0.20	(0.15)
Quartile 4 - highest/best score	-1.41	(0.42)***	-1.28	(0.20)***	-0.88	(0.24)***	-0.45	(0.20)*
Education								
No further education [REF]	.	.	.	.	.	.	.	.
Bachelor or postgraduate intensive and emergency care	0.10	(0.14)	0.02	(0.12)	0.13	(0.11)	0.23	(0.11)*
Sex								
Female [REF]	.	.	.	.	.	.	.	.
Male	0.10	(0.14)	-0.19	(0.09)*	0.52	(0.11)***	-0.15	(0.12)
Non-binary	-0.92	(0.86)	-0.38	(0.78)	0.12	(0.55)	-0.87	(0.69)
Age								
under 25 [REF]	.	.	.	.	.	.	.	.
25-29	0.41	(0.23)	0.23	(0.21)	0.26	(0.18)	0.50	(0.17)**
30-34	0.22	(0.24)	0.36	(0.21)	0.08	(0.22)	0.48	(0.21)*
35-39	0.39	(0.21)	0.14	(0.18)	-0.04	(0.21)	0.61	(0.19)**



Sample N = 2 183	At high risk of burnout (combined measure)		At high risk of emotional exhaustion		At high risk of depersonalisation		At high risk of reduced personal accomplishment	
	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]
40-44	0.39	(0.26)	0.02	(0.19)	-0.44	(0.23)	0.66	(0.23)**
45-49	0.29	(0.22)	0.30	(0.18)	-0.32	(0.22)	0.64	(0.21)**
50-54	0.31	(0.28)	0.25	(0.23)	-0.47	(0.23)*	0.42	(0.18)*
55-59	-0.47	(0.31)	-0.27	(0.26)	-1.02	(0.24)***	0.58	(0.22)**
60 or over	-1.19	(0.49)*	-0.32	(0.23)	-1.56	(0.34)***	0.25	(0.30)

[§] Significance level of the coefficients: * = p-value < 0.05, ** = p-value < 0.01; *** = p-value < 0.001

Other wellbeing variables

From Table 15 it can be observed that nurses working in hospitals with a better score on nurse working environment reported significantly lower levels of job dissatisfaction (general and wage) and intention to leave (job and profession). This association is present in all quartiles, but increases in intensity as the working environment improves. Also for patient-to-nurse ratios, significant associations were found. Nurses working in hospital sites with a patient-to-nurse ratio in quartile 4 (worst score) report significantly more dissatisfaction with wage (Coef. = 0.66, p-value < 0.01) and intention to leave the job (Coef. = 0.39, p-value < 0.05) compared to nurses working in hospitals in quartile 1 of the patient to nurse ratio (best score). Also nurses working in hospitals in quartile 2 of the patient to nurse ratio have a higher intention to leave their job (Coef. = 0.33,

p-value < 0.05) or the nursing profession (Coef. = 0.49, p-value < 0.01) than nurses working in hospital sites in quartile 1 of the patient to nurse ratio (best score).

It can be retained that nurses who are working in ICUs in Brussels or Wallonia report significantly higher dissatisfaction or intention to leave their job or the nursing profession than nurses who are working in Flanders. Nurses who are employed in university hospitals have – all other things equal – a slightly higher intention to leave their job compared to nurses who are working in general hospitals (Coef. = 0.30, p-value < 0.05). Males reported significantly higher intention to leave the nursing profession than females (Coef. = 0.25, p-value < 0.05) and overall younger nurses reported higher levels of dissatisfaction and intention to leave than older nurses.



Sample N = 2 183	Job dissatisfaction		Dissatisfaction with wage		Intention to leave job		Intention to leave nursing profession		Good or excellent perceived quality in unit	
	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]
25-29	1.00	(0.21)***	0.62	(0.19)***	0.79	(0.17)***	0.70	(0.24)**	-0.38	(0.20)
30-34	1.40	(0.26)***	1.28	(0.21)***	1.24	(0.19)***	1.26	(0.28)***	-0.34	(0.21)
35-39	1.36	(0.24)***	0.96	(0.23)***	0.94	(0.20)***	1.12	(0.27)***	-0.33	(0.23)
40-44	1.09	(0.27)***	0.81	(0.23)***	0.82	(0.19)***	0.87	(0.29)**	-0.32	(0.22)
45-49	1.03	(0.25)***	0.91	(0.23)***	0.46	(0.21)*	0.50	(0.31)	-0.19	(0.23)
50-54	0.85	(0.24)***	0.73	(0.24)**	0.42	(0.20)*	0.49	(0.32)	-0.14	(0.29)
55-59	1.24	(0.31)***	0.53	(0.23)*	0.31	(0.25)	0.61	(0.32)	-0.20	(0.29)
60 or over	1.04	(0.32)***	0.79	(0.32)*	-0.39	(0.30)	0.22	(0.29)	0.18	(0.32)

[§] Significance level of the coefficients: * = p-value < 0.05, ** = p-value < 0.01; *** = p-value < 0.001

Nurse-perceived quality of care

It can be observed from Table 15 that the nurse-perceived quality of care is higher for hospitals with a better score on nurse working environment (significant association for all quartiles). No significant associations between patient-to-nurse ratios and perceived quality of care were observed (these relationships are potentially masked due to limitations in case-mix adjustment). In addition, it can be observed that the perceived quality of care is higher in Flanders compared to Wallonia and Brussels.

Association between nurse working environment and missed care

From Table 16, it can be observed that in ICUs with a patient-to-nurse ratio in quartile 4 (highest, worst), there is a significantly lower probability (Coef. = -0.60, p-value < 0.01) that all the care was performed, compared to hospitals with a patient to nurse ratio in quartile 1 (lowest, best). In addition, nurses working in hospital sites with the best score on nurse working environments (quartile 4) have a higher probability to perform all care (Coef. = 0.70, p-value < 0.001) compared to nurses in ICUs with the

lowest score (quartile 1). When working in the night shift, the probability to perform all necessary care was significantly higher compared to day shifts. Males report a lower probability to perform all care (Coef. = -0.34, p-value < 0.01) than females.

For clinical activities left undone no significant association was observed for nurse working environment or patient to nurse ratio. Nevertheless, the region, sex and age were significantly associated to the number of clinical care items left undone.

For planning and communication tasks, a significant higher probability to report tasks undone was observed among nurses working in hospital sites with a PTN in quartile 4 (highest, worst), and with a higher average number of non-nursing tasks to be performed. The reverse was true for nurses working in ICUs with a better score on working environment (quartile 4, best score). Moreover also association with the sex (male) and the age group 40-44 years appeared to be significant.



Sample N = 2 183	Clinical care undone (max 9 items)		Planning & communication undone (max 5 items)		All care performed (yes/no)	
	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]	Coef.	(Standard error) [§]
Day shift (morning, afternoon, evening) [REF]	.	.	.	.	.	.
Night shift	-0.07	(0.07)	-0.40	(0.06)***	0.72	(0.11)***
Education						
No further education [REF]	.	.	.	.	.	.
Bachelor or postgraduate intensive and emergency care	-0.07	(0.07)	-0.03	(0.04)	-0.05	(0.11)
Sex						
Female [REF]	.	.	.	.	.	.
Male	0.37	(0.06)***	0.16	(0.04)***	-0.34	(0.11)**
Non-binary	0.29	(0.25)	0.33	(0.19)	-1.06	(0.86)
Age						
under 25 [REF]	.	.	.	.	.	.
25-29	-0.06	(0.11)	-0.04	(0.07)	0.25	(0.21)
30-34	-0.08	(0.11)	-0.06	(0.08)	-0.01	(0.24)
35-39	-0.05	(0.10)	-0.09	(0.08)	0.37	(0.22)
40-44	-0.27	(0.11)*	-0.21	(0.10)*	0.56	(0.26)*
45-49	-0.17	(0.13)	-0.16	(0.10)	0.49	(0.27)
50-54	-0.44	(0.16)**	-0.18	(0.10)	0.47	(0.26)
55-59	-0.48	(0.14)***	-0.12	(0.09)	0.49	(0.25)*
60 or over	-0.32	(0.16)*	-0.16	(0.12)	0.66	(0.29)*

[§] Significance level of the coefficients: * = p-value < 0.05, ** = p-value < 0.01; *** = p-value < 0.001



Alternative specifications

Three alternative regression specifications were evaluated in a sensitivity analysis (see section 2.3, results available upon request).

In a first alternative specification, the hospital site score on each of the five subdimensions of the PES-NWI scale was used in the model instead of a subdivision of hospital sites into quartiles based on the composite score for nurse working environment. In general, this specification has a slightly better fit to the data (lower QIC-value), implying that the information per subdimension can capture the observed variation in the data better than the composite score. The latter was preferred in the base model for the ease of interpretation.

The subdimension with the most important impact on the assessed outcomes is “staffing and resource adequacy”, with better values being associated with lower risk of burnout, higher perceived quality, lower job and wage dissatisfaction and less care left undone. Intention to leave was the only outcome variable that was not impacted by this subdimension. In addition, a more participatory work culture (higher score on the subdimension “nurse participation in hospital affairs”) is associated with lower job and wage dissatisfaction and reduced intention to leave job and profession. Other subdimensions have a smaller impact on the evaluated outcomes.

In a second alternative specification, the regional variables were excluded from the model to avoid interference with other covariates where significant regional variation is present, i.e. patient-to-nurse ratio and hospital type. However, for nearly all outcome variables, the goodness of fit clearly deteriorates (higher QIC-value), meaning that regional variation is not limited to the explanatory variables present in the model, but also relates to other unmeasured factors, e.g. labor market dynamics, language and cultural differences etc. Hence we consider it important to account for regional differences in the base model.

When regional variables are excluded, the analysis of missed care remains unaltered. On the other hand, there is an effect on the association between patient-to-nurse ratio and nurse working environment on the wellbeing outcome variables, with a more outspoken higher risk of

burnout, job and wage dissatisfaction and intention to leave in hospital sites with worse staffing levels and with worse working environments.

In a third specification, three casemix variables were added to the model based on the limited information available in the survey. Except for the probability that all care could be performed, the casemix information has no impact on the goodness of fit nor on the estimated associations. For the probability that all care could be performed, there is, however, a meaningful impact. We find that a higher caseload – to be interpreted as more patients per nurse on ECMO, or requiring kidney dialysis or with intracranial pressure measurement – reduces the probability to perform all necessary care.



3 PERSPECTIVES FROM THE FIELD ON ICU NURSE STAFFING

3.1 Summary

- This chapter includes a qualitative study to describe the difficulties experienced on Belgian intensive care units related to nurse staffing. We make a distinction between the pre-pandemic and pandemic situation. Seven online focus groups and 4 in-depth interviews were conducted to gather the perspectives of nurses, head nurses, middle management, chief nurse officers, physicians and policymakers.
- The work of ICU nurses is complex and multi-faceted. Working on ICU requires a combination of expertise and skills (e.g. medical knowledge, psychosocial and relational qualities, 'clinical view', medication management, stress resistant, ...) to perform a wide range of tasks (often simultaneously) with important potential consequences and responsibilities (e.g. what they do makes a difference between life or death; important impact on psychological consequences of a stay on ICU). In addition to their tasks and responsibilities related to patient care in the ICU, ICU nurses have to perform a lot of other tasks related to their specific expertise (e.g. rapid response team, ...), or work on the ICU (e.g. mentoring students and new colleagues, participating in care innovation projects). Nevertheless, also tasks and responsibilities that can be performed by other profiles are demanded from ICU nurses (e.g. administrative tasks, admission on ICU of not critically ill patients, logistic and clerical duties).
- Acquiring the necessary skills and expertise to work on an ICU requires a combination of several months/years 'on the job training' and following 'advanced courses in ICU'. The reform of the Bachelor program (from 3 towards 4 years) also had some impact on the advanced education in ICU and emergency care (e.g. less

intensive 'training on ICU', in Flanders the cost of a postgraduate education has to be born by the employee or employer).

- In Belgium an ICU has to include at least 6 beds and for every 6 beds there should be at least 2 nurses. Although it is not the same as a mandated patient-to-nurse ratio, it more or less boils down to a maximum patient-to-nurse ratio of 3:1. As a consequence of this legal criterion, the variation in patient-to-nurse ratios across ICU's and shift types is less pronounced compared to general hospitalisation units. Although some considered that before COVID-19 patient-to nurse ratios on ICU's were not really a concern, some expressed problems such as exceeding this ratio in case of staff absenteeism (e.g. during lunch breaks; meetings, transport or education outside the unit; sickness leave). Moreover the ratios were used in some hospitals as a default (especially during night shifts) while patient acuity requires lower ratios. A better adjustment of patient to nurse ratios towards objective patient acuity measurement is a clearly voiced request by the field.
- The every day's work of an ICU nurse changed drastically during the COVID-19 pandemic. The case-mix of ICU's changed and was dominated by COVID-19 patients. This new condition required a high level of care intensity (e.g. respiratory care in prone position, labor intensive mobilization procedures) and patients were critically ill for a long period, had comorbidities (e.g. obesity) and often pessimistic prognostics. Due to the COVID-19 context and the accompanying infection prevention and control measures the work was complicated. The personal protective equipment (PPE) was not only having a physical impact it also had an impact on the organisation of care. The visitor restrictions had a clear impact on the support of families and relatives. As time went on, ICU nurses were longing to take care of a 'normal mix' of ICU patients as taking care of COVID-19 patients was perceived as monotone. Moreover, due to staffing problems non-direct patient care activities (e.g. care innovation, mentorship role) were neglected.



- During the COVID-19 pandemic there was a high demand for ICU capacity. As a consequence both the required patient-to-nurse ratios and skill & expertise mix could not be maintained. During the first wave(s) many nurses with insufficient ICU expertise (e.g. from other units, retired staff, students, ...) had to take for ICU patients (regular and surge ICUs). Although their help and support was highly needed and appreciated, this also had a clear negative impact on patient care and nurse wellbeing. ICU nurses experienced stress because they had to delegate tasks to non-ICU staff and had the final responsibility for more patients than usual, while the non-ICU staff experienced stress because they felt they were not fit for the job (e.g. taking up tasks for which they were not properly trained, not accustomed to high mortality rates). In the following COVID-19 waves non-ICU staff was less utilized. Due to the pandemic and its long duration (e.g. nurses in isolation, quarantine, burnout) in combination with severe limitations to find ICU nurses on the labor market, many hospitals had to close ICU beds. Although this was in pre-pandemic times not an option for physicians or hospital management, it is more and more applied to guarantee sufficient quality in the available ICU capacity.
- After two years of COVID-19 pandemic many ICU nurses are physically but most of all mentally exhausted. An ICU is already a stressful environment outside a crisis period (e.g. high responsibilities, high impact of critically ill patients on families, ...), the COVID-19 crisis substantially increased the stress and psychological burden of nurses. ICU nurses were, for instance, anxious for the risk of being contaminated (for themselves or their relatives), and because the uncertainties about standards of care (e.g. due to the new pathology protocols and unclear procedures). Moreover, ICU nurses were confronted with higher than usual mortality rates and psychological suffering (e.g. due to the visitor restrictions).
- COVID-19 reinforced frustrations that were already looming prior to the COVID-19 pandemic (e.g. the level of flexibility asked from ICU nurses regarding their shifts and units to which they were allocated; the remuneration, the lack of praise and recognition from

their management and the general public, the perception that the hospital management and politicians do not listen to their problems) and created new ones (e.g. lack of understanding of political choices such as the relaxation of COVID-19 measures and the compulsory vaccination of healthcare staff; lack of understanding of choices and reactions of the general public: e.g. blame the ICU staff for continued COVID-19 measures, unvaccinated people).

- Nurses with ICU specific expertise were already a scarce resource prior to the pandemic. After two years of pandemic, the recruitment and retention problems only increased and create challenges on the short, medium and long term. Although the analyses of future actions is out-of-scope of the current chapter, the perception of the actions undertaken during the COVID-19 pandemic allow to conclude that the attractiveness to start and stay to work in an ICU will require a comprehensive approach (e.g. adapt patient-to-nurse ratios to patient acuity, invest in leadership and the role of head nurses, reward the specific skills and expertise of ICU nurses, spend the additional resources meant for staffing on staffing, reduce the burden of non-nursing task for ICU nurses, provide psychological support for ICU nurses, build partnerships between nursing schools and hospitals, increase involvement of nurses in staffing decisions, adapt the ICU capacity based on the available staffing resources in concertation with physicians and hospital management, re-assess ICU admission criteria).

In this chapter we describe the difficulties experienced on Belgian intensive care units (ICU) related to nurse staffing based on a qualitative study. We make a distinction between the pre-pandemic and pandemic situation



3.2 Research objectives

The main questions were:

- What were the problems and potential solutions regarding nurse staffing on ICU before COVID-19 emerged?
- What lessons can be learnt regarding nurse staffing practiced used during the COVID-19 pandemic ?

3.3 Methods

3.3.1 Design

In order to collect data on perspectives of healthcare professionals on nurse staffing related issues on ICU, we performed a qualitative study.

Because qualitative research aims to describe and understand the object of inquiry (i.e. here: the perceptions regarding problems/difficulties with staffing on ICU) to reach variation of the experiences, beliefs, opinions or perceptions, we selected a purposive and balanced sample of participants in order to obtain an accumulation of views that allows us to construct a rich and meaningful whole that transcends the subjectivity of any one individual and support the findings. Such approach does not aim at generalization and therefore do not target to reach statistical representativity of the population under investigation.

Eight online focus groups were organized. Focus groups are group semi-structured interviews used for the purpose of information gathering focused on a specific subject.⁷² Focus groups allow interaction between participants, which means rich data can be generated in a short time. From the group dynamic, topics can emerge that otherwise might be unobservable. As focus groups allow interaction among participants, the group dynamics can bring about insights in ways individual interviews may not be able to do. The interaction between participants may result in more in-depth information and elicit a broader range of perspectives related to the carefully designed questions.

Focus groups for this study were stratified according to language (i.e. French and Dutch-speaking focus groups) and (overlapping) professional

groups (i.e. Chief nurse officers, middle management, head nurses and/or nurses, and physicians). When it was not possible to organize focus groups for practical issues, we conducted semi-structured interviews. Interviews were also held to have additional perspective from a general management perspective (i.e. policy perspective: hospital umbrella organisations) not included in the focus groups.

3.3.2 Recruitment

An open call was launched to recruit healthcare professionals. All Chief Nurse Officers and field contacts of the hospitals who participated on the survey (see Chapter 3) received an e-mail with an invitation for the focus groups (with several proposed dates for the focus groups). They were asked to forward it to head nurses, middle management, nurses and physicians within their organisation. In addition, we asked the professional nursing and physician organisations (e-mail to presidents and/or board members of the respective organisations) to circulate the invitation to their members.

Candidates could apply via a structured application form on the KCE website. The application form requested the following information: name, hospital, experience with ICU, educational level, job title and the availabilities for the focus group per professional group (i.e. five possible dates per focus group).

Participants were selected based on their availability (for each professional group the date available for most candidates was chosen) and in order to have different perspectives present (in terms of represented hospitals and hospital type). Additional invitations were sent to the hospital umbrella organisations.



3.3.3 Data collection process

Moderation of the focus groups/interviews has been carried out by two native French-speaking researchers (LK was moderator and CM or NS were observers) for the French speaking groups and two native Dutch-speaking researchers (JD was moderator and KV or JA were observers) for the Dutch speaking groups. Due to the COVID-19 measures in place at the time, focus groups were organized online using the videoconferencing software Zoom®.

Before starting the interviews the objective was explained, confidentiality of the discussion was assured and permission to audio-record the discussion was requested.

3.3.4 Data collection tools

An interview guide was developed for the focus groups and in-depth interviews (available upon request). The general structure of the interviews was as follows:

- Introduction
- Problems with nurse staffing on ICU before the COVID-19 pandemic (and solution elements used to deal with these problems: what worked, what didn't work?)
- Problems with nurse staffing on ICU during the COVID-19 pandemic (and solution elements used to deal with these problems: what worked, what didn't work?)
- Actions (public authorities/hospital sector) required to deal with these problems related to nurse staffing on ICU (regular times/crisis situations; facilitators and barriers to implement them). It should be noted that the analysis of this part of the focus group interviews is out of scope of the current report. These data will be used as a step up for the evaluation of action points in the second report (to be published in 2023).
- Closing remarks

During the focus groups, topics and statements were visualised by the observer using post-it's on a Miro® board. All participants could see this so that they were able to give feedback if statements were not in line with their message or not noted correctly.

All focus groups and semi-structured interviews were audio-recorded transcribed verbatim.

3.3.5 Analysis

Transcripts have been coded in NVivo® by three KCE researchers (LK, JD and KV) in their respective language. After the coding of one interview in each language, code trees have been compared and discussed. After coding all data, clustering of both Dutch and French codes was performed by one researcher (LK). The result was an overarching node tree including both the Dutch and French data. An inductive thematic analysis has been performed. Nodes have been clustered together in several themes. Subsequent analytic steps (e.g. explorative query's in NVivo®) and drafting of the report were done by one researcher. We have added quotes (in the mother-tongue of the participant) to the text. The text stands on its own, quotes are only added as an illustration of the finding. Note that the characteristics between brackets refer to the focus group, not the individual participant.

3.4 Findings

3.4.1 Description of the participants

We received a high number of candidates to participate in the focus groups. This enthusiasm to participate is probably linked to the general feeling of the nurses on the field to be heard by policymakers and the general public. They have expressed to have been waiting for a long time for action to be taken in this domain. They stressed that they already repeatedly tried to put nurse staffing concerns on the political agenda. The KCE study seemed to be an opportunity to get their message across in a constructive way. They also acknowledge that the results of the report maybe not include an innovative and/or new message but that it is nevertheless important to clearly listen to the nurses and bundle their



concerns that already pre-existed before COVID-19 by an independent organisation in a scientific/objective manner.

« J'étais enthousiaste aussi dans l'aspect constructif des choses. C'est qu'on est souvent dans la plainte et voilà je pense qu'ici, une des manières de pouvoir donner son avis et d'essayer de trouver des solutions constructives et le fait que ça passe par une étude aussi de cette ampleur et par un organisme comme le KCE je pense que ça peut objectiver certaines choses (...) ça peut peut-être apporter des, améliorations, mais aussi sur base d'arguments scientifiques et pas juste ben 'il manque des gens' ou 'il y trop de gens' ou 'la charge de travail est trop lourde', (...) et je pense que ça peut avoir plus de poids que juste descendre dans la rue et dire qu'on n'est pas contents (FG middle managers)

Focus groups and interviews were scheduled between 7th and 28th of February 2022. The focus groups lasted between 110 to 120 minutes, the interviews between 50 and 60 minutes. Seven online focus groups with healthcare professionals were performed and 3 semi-structured interviews were conducted. Also an interview with a Dutch-speaking physician was done because the participants that subscribed for the focus group cancelled last minute. To ensure that the policy perspective was also represented we interviewed 2 representatives from Dutch-speaking hospital umbrella organizations (French-speaking hospital umbrella organisations were invited but did not respond to our invitation) and a nurse involved in policy-making committees.

In every focus group, participants represented different hospitals. In total we have met 20 Dutch-speaking and 18 French-speaking participants, 24 men and 14 women, from 15 French-speaking hospitals, 13 Dutch-speaking hospitals and 2 Dutch-speaking representatives of hospital organizations, distributed across all Belgian provinces. (see Table 17)

Table 17 – Description of the participants to the focus groups and interviews

	Dutch speaking	French-speaking
Nurses	-	1 FG: 4 participants (1 man, 3 women)
Head nurses	1 FG: 4 participants (1 man, 3 women)	1 FG: 4 participants (1 man, 3 women)
Nurse and Head nurses	1 FG: 6 participants (4 men, 2 women)	-
Middle management	1 FG: 7 participants (5 men, 2 women)	1 FG: 6 participants (5 men, 1 woman)
Physicians	1 interview (1 man)	1 FG: 4 participants (4 men)
Policy perspective	3 interviews (3 men)	-

Legend: FG=Focus group

3.4.2 Preamble

In this section we will first describe the specificities of the nursing work and environment of ICU nurses. Then we will go through the perceived requirements to provide nursing care at the ICU up to high quality standards.

Many of the issues related to ICU nurse staffing are not new. Nevertheless, the COVID-19 pandemic amplified latent problems and brought them to the foreground. In addition, next to the worsening of these pre-existing problems new specific problems arose. Therefore, we decided to first identify for each theme the aspects already present in the pre-COVID era, followed by an identification of how the COVID crisis impacted the situation. Finally, when positive elements were identified as a consequence of the COVID-19 pandemic they were also pointed out.



3.4.3 Working as an ICU nurse: what does it entail?

3.4.3.1 Type of tasks and responsibilities

The work of ICU nurses is complex and multi-faceted. They have to perform a wide range of tasks (often simultaneously) and have an important responsibility (e.g. what they do makes a difference between life or death; important impact on psychological consequences of a stay on ICU). Although we did not ask participants to describe their job content in detail, they raised the following **core aspects**:

- Participants mentioned that nurses obviously have to provide the patient care for the critically ill patient, including monitoring/surveillance, mobilizing and hygienic care, respiratory care, drug management and the communication and support of family and relatives. The ICU nurse with clinical expertise has a pivotal role in the care process and brings in essential elements for the medical management. They have to take multiple decisions often with a high level of potential consequences (e.g. medication management is complex and when errors are made the risks to impact patient's health are high). Working on ICU requires a combination of expertise and skills (e.g. medical knowledge, psychosocial and relational qualities, 'clinical view', medication management, ...).

« Un des éléments qui alourdit aussi la charge de travail en réanimation, aux soins intensifs, c'est toute la gestion des médicaments. Que ce soit parce que les médicaments que l'on doit gérer sont extrêmement, sont tous à haut risque, par leur nombre, par les ruptures des stocks déjà avant Covid, par toute cette gestion particulière et je ne parle même pas de la non-prescription où c'est l'infirmière qui joue le rôle du médecin et qui doit faire des, des prescriptions à la place du médecin. » (FG cadre)

- Becoming an ICU nurse requires intensive on-the-job learning. As such the ICU's welcome nurse students. Adequately supervising and mentoring students, which is time-consuming, is part of the job. In the same way, each new recruit requires time to familiarise him/herself

with the department and the way it works. Given the high nurse turnover in several ICUs, mentoring and supporting new recruits on the ICU (also when they followed an advanced course in ICU care) can be an intensive task for an ICU nurse. Moreover, with the reform of the nursing education and the implications on the advanced training in ICU care, the requirements to mentor and guide newly graduates even increased.

« Par rapport à la formation permanente. J'ajoute aussi que la, la difficulté était déjà de l'accompagnement des nouveaux collaborateurs. Donc la post-formation sur le terrain même si on est quatrième année SISU ça prend du temps et ça demande de l'investissement. » (cadre)

- In addition to the time they have to spend on supporting new and future colleagues, ICU nurses must also keep their specific ICU expertise up to date, by investing time in continuous education and specific training. This is even more so the case for head nurses. The combination of management and leadership tasks with following training, makes it hard to take up patient care tasks as well. Head nurses express the tension of their function at the intersection of patient care and management: the hospital management expects 'management and leadership' from them while the bedside nurses expect them to help out in direct patient care.

« L'inconvénient c'est le manque de temps. Et comme, le problème c'est qu'on est infirmier-chef, eh ben on est infirmier aussi et le travail de l'infirmier, de l'aide-soignant, de l'aide logistique on peut le faire, mais, dans l'autre sens, personne ne fera notre boulot en fait. Et donc c'est ça, cette difficulté de trouver les, les priorités, de se dire ben voilà pour l'équipe, allez pour les, les directions, ben ce serait logique qu'on soit tout à fait en dehors des, des soins. Euh, voilà. Et alors que pour l'équipe ben ce serait normal qu'on soit tout le temps dans les soins. » (FG head nurse)



Next to the essential usual nursing tasks, and depending on the hospital, **other duties can be asked from ICU nurses:**

- Some of these additional activities are a consequence of their specific level of expertise (not available elsewhere). Respondents pointed out that ICU nurses have to help out on other units when expertise is lacking to perform specific tasks (e.g. Oxygen therapy, care central intravenous catheters) or have to respond on internal reanimation requests (e.g. rapid response team within the hospital). Although these activities are linked to their specific expertise it causes interruptions in their regular care activities. If all these activities are not compensated by additional staff it risk to increase the workload of the available ICU staff. Moreover, other activities, like the transport of patients (internal or external) do not really match their expertise level.

“Er wordt alsmaar meer gevraagd van, intensieve zorgen verpleegkundigen en, “je gaat nog wel dit bijdoen en dat bijdoen”, het gaat over CVVH, het gaat over perfusie als de perfusionist niet in huis is, en de ECMO, en de (...) pomp niet goed werken. Het komt er allemaal maar bij.” (FG head nurses)

- Care for non-ICU patients in the ICU due to the lack of bed capacity in a more appropriate unit. Moreover some patients require a care level between a general hospitalisation unit and an ICU which is not everywhere available (i.e. medium care units do not formally exist in Belgium).

« C’est en perpétuelle croissance quoi parce que les soins intensifs, ça devient aussi un peu les services de middle care par moment quoi. Il y a une vieille dame chez qui on doit mettre un pacemaker, il n’y a plus de place en unité coronaire, voilà hop ça vient chez nous. » (FG nurse)

- Other logistic or administrative tasks that do not require nursing expertise also have to be performed by ICU nurses: such as serving food, clerical tasks (answering telephones), stock management, cleaning rooms and equipment, stretchertransport by two nurses (while one nurse assisted by supporting staff could be a valid alternative), resolving IT problems. These tasks are not only time-

consuming but interfere with the core tasks of an ICU nurse as they are often intermittent (e.g. regular phone calls) and disrupt the care activities in which nurses are involved at that time.

« Il y a le travail infirmier et puis il y a tout ce qu’il y a autour que les infirmières doivent assumer. Donc le téléphone, rechercher du matériel, matériel qui manque, le matériel qui est (silence), trouver un technicien ... Toutes les tâches annexes finalement qui ne demandent pas un diplôme d’infirmière, qui polluent vraiment la journée d’une infirmière au quotidien parce qu’elles sont interrompues très régulièrement dans leurs tâches et donc elles doivent reprendre, se recentrer sur la tâche qui était commencée. Donc ça, je trouve que ça pollue énormément et, finalement, cette petite main, entre guillemets, pourrait vraiment nous aider et ne nécessite pas d’avoir un diplôme d’infirmier. » (FG head nurse)

The completion of the DI-RHM/ VG-MZG (registration of the Belgian Nursing Minimum Data set) is also time consuming. Given its complex nature it has to be done by an ICU nurse and cannot be delegated to non-nursing staff when it is (in their hospital) not automatically extracted from the electronic patient record. But also when it is extracted from the electronic patient record they have to pay extra attention to recording the care in the electronic patient record during the DI-RHM/ VG-MZG periods. Some hospitals liberate a staff member to take care of this registration.

« C’est devenu tellement complexe de coder ce DI-RHM qu’on en vient à mettre des infirmières dont on a bien besoin sur le terrain. On les met comme expert DI-RHM parce que si on n’est pas un expert du métier pour encoder, on perd des points et donc l’hôpital perd du financement ». (FG physician)

ICU nurses are also expected to work on quality improvement and innovations. They are not against it (on the contrary) but they stated it takes time that they cannot spend on direct patient care and when it is not compensated it increases the burden on nurses involved in direct patient care.



Anyway, this long list of tasks and responsibilities have to be combined within the available time of ICU nurses.

What was the impact of COVID-19 on the tasks of an ICU nurse ?

The already long list of tasks and responsibilities was extended because of the COVID-19 pandemic. Yet, it was also mentioned that the diversity of care decreased since ICU nurses had to predominantly take care of one type of patient during the pandemic. But given the type of patient care a COVID-19 patient requires and the context of the COVID-19 pandemic, overall the intensity of the care and the arduousness of the work increased. An example of such a factor that increased the intensity of care is that many COVID-19 patients were in a prone position during ventilation. The prone position also had an impact on the time required to perform other nursing activities such as hygiene or mobilization.

We will come back to this below (see 3.4.3.2 section "Covid impact").

Due to personal protection equipment (PPE) and other infection control and prevention measures, the nature of the tasks changed (e.g. medication management) not in the least for communication with and support of family and relatives. Indeed, visitor restrictions prohibited family to come to the hospital. Nurses had to implement new methods to allow contact between the patients and his/her family and get news on the evolution of the patient. Also the collaboration within the team and with other teams was influenced by these infection control and prevention measures. After all it was not evident to involve staff members or people from outside 'the cohort unit' to enter the unit which implied that all the non-nursing tasks had to be done by ICU nurses.

Finally, the heavy workload during the pandemic caused a lack of time to spend on activities not strictly related to patient care such as appropriate on-the-job training and working in quality improvement and innovation.

3.4.3.2 Patients in ICU

In general, the intensity of nursing care on ICU increased during the last couple of years. Several factors contributed to this (e.g. ageing population, shorter length of stay, higher patient turnover, multi-pathology and comorbidities). Respondents stated that also with innovation and

evolution of the medical technology, patients in ICU require increasingly high-technologic care. In addition, ICU patients who already require a high level of attention are often agitated due to the ICU-environment (in terms of noise, light, agitation) and the medication they receive. This demands an even higher need of surveillance and intensive work. A problem that was also indicated is that clear ICU admission criteria are often lacking resulting in the admission of patient on the ICU that might have been better being admitted on another type of unit. An example is the lack of clear 'do not resuscitate' (DNR) criteria. Patients end up on the ICU while they need, in fact, tender loving care.

"Dat is ook wel een punt dat hier dikwijls moeilijk ligt, vind ik, een DNR beleid, dat is hier beetje soms een jojo-beleid, he, patiënt wordt DNR afgetekend, maar als het dan iets beter gaat, dan wordt die DNR toch weer ingetrokken, of de DNR-codes zijn tijdens de wacht niet altijd heel vlot zichtbaar of gekend en de patiënt belandt dan toch op intensieve zorgen. En dan gaan ze toch maar de volledige therapie geven. Het is een probleem wat hier toch ook wel dikwijls, zich stelt, vind ik. En wat dat we ook niet echt een oplossing voor hebben, we zeggen elke keer van het is niet goed, het zou anders moeten, maar het blijft een beetje daarbij hangen en dat dan wel goed zou gaan, dat is hier nog niet echt duidelijk." (FG head nurses)

What was the impact of COVID-19 on the patient profile?

With the pandemic, the patient profile in ICU changed substantially. At the start of the pandemic the operating theatres were closed to free ICU capacity for COVID-19 patients. As a consequence, the elective surgical patients requiring ICU care postoperatively (and are often compared to other ICU patients, but are in general, less complex and severe) were no longer at the ICU, making the care intensity at the unit level more severe. Moreover, the COVID-19 patients were in a complicated clinical state and stayed longer than usual. The case mix was rather uniform with often very pessimistic prognostics. In the group of COVID patients, there was also a large number of people suffering from obesity which had an impact on nursing care. In addition, because of the visitor restrictions, patients suffered from social isolation.



«Le mixte des patients a changé. Avant le Covid on a toujours eu des moments très lourds et puis des semaines ben voilà les patients soit ils vont mieux ils remontent à l'étage soit ils décèdent, ils ne restent pas très aigus comme ça pendant, pendant plusieurs semaines. Et donc il y avait quand même des moments plus aigus et puis des moments où c'est plus calme. De temps en temps des lits vides puis ça remontait. Et voilà donc ça on a toujours eu. Et ce qu'il y a c'est qu'on a aussi chez nous, allez, plus ou moins moitié-moitié de patients aigus et de patients euh qui viennent de la salle d'op. Mais quand le service a été plein de Covid où il n'y avait plus du tout de la salle d'op, on est que les patients intubés, ventilés, compliqués très lourds et on n'a plus ces patients post-op qui demandent quand même pas mal de temps au niveau du turn-over, de la gestion des chambres, des départs, toutes les transmissions, mais ça reste des patients plus légers. Et donc on a été saturés comme ça pendant tout un temps avec des patients qui ne bougeaient plus et qui restaient très lourds et donc on n'a pas eu ce 50/50 de patients plus lourds plus légers. » (FG head nurses)

3.4.3.3 Psychosocial and physical burden of working on the ICU

ICUs are known to be a stressful place to work with a high psychological load for nurses.

« Les soins intensifs ça reste un environnement qui est stressant, un environnement aussi humainement difficile et un environnement aussi où, comment, tout ce qui va être bruit est prédominant aussi. Et donc ça reste un environnement complexe parce qu'on ne sait pas, on peut solutionner un élément, mais ce n'est pas pour autant qu'on a solutionné toute l'équation, par exemple, dans l'environnement de travail. Et donc ça reste un environnement complexe à appréhender » (FG middle managers)

Several **stress factors** were pointed out during the discussions:

- Given that patient-to-nurse ratios do not differ as much between night and day shifts as on general hospitalization units, ICU nurses have to work more night shifts compared to nurses working on other units. This has an impact to on the combination of work with the private life.

“Op intensieve zorgen in vergelijking met de, de ‘gewone’, zou ‘k bijna zeggen, hebben we bijna dezelfde bestaffing te houden ‘s nachts. Maar dat betekent dat verpleegkundigen ook gewoon veel vaker nachtdiensten zullen moeten doen. En dat betekent bij ons ook wel gewoon fysiek en voor ‘t gezinsleven een heel zware belasting.” (FG head nurses)

- Difficulties regarding the relationships between medical staff and nursing staff.

“Et moi je constate quand même qu’au niveau des, des différents hôpitaux, en tout cas moi au niveau de ma réalité, ce sont des services avec une charge psychosociale qui est quand même relativement élevée et dans laquelle la composante médicale a une part de responsabilité non négligeable. » (FG middle management)

- When non ICU physicians transfer patients to the ICU for peace of mind during the night

« Le stress du médecin en lui-même de l'étage qui lui le soir, même après 5 heures, rentre chez lui et n'a plus envie de gérer ces patients-là. Et donc forcément ben... ce qu'il faisait en tout cas énormément à l'étage c'est que quand il y avait un patient qui était limite, il venait directement chez nous comme ça au moins c'était confortable pour tout le monde. Donc c'est surtout ça aussi par rapport à son rôle et aussi du rôle middle care : quand il y a un patient qui est limite ben, c'est plus facile de le transférer aux soins intensifs comme ça au moins ce n'est plus à gérer en tout cas dans les étages pendant la nuit. » (FG nurses)



- The flexibility that is asked from ICU nurses is high. As they are highly skilled professionals they can work on many other types of units. As a consequence, when staff is short on other units, ICU nurses are often asked to work a shift (or part of a shift) on these units. This happened frequently pre-pandemic since empty ICU-beds were not a rarity at that time. While ICU nursing staff stated that too much flexibility is asked from them, the management often stressed the current limitations in flexibility (e.g. social laws that hamper to combine different shift types or to let people work in different hospitals from the same hospital network). From a management point of view more flexibility is asked while nurses want stability and less flexibility.

“Een grote stressfactor bij ons is de flexibiliteit tussen de afdelingen. Als je intensieve zorgen-bedden hebt, dat betekent dat ge een man of [aantal] hebt die daar de ochtenddienst doet, en als er een paar lege bedden zijn op de cardiale intensieve zorgen, maar op de heekundige, of op de medisch intensieve zorg hebben ze volk nodig, dan zal de verpleegkundige die op die lege bedden gestaft staat, niet zijn collega's helpen, maar patiënten gaan doen op een andere afdeling waar hij het team niet kent, waar hij de pathologie niet kent. En, daar is geen oren naar de, ik denk dat de directies dromen van de multi-inzetbare intensieve zorgen verpleegkundigen. Ik denk dat die ook zeer goed onderlegd zijn, maar ge zijt maar zo sterk als uw team. En, en dat wordt vaak vergeten. Dan tijdens de, typisch vóór tijdens de Covid- periode was er in zekere zin wel een expertiseprobleem.” (FG (head) nurses)

- Taking care of critically ill patients requires a high level of expertise. The fact that this expertise is not always present when working with nurses without advanced ICU training, can also be a source of stress. It was stressed that a sufficient number of nurses with specific ICU expertise (and an advanced title in ICU and emergency care) is required.

- A high pressure to maximize the use of the available bed capacity (often at the request of physicians and hospital management related to financial incentives). This translates in a high patient turnover and pressure to free beds..

“Een bed vrij wordt eigenlijk onmiddellijk ingepakt terug. Er moet zelfs soms gekeken worden welke patiënt is het beste om naar de kamer te laten gaan om iemand die echt, urgente zorgen of intensieve zorg nodig heeft te kunnen gaan opnemen.” (FG (head)nurses)

- Important decisions are taken by ICU nurses with potential serious consequences and medico-legal implications. This is, compared to nurses working on other units, much more the case for ICU nurses.

“Si vous comparez à une infirmière de gériatrie, l'infirmière de gériatrie prend beaucoup moins de décisions potentiellement avec un risque médico-légal tandis que l'infirmière de réa est réellement... je sais pas combien de décisions elle prend sur sa journée, mais il y en a quand même beaucoup. » (FG physicians)

Frustration was also expressed regarding :

The remuneration does not take the number of years needed to study to become an ICU nurse, into account. Moreover it was not revised when the reform of the Bachelor-program resulted in an additional year of education to become a nurse. Moreover the implementation of the IFIC pay rates added to this frustration. After all, as it was initially conceived, the fact to have an 'specialisation in ICU' was no longer resulting in an additional yearly bonus. Also the required flexibility is difficult to compensate financially (primes de rappel)

« Le salaire de base d'une infirmière qui commence est à 1 800 € net par mois et [une infirmière] me disait « j'ai une amie qui est chômeuse, elle gagne 1 400 et elle ne fait rien et elle a 1 400 et j'ai une amie, une autre amie qui est à l'usine qui n'a pas fait d'études supérieures, qui a juste fait ses humanités et qui gagne 2 000 par mois ». Et moi je crois qu'il y a un problème aussi de barème de base. J'ai regardé dans, dans les fameux les



fameuses règles de l'IFIC là, le protocole, de paiement. Les infirmières sont au barème 15 ou 16 et je pense qu'elles mériteraient certainement d'être montées d'un barème ou deux par rapport à, au salaire de base je pense que c'est tout à fait disproportionné. Il n'y a pas de différence par rapport aux chômeurs, par rapport à d'autres métiers où il n'y a même pas d'études à faire donc quand on prend quelqu'un qui est engagé à la SNCB, qui, qui a fini euh qui a fini euh simplement ses humanités, il fait deux mois de formation, il est à la SNCB, il gagne 2 000 € par mois. Donc il y a un problème. les années d'études ne sont pas reconnues d'autant que maintenant elles sont passées de, de, de trois à quatre ans sans que ça n'ait rien changé dans leurs salaires. » (FG Physicians)

- The remuneration neither reflects the level of responsibility of ICU nurses, compared to physicians or nurses working in other disciplines (in pediatry or geriatry for example)

«- Il y a un sentiment d'injustice euh ou en tout cas euh une frustration entre les infirmières et les médecins sous-jacents, parce que les médecins sont trop bien payés je trouve par rapport aux infirmiers et donc ça génère un sentiment de, oui il y a un malaise. (...) Oui, par rapport à la pénibilité de leur travail, peut-être le travail médical est aussi difficile hein, ça je vais pas dire le contraire, mais je vais dire ...le rapport de salaire est disproportionné à mon sens et ça elles le savent très bien .

- Oui je voulais rebondir (...) dans le sens où, enfin, ne travaillant pas aux soins intensifs vous n'avez peut-être pas la notion que euh les soins sont autant voire plus assurés par les infirmières que par les médecins et donc ça renforce ce sentiment d'injustice pour beaucoup de choses. Elles font le même job en quelques sortes, euh elles prennent des décisions, elles en réfèrent aux médecins c'est clair, mais le, le patient est vraiment soigné au quotidien, minute par minute par les infirmières. Le médecin vient en chapeau au-dessus, mais donc ça, ça renforce ce sentiment euh d'injustice et de, de déséquilibre entre les salaires. » (FG physicians)

- ICU nurses are sometimes obliged to have the compulsory training (in the context of their professional title) on their day off. This training is not necessarily paid by the employer and thus a double personal cost occurs: using free time and personal income, while it is mandatory to follow it.

« Les infirmières doivent souvent prendre euh ce temps de formation sur leurs heures de congé. Et donc temps de formation pendant le travail ben puisqu'il y a une pénurie, puisqu'il n'y a pas de formation possible, puisqu'il y a un turn-over... enfin tout est lié évidemment. Elles doivent se former en dehors de leur journée de travail et, et ne comprennent pas, elles sont épuisées, elles ont, elles ont marre quoi, elles sont vraiment démotivées pour ça par moment. » (FG head nurses)

- There is not enough time for qualitative on the job training and/or mentoring traineeships.

What was the impact of COVID-19 on the physical and psychological burden of ICU nurses?

COVID-19 weighed heavily psychologically on the ICU staff. This increased the risk of burnout and also post-traumatic stress was reported.

Several **new stress factors** contributing to the psychological burden of working in ICU were experienced during the COVID-19-pandemic.

- COVID was a new condition with a lot of unknowns. For instance, at the start the procedures regarding PPE were unclear or non-existing.

« On nous a demandé d'y aller sans nous dire c'était réellement quoi, encore aujourd'hui hein, attention hein, mais on nous a demandé de rentrer euh... alors qu'on n'avait pas encore entre guillemets la procédure d'habillage parfaite, enfin comment désinfecter les choses, on ne s'est même pas... même pas préoccupé de ça, je pense. Honnêtement, on nous a jetés comme ça et on l'a fait (rires). » (FG nurses)



- Incertitudes regarding their own security, particularly among older nurses, (and also for their family members) were expressed. Also at the start of the pandemic the PPE was not sufficiently available or of insufficient quality which caused concerns and anxiety among the ICU staff.

«On a été projetés dans des isolements sans savoir si, en gros hein, , on allait avoir le matériel de protection adéquat, après on devait faire notre job... (...) Certaines aujourd'hui osent plus en parler en disant ben quand je suis rentrée dans un isolement, je pleurais. Donc on était, on a été au front, du jour au lendemain, avec des images qui venaient d'autres pays où on voyait que tout le monde mourrait et où on était face à un virus très contagieux qu'on pouvait ramener à la maison ...» (FG nurses)

- The - higher than usual - mortality rate and the fact it concerned many young people, combined with the fact that people died alone (without family being present) contributed to a loss of meaning of work among the ICU staff. It was also stated that redeployed nurses not used to take care of critically ill patients were more vulnerable to this.

“Vaak zijn die mensen, geconfronteerd met leed, met eenzaamheid, mensen, patiënten die dat eenzaam, ja, toch sterven.” (FG middle managers)

- The COVID-19 pandemic seems a never-ending story. The lack of perspective and recurrent waves in combination with the long duration of high stress levels make that nurses are at the end of their rope.

“Je merkt dat heel veel verpleegkundigen dat er eigenlijk niet veel niet meer moet gebeuren. Het spreekwoordelijke druppeltje in de emmer. Ik heb het gevoel dat bij heel veel van onze medewerkers dat die langdurige belasting toch echt wel doorbreekt op hun welbevinden.” (FG middle managers)

- Nurses were confronted with ethical dilemmas that occurred during the pandemic like which priority to be given to which patients, correct application of DNR...

“Er was een combinatie van enerzijds ethische dilemma's van wie komt op intensieve, dat is voorbereid geweest, is gelukkig niet vaak moeten toegepast zijn, maar bijvoorbeeld ook, de correcte toepassing van DNR-codes, , was toch wel een druk die heel belangrijk was, ook naar geriatrische patiënten, woonzorgpatiënten, woonzorgcentrapatiënten, afspraken met CRA's rond wie komt nog binnen, wie komt niet meer binnen? Dat zijn toch wel, allez, zaken die, 'k ga niet zeggen nieuw waren, maar toch, af en toe toch ook wel, mensen die te confronteren met ouders die dezelfde leeftijd hadden, en noem maar op.” (FG middle managers)

- Nurses had to make certain suboptimal decisions because a lack of resources for which they were, according to the interviewees, not legally protected.

« Il n'y a pas de protection médico-légale. C'est-à-dire que si les infirmiers, les médecins font des choix thérapeutiques par manque de moyens il y a toujours une possibilité de procès. Un hôpital proche des nôtres a subi des pressions d'avocats lors de la deuxième vague, je pense, qui ont finalement été déboutés par le barreau, mais donc ça, ça, ça ajoute à la pression et, et les infirmiers, ça les fait refléchir quand même hein ! non ? (...) le cadre juridique des procédures dégradées c'est important et surtout pour les médecins quand on voit ce qui avait été euh établi pour la vague Omicron, les modèles prédictifs et la fin de deux ou, ben je ne sais plus en surge capacity où on demandait aux médecins de faire un triage à la porte et ce triage reposait uniquement sur l'épaule du corps médical sans cadre juridique à associer. C'est inacceptable, c'est inacceptable. Mais bon là on s'écarte du sujet de la l'infirmier. (FG physician)



- Visitor restrictions had a clear impact on the psychological state of patients and their relatives but also were perceived as stressful by the nursing staff as they felt they could not do their job properly. Moreover as a consequence of these visitor restrictions the (verbal and physical) aggressive behaviour of family members were reported. This is a very stressful event for the ICU nurses that have to deal with it.

« Les visites avaient été interdites. Donc tout ce côté d'accompagnement des familles. Enfin, je veux dire on a eu des décès avec des personnes qui n'avaient pas eu de visites pendant deux mois et où le conjoint arrivait on a permis au conjoint quand même d'aller voir son conjoint décédé avant qu'il ne soit vite, vite, vite mis à la morgue et vite, vite, vite plus visible en tout cas hein pour les visites. Donc tout ça je pense a fort, fort, fort impacté sur les psychologies et tout ça, dans notre travail qui est quand même un travail aussi en tout cas d'accompagnement. » (FG nurses)

- Due to a shortage of nurses with specific ICU-expertise, nurses from other units worked on ICUs. This was not only stressful for these nurses themselves and for the nurses supervising them, it also created additional stress for the head nurses who had to allocate patients to the available nursing staff (with and without ICU expertise).

“Wat dat maakte dat wij een, een instroom kregen van heel veel nieuwe mensen. En, niet allemaal mensen die dat de BanaBa gevolgd hadden, dus mensen die dat eigenlijk qua opleiding niet direct inzetbaar waren. Dus dat gaf toch wel een heel deel stress en moeite om een goeie verdeling te maken van patiënten. Euh, bij de juiste, bij de juiste verpleegkundige.” (FG (head) nurses)

- Because high absenteeism rates (e.g. during the fourth and fifth waves of the pandemic due to sickness, quarantine and isolation), the flexibility asked from ICU nurses was too much. Also a decrease in COVID-19 admissions was named as a factor contributing to an overstretching of the flexibility. After all COVID-units continued to

exist at the tail of COVID-waves at a time when the new COVID admissions decreased. As such the ICU nurses allocated to COVID-units were (in case of empty beds) asked to help out on other ICUs in their hospital, often at very short notice. Working in an other ward is difficult and might be stressful because a high degree of adaptation (in terms of working with different procedures and different teams) is required of the nurses. In addition, they did not have time to recover.

“Nu zijn de meeste mensen die nu op de Covid staan, dat zijn geen interimers meer. Dat zijn degenen met 2 jaar ervaring of gewoon intensieve zorgen ervaring. Maar, euhm, als ge om 7 uur op uw dienst toekomt en voor Covid moet ge u emotioneel opladen, elke dag opnieuw, en ge weet nooit zeker waar dat ge gaat staan, of ge moet voor, voor de zoveelste keer bijvoorbeeld naar de kinderintensieve, alle dat, dat, dat kan bij ons allemaal. Ge kunt op kinderintensieve geplaatst worden, ge kunt op brandwonden geplaatst worden. Waar er een tekort is, zult ge gaan werken en, en dat is destructief. En dat is nu wat bij, tijdens de Covid gebeurt, we hebben tien bedden voorzien, er zijn er zeven vrij, dan zullen er twee verpleegkundigen minstens ergens anders gaan werken. En die vinden dat niet fijn. Maar het is een economische noodzaak om uw ziekenhuis te runnen, he, dat weet iedereen. Maar het is zwaar.” (FG (head) nurses)

- The help and support of staff from other units decreased, as regular activities in other part of the hospital restarted.

“Dan zijn we bij het afschalen, dan terug naar een gemengde intensieve gegaan en dat hebben we eigenlijk toch als heel stressvol ervaren, omdat dan ook de rest van het ziekenhuis dikwijls terug opgestart wordt, de hulp wegvalt.” (FG head nurses)



Providing care to COVID-19 patients was also **physically** heavier than usual.

- Because of the patient profiles: the management and treatment of COVID-19 patients requires high levels of care (mainly respiratory care – often in prone position). Taking care of a COVID-19 patient is already physically demanding but it is even more so when patients are obese, which is regularly the case in COVID-19 related ICU admissions. It has a large impact on mobilization and other activities.

«- Il y a une lourdeur physique qui est accrue aussi parce que... en particulier avec le Covid c'est souvent un problème respiratoire, on va mettre le patient en ventral, ce qui est physiquement lourd et qui nécessite une surveillance accrue donc c'était, psychologiquement plus lourd avec tout ce qui vient d'être dit, mais aussi physiquement plus lourd.

- (...) c'est plus lourd parce qu'il faut les retourner, mais c'est aussi plus lourd parce que la majorité sont obèses et donc on voit bien que... à l'heure actuelle en Europe, plus de la moitié des patients qui sont en soins intensifs sont obèses ou en surpoids, voire deux tiers. (...) Or c'est une réalité. Quand on retourne un patient de 100 kilos, ce n'est pas la même chose que de retourner quelqu'un de 54 kilos. » (FG physicians)

- In quite periods nurses are allowed to rest and take a break, instead they are sent out to other units

« Plutôt que de laisser récupérer un tout petit peu souffler l'équipe infirmière, on les envoie directement aider aux urgences, aider ailleurs où là, ils manquent des bras et donc c'est quelque chose qui est extrêmement mal vécu aussi par l'équipe d'infirmières. » (Physician)

The **COVID-19 context also created a lot of frustrations** among healthcare professionals and ICU nurses in particular. Several reasons for these frustrations were named:

- At the hospital level:

- ICU nurses had to be on the forefront in dealing with the COVID-19 pandemic during the entire crisis. ICU nurses felt that the workload remained continuously high and that they were the only group that had to go on while other non-ICU staff could reduce their activity (e.g. physicians who stopped consultations, etc.).

« Il y a eu, pour une partie, une très bonne collaboration avec les médecins, mais, pour une autre partie en tout cas, c'est comme s'il y avait une sidération générale dans l'hôpital et si le département infirmier ne prenait pas des initiatives, ne suggérait pas des solutions de fermeture de lits, des solutions de réaffectation de personnel, de rappeler pour le week-end, etc., il n'y avait rien qui se passait. Donc le département infirmier, à mon sens, a vraiment pris un leadership par rapport (...) au fait de devoir se débrouiller avec les moyens qu'il n'avait pas. Mais donc un sentiment de solitude.... Plus de solitude que d'abandon parce que je pense que tout le monde était désemparé par rapport à la situation et on s'est retrouvés bien seuls devant l'incertitude et devant un phénomène qui faisait peur à tout le monde. Et donc des médecins qui préféraient arrêter leurs consultations, arrêter les salles d'opération et attendre de voir, de voir un peu ce qui allait se passer. Seulement les infirmières, elles, elles devaient rester au front. » (FG middle managers)

- Respondents expressed the perception that the 'usual suspects' were always asked to assist in the frontline of COVID-19 care: the nursing units that were transformed into COVID-19 units and the nurses who were asked to help in COVID units and take care of COVID patients were often the same at all times.

« On devait faire une gastroscopie à un patient. Le gastroentérologue de garde n'a pas voulu venir parce que c'était un Covid et qu'il avait 66 ans le docteur. Moi ça me choque en fait, ça me choque encore à l'heure actuelle alors que maintenant... voilà on a quand même travaillé, moi je n'ai même pas été malade une seule fois, mais... ça me choque encore maintenant à l'heure actuelle, c'est toujours les mêmes qui vont



dans les Covid, toujours et même au niveau infirmière. C'est toujours les mêmes salles qui sont Covid, toujours.» (FG nurses)

- The postponement of (elective) surgical procedures because of COVID (to create ICU capacity for COVID-19 patients) frustrated some staff members because as time progressed they started to notice the impact. After all, they noticed that non-COVID patients arrived at the intensive care units in a much more critical state than they would have been when their care had not been postponed.

“Le fait que tous les non-Covid ont, ont dû avoir une chirurgie postposée, que ce soit des patients cardiaques ou cancéreux ça a aussi créé un très profond malaise parce qu'on mangeait du Covid matin, midi, soir et en fait il y avait toutes sortes de gens y compris dans la famille des infirmières qui avaient une chirurgie importante qui était postposée. On voyait des, les quelques chirurgies urgentes qui se faisaient étaient arrivées à un état catastrophique et donc là, c'était encore un sentiment de, d'injustice par rapport à d'autres patients qui les mettaient mal aussi et les médecins aussi, mais je veux dire les infirmières aussi. » (FG physicians)

- In some cases, hospitals have implemented IT changes during the crisis. This is an additional source of adaptation and workload that was not appreciated in such heavy times.

« Nous en plus on nous a lancés, à la deuxième vague, notre outil informatique pour le dossier informatisé hein. Donc en pleine pandémie, on s'est retrouvé à ne plus avoir de papier. (...) Et des ordinateurs qui ne fonctionnent pas à l'intérieur des chambres. Donc, il fallait tout noter, ou sur papier ou dans la tête et puis sortir après une heure et tout noter quoi. Donc là ça a été un défi qu'on a osé nous [imposer] ! » (FG nurses)

- At the societal level:

- For part of the ICU nurses, it was difficult to care for non-vaccinated patients. Nurses had a very difficult time dealing with a higher workload, use of PPE and all the frustrations already mentioned above. Taking care of persons who did not follow the recommendation to get vaccinated in order to protect themselves and others could be then difficult to accept.

“(...) de mensen met de non-vaccine, he, de non-vaxers. Ook daar werd op de duur die draagkracht om daarmee om te gaan en, en uit te leggen dat die mensen, ja, dat die ook een keuze hebben en recht op een keuze. En dat als dat misloopt, dat die mensen recht hebben op verzorging. Wel, daar is toch ook wat tijd in gestoken om, om dat uit te leggen en dat herhaalde keren uitleggen dat, dat... Maar dan wordt het moeilijk. Euh, voor, voor zware pathologie zorg te dragen, terwijl dat je weet dat er misschien andere keuzes hadden kunnen gemaakt worden. “ (Physician)

- As the COVID-19 pandemic progressed, nurses felt a lack of societal praise and recognition for the role of nurses (and healthcare staff in general), which was a sharp contrast to the first wave when society literally applauded for the healthcare sector. Moreover, the attitude of part of the population changed in the sense that ICU nurses experienced that they were held responsible for the continuous COVID-19 protection measures of society as a whole. After all, they felt that the public and families blamed them for the consequences of policy decisions.

“Plots waren het de ziekenhuizen die in de weg lagen voor het ‘rijk der vrijheid’. Dat zijn dingen die psychologisch zwaar wegen voormensen die eigenlijk een zorgberoep gekozen hebben en er eigenlijk, proberen dag in dag uit voor zieke medemensen te zorgen. Als ge dan nog ne keer onder druk gezet wordt en agressief behandeld wordt.” (Hospital umbrella organisation)



- At the political level

- The compulsory vaccination for healthcare professionals was perceived as an unfair and discriminatory measure by some: why them and not everyone?

« L'obligation vaccinale pour les soignants... Alors ça, ça peut tomber sous le sens euh, euh voilà pour les soignants, mais c'est arrivé au plus mauvais moment et euh c'est un moment où finalement où on avait, alors que nous on était en difficultés aux soins intensifs, on voyait arriver des gens non vaccinés et puis euh on voyait ces gens qui ne se font pas vacciner alors que nous, que les soignants allaient être obligés de se faire vacciner. Donc ça c'est, c'est quelque chose qui est totalement incompréhensible pour les infirmières (...) c'est en fait, c'est une maladresse politique, mais monumentale, monumentale. (...) C'est un sentiment de discrimination qui est, qui est toxique alors que ce serait plus simple d'obliger le vaccin pour toute la population belge pourquoi est-ce qu'eux euh sont traités différemment donc c'est, c'est encore une injustice supplémentaire. » (FG physicians)

- The letting go political decisions in society was also a source of frustration because it could be perceived as a lack of consideration of the heavy work they have and do not encourage a partnership patient-healthcare practitioner.
- The corona measures (e.g. visitor restrictions, mouth masks) have had a serious impact on the work of nurses. In pre-pandemic times they invested a lot in processes as patient empowerment and involving family and relatives in patient care. By the ongoing restrictions nurses felt that they could not do their job properly.

“Wanneer gaan wij niet meer in die Covid-maatregelen moeten zitten? Want ja, het is natuurlijk wel gemakkelijk om te zeggen van ja, ja, maar doen jullie dat maar voort. Maar gaan ze nu echt verwachten dat wij als verpleegkundigen acht tot tien uur per dag continu met dat masker oplopen en, en FFP2's, en ons bezoek

gaan verplichten van het minder te doen en ons flexibele bezoeken niet meer te mogen openstellen. Allez, ik vind dan, qua patient, , participatie, allez, patient empowerment, familieparticipatie. Dat zijn allemaal zaken dat we vóór de pandemie hard aan, aan het werken waren en dat is nu als een kaartenhuisje wat ineengezakt omdat we gewoon niet goed meer bijeen mogen komen met, met die mensen rond de patiënt, dus dat is wel, wel, wel jammer, ja.” (FG head nurses)

- Respondents felt that there was insufficient central guidance of patient transfers across hospitals (e.g. ICU admission criteria). Therefore hospitals were obliged to organize this themselves. As a consequence some hospitals refuse patients who had to be admitted by other hospitals. This created the perception that workload was not evenly distributed across hospitals.

“Dat is dan derde of vierde golf patiënten vanuit andere regio's van het land worden aangevoerd. Euhm, waarbij dat er soms ook andere, triagecriteria werden gebruikt, dus, bijvoorbeeld onze regio is zeer streng in triage. Patiënt wordt niet meer opgenomen op intensieve zorgen of krijgt een code beperking therapie. Deze patiënt, ja, gaat overlijden en langs de achterdeur wordt via een ander triage systeem een patiënt binnengereiden vanuit een andere regio van het land waarbij dat je merkt dat we met hetzelfde triage systeem absoluut niet is rekening gehouden. Wel, dat kun je niet verkopen aan mensen. En dat werd ook aangegeven dat dat men het daar zeer moeilijk mee had en dat werd ook uitgesproken en meerdere malen uitgesproken op de afdeling.” (physician)

- The decision to allow to delegate some nursing tasks to non-nurses as a temporary COVID-19 measure was perceived as an absence of recognition of the nursing expertise. On one hand the government requires nurses to follow a longer education (i.e. extension of the Bachelor from 3 to 4 years) to become a nurse, and on the other hand, they consider that the tasks are not so specialized and can be done by non-nursing staff.



« - Je pense qu'un élément qui n'a pas été qui n'a vraiment pas été bien perçu au niveau du terrain c'est les dispositions particulières qui ont été prises par le gouvernement et autorisant la prestation d'actes infirmiers par des non infirmiers (...) à la fois on vous demande de faire quatre ans plus une cinquième année d'études. Ce n'est pas assorti d'une revalorisation financière. On met des normes en disant ben il faut des infirmiers spécialisés pour pouvoir tenir des soins intensifs et puis, dans la foulée, ben finalement, je vais caricaturer un peu hein, mais je prends un quidam dans la rue, je lui donne une mini-formation et allez hop boom bon on s'improvise infirmier du jour au lendemain. Et, et c'est prendre cette décision comme ça, c'est vraiment les prendre comme, comme une gifle. (...) Difficile hein...très difficile hein. (...) On est en première ligne, effectivement, si les départements infirmiers n'avaient pas été à la barre pour prendre un ensemble d'initiatives et de forces de proposition et surtout de solutions dans le cadre de la gestion de la crise, je ne sais pas où on serait où on serait maintenant. Et puis finalement (...) on ramènerait la profession infirmière à rien.

- Il faut savoir que ce n'est pas venu une fois, c'est venu trois et c'est quand même passé. Et donc sur deux ministres différents et autres, et donc ça n'a fait qu'appuyer, renforcer l'absence de prise en compte et de reconnaissance sociale. » (FG middle managers)

All of these factors contributed to a feeling of **general exhaustion** of the ICU nurse staff. While they already felt overburdened before the COVID-19 pandemic (e.g. due to additional tasks within quality accreditation programmes), COVID-19 was the straw that broke the camel's back for many.

“‘t Is zo dat ik het eigenlijk heel belangrijk vindt, de laatste vier jaar is er heel veel geveegd en gevraagd van verpleegkundigen op de werkvloer, op intensieve zorgen. Eerst naar kwaliteitslabels die moesten gehaald worden. En nu eigenlijk met Covid, dat je toch wel voelt, of heel veel druk ervaart en dat er heel veel mensen neigen naar burn-out, dat het toch wel lastig wordt allemaal” (FG head nurses)

3.4.4 What is expected to ensure high quality of care in the ICU?

3.4.4.1 An adequate patient to nurse ratio

Quality of care is related to the availability of nursing staff. The patient-to-nurse ratio in ICU is lower and less variable than in other hospital units. After all, critical care patients require a high intensity of care and patients-to-nurse ratios vary from 1:1 to 3:1. Some interviewees mentioned that patient-to-nurse ratios were not really a point of concern in the pre-COVID period. They stated that this was more in balance with the care intensity (in contrast to general wards). Especially the discrepancy during day- and night shifts is less pronounced on ICU compared to general hospitalization units. Nevertheless, it is important to remind that the staffing levels and practices differ across hospitals. A notable difference is that between university and non-university hospitals. Other interviewees did, however, mention **concerns with the current patient-to-nurse ratios**. The following issues were raised:

- The Law includes a maximum of 3 ICU beds per nurse. This **legal maximum is perceived too high** and not adapted to the changing context of ICU care.
 - The evolution of medicine, medical procedures (e.g. increasing number of invasive surgical procedures require ICU care), societal expectations (e.g. patient and family involvement), economic reality (e.g. shorter length of stay on the ICU) have changed ICU nursing care over the past decades while the legal patient-to-nurses ratio for ICU did not. As such, it was considered to be outdated by several respondents due to the sharp increase in the care intensity. Moreover, the additional tasks and roles that are more and more assigned to ICU nursing staff (e.g. rapid response teams, tele-medicine support for other units) and their overall participation in hospital affairs (e.g. quality improvement and expert committees) reinforce this problem. Also the time required to guide nursing students and newly recruits is included in the patient-to-nurse ratios which lower the available time for direct patient-care.



« On évolue vers une médecine moins invasive avec beaucoup plus de soins, prise en charge de moins en moins... Enfin, de plus en plus active des patients et donc, tout ça, ça se solde par des soins nursing qui sont de plus en plus conséquents en termes de temps, en termes de, de lourdeur et ça n'a pas été suivi par un encadrement qui est resté figer euh depuis euh depuis plus de 25 ans. Le deuxième point, c'est que euh cette lourdeur et, et le fait que la pression psychologique a augmenté parce que les familles sont plus présentes, parce que euh les patients sont de moins en moins endormis et, et donc, tout ça concourt aussi au fait que le métier d'infirmier est devenu de plus en plus dur. Alors, vous rajoutez à ça que la plupart des hôpitaux ont développé des techniques euh qui sont de plus en plus invasives dans le sens du support et donc, qui nécessitent plus d'infirmiers alors que euh clairement, l'encadrement n'a pas suivi. » (FG physicians)

“Wat dat ik nog heb gezien is dat de, de, de voorziene bestaffingen of de gebudgetteerde bestaffingen nooit volgden. Alle extra functies dat intensieve zorgen verpleegkundigen erbij kregen op den duur, he, ze moesten dan de telemetrie beginnen opvolgen van andere afdelingen, de MUG lopen, Rapid Response teams oprichten, , tele-ICU doen... Allez, daar was eigenlijk zo van alles dat men dacht van, ja, als het nog wat iets of wat technisch is of monitoringgewijs, hup, ging dat bijkomen bij, bij de verpleegkundigen op intensieve en in ons geval ook medium care, dus dat hebben we wel fel gezien.” (FG head nurses)

- The 3:1 ratio is used as the default staffing practice for one or more shift types (e.g. only during night shifts, with a lower patient-to-nurse ratio during day shifts). When it is not busy on the ICU, this ratio can be sufficient. Nevertheless, during busy periods these ratios might be insufficient (e.g. high patient turnover; many patients with high care needs admitted during the same period). In case of the latter, its impact on the overall quality of patient care can be a concern. Nurses then have to limit their activities to the strictly essential tasks and cannot spend time to activities

that seem trivial but are essential to provide high quality of patient care.

“Dus inderdaad, die 1 op 3 verpleegkundigen, bij ons is dat in de late dienst, en de nachtdienst dat dat toen zo was. Euhm, dat was toch wel redelijk krap, zeker gezien de zorgzwaarte, waar dat de zorgzwaartemeting eigenlijk nooit gemeten is die er effectief was, wat wel een tekort is die ik zelf ontdekte toen dat ik hier eigenlijk een eindje bezig was.” (FG middle managers)

- In most hospitals, there is no appropriate measurement of the workload to adjust the patient-to nurse ratio accordingly. The variation in intensity of care and the mismatch between patient-to-nurse ratios and intensity of care is not objectivized. Nevertheless, bedside nurses clearly experience it when there is a mismatch between patient acuity and staffing levels. Despite the expressed need for objective workload measurement, not every task or responsibility of the ICU nurse is measurable while these nurses activities do contribute to the overall quality of care.

« C'est trois patients pour, pour une infirmière donc on a un encadrement qui, qui est fixe pour une charge de travail qui est variable euh et, et donc déjà donc ça nous pose un premier problème c'est-à-dire que, il y a des périodes très calmes, plus calmes et des périodes extrêmement chargées. Or l'encadrement ben il, il est plus ou moins fixe euh les infirmières font un euh un nombre d'heures plus ou moins fixe par mois. (...) c'est que la charge de travail est variable d'un jour à l'autre, mais elle est aussi variable au cours de la même journée où l'encadrement est le même, en pause de A, B et nuit ce qui n'est pas logique et donc beaucoup d'hôpitaux déplacent une partie de leur encadrement sur la matinée et donc quand on a le contrôle de la région, on est pointé du doigt parce que proportionnellement il y a moins de gens la nuit. » (FG physicians)



- Besides adjusting patient-to-nurse ratios based on objective workload measurement it is also possible to lower the legal 3:1 ratio based on patient indications. Yet, although there are several scenarios or profiles in which the patient-to-nurse ratio has to be lowered, the criteria to apply a 1:1 ratio are currently in most hospitals too restrictive. ECMO is often the only indication to apply a 1:1 ratio.

“Er zijn veel te weinig 1 op 1 indicaties. In mijn ziekenhuis is er maar één indicatie voor 1 op 1 en dat is de ECMO, de veno-arteriële ECMO. Als je geluk hebt, heb je een veno-veneuze ECMO, dat is, iets gemakkelijker. Maar dat is de enigste indicatie die bij ons, waarvoor een bed gesloten wordt.” (FG (Head)nurses)

- The 3:1 patient-to nurse ratio is **not always a reality** in the field because:

- The patient-to-nurse ratio does not only include bedside nurses but also head nurses that have management and leadership responsibilities and less time to spend to direct patient care.

« Les chefs sont comptés dans la dotation infirmière euh tout comme, en fait, toutes les personnes euh reprises dans l'équipe, que ce soit aide-soignant, aide-administratif, aide logistique, tout ça est repris dans un seul euh quota d'ETP. (...) On est tout le temps sur le fil parce qu'on n'est jamais en nombre donc finalement euh on n'arrive pas à faire son travail de management, on fait du travail d'infirmière parce qu'on remplace les infirmières tout le temps dans les chambres. ... le problème c'est qu'on est infirmier-chef, eh ben on est infirmier aussi et le travail de l'infirmier, de l'aide-soignant, de l'aide logistique on peut le faire, mais, dans l'autre sens, personne ne fera notre boulot en fait. Et donc c'est ça, cette difficulté de trouver les, les priorités, de se dire ben voilà pour l'équipe, allez pour les, les directions, ben ce serait logique qu'on soit tout à fait en dehors des, des soins. Euh, voilà. Et alors que pour l'équipe ben ce serait normal qu'on soit tout le temps dans les soins. » (FG head nurses)

- Hospitals do not always compensate for nurse absenteeism (e.g. sickness, (pre) maternity leave, holidays, recuperation). For small hospitals, when there is absenteeism, the ratio might even increase to 4:1. In addition, hospitals do not proactively take these absences or job dropouts into account (e.g. by hiring more nurses than required during summer when nurses graduate to anticipate on nurses leaving the job during the rest of the year). It is difficult to meet these shortages with new recruits given the scarcity in the labour market

« Il n'y a personne sur le marché moyen... à part, je dis vraiment des, des petits mouvements ponctuels. Et donc (...) on est au staff en septembre et puis ça diminue et les, les gestionnaires ont parfois du mal à se dire, alors je l'ai déjà entendu en réunion d'assemblée de middle managers ou autre chose, c'est expliqué, mais c'est quelque chose qui est compliqué, par exemple, pour ceux qui gèrent notre budget, par exemple, de service, de dire bien voilà en fait je devrai être à plus deux ETP une fois qu'on a fini d'engager parce que on sait sur les cinq dernières années qu'on va perdre probablement deux ETP sur l'année de gens qui vont partir du roulement habituel. Et donc ça veut dire qu'on se trouve au cadre, si tout va bien, en début d'année, enfin on va dire début d'année scolaire et dans les mois qui suivent, novembre, décembre, et vraiment on se retrouve déjà en sous-effectif. » (FG head nurses)

What was the impact of COVID-19 on the application of the patient to nurse ratio on ICU?

The COVID-19 crisis increased the absenteeism rates of nursing staff because of COVID infection, long term illness (PTSS, burnout), quarantine (in particular during the 'Omicron wave' end 2021 – beginning 2022). Moreover, it was more difficult to find candidates to help out in ICU (especially among non-ICU staff) because of anxiety to be contaminated and the physically and mentally heavy workload on COVID-19 ICUs. As the COVID-19 pandemic progressed more and more nurses (both ICU and non-ICU nurses) asked to be exempt from working on a COVID-19



unit. The combination of a high influx of patients and a shortage of ICU staff resulted in higher than usual patient-to-nurse ratio in some cases.

“ We hebben dus gemerkt dat dat voornamelijk de buddy's, dus de mensen die zijn bijgeplaatst dat daar het vrij snel, misliep omwille van die confrontatie met toch wel een redelijk hoge sterftegraad, voornamelijk in die eerste golf. En wat ook zeker wat speelde in de eerste golf, en dan verwijs ik terug naar het, die, die U-golf, naar de wat meer, stijvere verpleegkundigen, dat zijn mensen met een langere carrière, weet u nog. Vooral de angst. De angst voor het virus an sich en de angst om gezien hun leeftijd zelf geïnfecteerd te worden met alle mogelijke gevolgen van dien, en de angst om dat virus mee naar huis te nemen, in uw familie met alle gevolgen van dien. Dat speelde ietsje minder bij de jongere verpleegkundigen, maar speelde extreem bij de, oudere verpleegkundigen. Wat ook heeft geleid, dat sommige oudere verpleegkundigen gezegd hebben van kijk, we weten dat er nog altijd een non-Covid IC is, stuur mij maar naar de non-Covid IC” (physician)

3.4.4.2 A nursing staff with specific expertise and qualifications in ICU care

A. Availability of icu nurses

Next to an adequate patient-to-nurse ratio, there is a need for sufficient nursing staff with appropriate qualifications, skills and expertise. Working in an ICU requires specific expertise and qualifications. It is not only a huge problem to recruit these nursing profiles, but also to keep them in the unit or even in the hospital. This issue is not new, but has been highlighted by the participants as a main cause of staffing problems. Indeed, currently **there are not enough nurses (in general and with ICU specific expertise in particular) on the labour market.**

The reasons to explain this scarcity are diverse:

- The **lack of attractivity of the nursing profession** creates a lack of students in the nursing schools. We did not address this broad issue during the focus groups/interviews, but one reason mentioned is the

lengthening of the bachelor's programme from 3 to 4 years. In addition, because of this reform there was one year without new graduates.

“Wat ik niet begrijp als verpleegkundige, dat is waarom dat een artsenopleiding 6 jaar geworden is en dat dat voor verpleegkundigen 4 jaar geworden is. Ik weet wel dat ge zegt ge moet er (onverstaanbaar) voor de bacheloropleiding, 4 jaar, ik denk dat dat het beroep absoluut niet aantrekkelijker maakt.” (Hospital umbrella organisations)

- A lack of attractiveness at the base, also reduces the chances of having staff who specialise later on. In addition, for the future nurses, **working in ICU is often not attractive** and specialized nurses prefer to work in emergency care. One reason for the penibility of nurses who want to start working in an ICU is the high workload experienced by trainees during their training on the ICU. Another hypothesis could be the relationship with the medical team during their ICU training, which may be perceived as difficult in such a stressful environment. Moreover, trainees are not sufficiently prepared by the nursing school and are not optimally welcomed by the staff because of the lack of time and human resources.

“Tous ces étudiants qui arrivent chez nous, on n'a pas non plus souvent des professeurs de ces écoles qui viennent, en tout cas le premier jour les écoler et leur expliquer un petit peu ce qu'ils doivent faire. Du coup, ils arrivent comme un cheveu au milieu de la soupe, ils ne savent pas très bien ce qu'ils doivent faire donc ... on n'a pas tout le temps non plus le personnel pour les encadrer et donc ça, ça... ça pose quand même un réel problème quoi. Du coup, (...) ils sont complètement désabusés et moi ce qui me dérange c'est qu'après ... on a une mauvaise image à leurs yeux et du coup ben, voilà je pense que... par moment ça ne se passe pas très bien à cause de ça ... parce qu'ils ne se sentent pas concernés ni valorisés. » (FG nurses)



- The availability of (ICU) nurses on the **labour market is not equally distributed during the year**. In the summer, with new graduates, there are opportunities to recruit ICU nurses but later in the year it is really difficult.

« Le fait qu'il y a une pénurie, ben ça veut dire que dès que les gens sont engagés ils sortent de l'école, eh bien on peut les engager en général juillet ou voire septembre ils démarrent et après il n'y a plus rien jusqu'au mois de juin sauf quelqu'un qui change d'hôpital, quelqu'un qui déménage, mais c'est anecdotique. » (FG head nurses)

- The **competition on the tight labor market** is high at different levels: between services, between hospitals, between regions, and between countries. Some hospital types (e.g. restriction in which benefit packages they can offer), regions (e.g. no nursing school nearby), have competitive disadvantages compared to others. In general nurses will not commute long distances to their job. They often prefer to work in a hospital close to where they live. This factor is a restriction for hospitals to recruit nurses. The recruitment is also particularly difficult in regions because of competition with neighbouring countries, i.e. Luxembourg and France, where working conditions, and salary in particular, are much better than in Belgium. The high salaries in countries such as Switzerland also attract part of the Belgian nursing workforce.

New legislative framework regarding mobility between professions limits the possibility of recruitment. For example, midwives today cannot longer be employed as nurses while there is no scarcity in this profession.

Next to the problem of attractiveness and the recruitment, there is a huge **retention problem in the nursing profession and in the ICU in particular**.

A lot of factors can explain this according to the interviewees.

- The lack of (monetary) rewards. Several respondents stated that the remuneration of ICU nurses does not sufficiently take into account the number of years of study, their specialisation, the degree of responsibility and irregular shifts. (See 2.3.3.3)

« Cette rémunération est tellement basse que beaucoup d'infirmiers vont avoir une activité complémentaire euh notamment de domicile ou alors je sais qu'il y a des hôpitaux où elles font de l'intérim et donc, elles se font, elles reviennent travailler dans le même service, mais sous le statut intérimaire qui est plus intéressant que leur statut de base. Et donc euh évidemment ça concourt à, à l'épuisement progressif et ça fait aussi en sorte qu'après un certain temps ben ils se rendent compte qu'ils gagnent beaucoup mieux leur vie avec une pénibilité moindre, par exemple en faisant du domicile avec plus de lassitudes dans les horaires par exemple, puisqu'on a à des points morts en ce moment-là. Et donc on a des gens qui, qui finissent alors qu'ils aiment bien leur job, par arrêter. » (FG physiciens)

- The lack of societal acknowledgment. (see 2.3.3.3)
- The working conditions: physical exhaustion due to the irregular working hours is a constraint that is not easy to balance with private life or health. The frequent night shifts that have to be performed by ICU nurses, for instance, are more burdensome for older than for young nurses. This problem is also worsened by strict social laws. On the one hand, when rules are strictly applied, it impairs nurses to have more than 2 consecutive weeks of annual leave. The time to rest and recover is thus limited. On the other hand, regulations on night shifts have been modified to protect workers but it does not fit with the work-life balance of every nurse. As a consequence some nurses will rapidly ask for work reduction or change to another unit or another setting (e.g. home nursing), etc.

« On se rend bien vite compte qu'au bout de trois-quatre ans ben il y en a déjà qui demandent des réductions de temps de travail, il y en a d'autres qui demandent leur transfert vers d'autres unités avec des horaires un peu plus, entre guillemets, confortables. Voire d'autres même qui quittent le métier ou qui quittent l'institution pour refaire des soins à domicile ou autres. » (FG middle managers)



- ICU nurses are often characterised by a personality type that is at risk of exhaustion. They are vulnerable since they are used to stretch themselves, want to obtain perfectionism and are often too proud to admit that they are at the end of their rope.

« Il faut savoir que l'infirmier de réa en général ne va pas facilement ni se confier, ni dire qu'il est au bout du rouleau et donc ils ont tous fait beaucoup, beaucoup d'heures. Ils sont tous allés jusqu'au bout de leur retranscription et donc quand ils craquent, euh c'est, c'est quelque chose qui est plus difficile à récupérer. (...) les gens qui choisissent de rester infirmier de réa c'est une profession où euh on estime... l'estime de soi et on veut montrer qu'on est fort et va jusqu'au bout et on mord sur sa chique et puis à un moment ça casse et donc ça, ça concourt très clairement au, au problème. » (FG physicians)

« C'est une fierté hein de ne pas se dire qu'on est en burn-out, je pense, en tant qu'infirmier et c'est une honte » (FG nurses)

- All the above factors lead to mental health problems like burnout or the desire to leave the ICU, the hospital or even the profession.

« Et c'est ça qui peut frustrer les gens, qui peuvent faire qu'à un moment qu'il y a des burn-out où euh les gens ont envie de quitter la profession parce que leur boulot ils arrivent à le faire, mais pas avec la qualité qu'ils voudraient pouvoir donner » (FG headnurses)

- No adequate training / mentorship (see 2.3.3.1)
- The observation on the field that a 'large' portion of nurses with advanced education in ICU and emergency care often prefer to work in emergency care.

« En ook nog een ander probleem is, mensen die studeren voor een BBT, starten op intensieve zorgen. Maar plots komt er dan een vacature vrij op de spoedgevallen, ja, en hun interesse ligt daar dan een stuk. En ja, soms solliciteren ze daar dan op met

als gevolg, de mensen op IZ hebben daar een jaar aan gewerkt om die mensen op te leiden. » (FG middle managers)

- A good leadership and ambiance in the team is a key factor to keep staff motivated to work in the ICU (see 3.4.4.3). But unfortunately, retention of headnurses with these skills is also problematic.

« Moi j'ai connu quatre chefs de service en dix ans, à cause du fait qu'on avait un turn-over important au niveau des... du service aussi. On a 21 lits qui tournent sans cesse et avec un turn-over d'entrée entre six et sept entrées chaque jour avec des sorties. Donc ... il y a les turn-overs de patients et alors une difficulté d'installer une équipe et de garder une équipe parce que le chef changeait tous les deux ans. Moi je suis la cheffe adjointe, je suis là depuis 20 ans. Donc à cause des conditions de travail et du fait que c'est un service très, très, très, très lourd. Ils partent, il y en a qui partent parce qu'ils ont d'autres opportunités de carrière et il y en a qui partent parce qu'au bout de deux ans ils sont épuisés par tout le travail de management et le fait qu'on est tout le temps sur le fil. » (FG Head nurses)

What was the impact of the COVID-19 pandemic on the retention of available staff? The COVID-19 pandemic made clear what was already known but not yet sufficiently acknowledged. Working on the ICU requires specific expertise and skills that is not available among nursing staff without ICU specific training, education and experience in ICU care. The pool of nurses fit to work on an ICU is scarce and the COVID-19 pandemic added additional challenges.

“De pot waaruit je kan gaan vissen, de zee waaruit je kan gaan vissen, dat die zeer beperkt is, he. En dat je niet zomaar verpleegkundigen kan inruilen op zulke dienst. Ik denk dat is voor, dat is een van de belangrijkste lessen.” (Physicians)

- Working during the COVID-19 crisis caused post-traumatic stress and burnout among a considerable group of ICU nurses. Many of them have the desire to change careers.



« Moi ce qui me, ce qui me marque le plus c'est aussi l'augmentation de, de l'épuisement professionnel, mais ça rejoint un peu ce que X a dit aussi avec la perte de sens, c'est, c'est lié, mais donc il y a beaucoup plus d'épuisement professionnel avec un certain nombre de personnes qui quittent carrément, ils ne quittent pas seulement l'hôpital, ils ne quittent pas seulement le service de soins intensifs, mais ils quittent le métier d'infirmier. » (FG middle managers)

- Retention was more difficult also because of the competition with Luxembourg increased. By crossing the frontier, nurses double their remuneration on top of additional benefits (e.g. cheaper fuel for commuting).

« On est à une vingtaine kilomètres de la frontière luxembourgeoise et nous sommes confrontés(...) [à] une concurrence déloyale avec nos amis luxembourgeois. Donc, c'est quelque chose que l'on constatait déjà avant la crise et c'est quelque chose qui s'est empiré pendant la crise. On a vraiment eu de, de gros départs de personnes... de personnel qualifié pendant la crise. » (FG middle managers)

B. Education and competencies of ICU nurses

- Basic training

The reform of the Bachelor-level nursing education program implied that, to have advanced education in ICU care, students in Flanders have to follow a post-graduate course instead of a Bachelor-after-Bachelor. This post-graduate program is structured in several modules and comes with a higher cost for students (or their employers). In addition, in the 4th year of the Bachelor program, the traineeship on ICU ('stages') is less intensive compared to the previous Bachelor-after-Bachelor program where nurses had intensive traineeships on both emergency- and intensive care units. As such, new recruits have not the same level of expertise as before. They need time to be able to provide care in an autonomous and independent manner. And as already mentioned, the resources (e.g. no sufficient means to liberate nurses to spend time on mentorship roles, etc.) in ICU's are lacking to offer a qualitative support of traineeships.

« Quand une infirmière sort de l'école, elle n'est pas compétente, il lui faut en moyenne deux ans pour arriver à prendre en charge correctement un patient tout-venant sans l'aide de ses collègues. Donc ça, c'est une grosse problématique (...) la nouvelle loi, les nouveaux changements de formation accroissent encore le problème. » (FG physicians).

As the new recruits arrive together in the same few weeks (after the summer), it is important that there is a good balance of expertise per shift and that the patients are adequately assigned to the nurses.

- Continuous training (lifelong-learning) is required to work in intensive care (and to maintain the special professional title). But the training is not necessarily paid by the employer or cannot necessarily be followed during working hours.

« Want, vier jaar opleiding, die mensen hebben geen bijzondere beroepstitel, maar de kostprijs van nu, de nieuwe bijzondere beroepstitel behalen, dus het postgraduaat zit je aan, denk ik, tegen de 3.000 euro... zelf op te hoesten als medewerker. » (FG middle managers)

What was the impact of COVID played on the qualification level of nurses employed on ICU's?

- First of all, it was stated that increasing beds staffed by non-ICU staff resulted in a higher mortality rate in surge beds ([partly] staffed with non-ICU nurses) than in regular ICU beds (staffed with nurses with specific qualifications and expertise in ICU). This highlights the need for specific ICU expertise among nursing staff employed on ICUs to ensure quality care.
- Due to the COVID crisis, there was less time for on-the-job training/mentoring traineeships. Moreover, the types of patients were less diverse than in normal times, so training was not as extensive and comprehensive as usual. This affected the quality of newly recruited graduate nurses.



- Because of the high need for staffing on ICU, many nurses who worked on ICU during the COVID-19 pandemic were not at all trained in ICU care (e.g. nurses who were usually working in operating theatres or post-anesthesia care units) and required a 'fast-track' training in ICU care. The collaboration with non-ICU trained nurses caused additional stress to the ICU teams. After all, they had to take on tasks and responsibilities with which they were unfamiliar (e.g. the supervision of and delegation of tasks to non-ICU nurses). Moreover they felt responsible for a higher number of patients than usual (e.g. because they worked in team with non-ICU nurses the caseload for which they felt they had the final responsibility also included the patients assigned to the non-ICU staff)
- The high workload and the stressful context tended to increase job dissatisfaction. As a consequence, a depersonalisation of care was expressed: 'death became usual', the absence of visitors was considered as an advantage because it facilitated the work (ignoring the importance of family involvement and presence for both the patients' recovery and their and their families psychosocial wellbeing).

« (...) des réactions, par exemple, qui disaient « enfin vous avez choisi ce métier, il faut vous faire une carapace, c'est normal, vous devez vivre avec la mort, c'est un virus effroyable » et donc on les voyait arriver comme des poissons hors de l'eau à 10 heures du matin et c'était presque normal qu'à 16 heures ils fussent morts. » (FG middle managers)

3.4.4.3 Management and leadership: importance of providing stability in nursing teams

A good management of the financial and human resources with nursing staff involvement results in stability of the ICU teams. Indeed, qualitative ICUs require a good management. That also implies that bedside nurses are involved and that communication with the bedside nurses is smooth, open and bi-directional. Combined with all the other factors it will contribute to the stability of the team (less turnover of nursing staff). This stability is a pre-requisite, not only to deliver patient care according to high

standards but also to develop and implement quality improvement projects and care innovation. Unfortunately, such a stability is hampered by the lack of good leadership (hospital management, nursing department, physicians) resulting in high turnover of nursing staff.

« A partir du moment où vous avez un chef de service qui change tous les deux ans... Vous n'arrivez pas à installer des projets de service. Moi en tant que chef adjointe à chaque fois j'ai dû recommencer un travail avec une personne et donc on finit quasi jamais rien dans les projets et donc vous n'avez pas une stabilité d'équipe puisque le chef de service on s'en va à chaque fois donc ça reste difficile aussi pour l'équipe qui est là et qui est en place. » (FG Head nurses)

From management, it is expected that staffing problems at the mid- and/or long-term are well anticipated. Yet, this is not always the case. One of the reasons is because it is not affordable to foresee extra nursing staff in order to compensate (potential) future staff absenteeism or departures. Appropriate bed capacity management is also required, including the decision to close beds in case of nursing staff shortage. Although it is needed to close beds in case of staffing shortages it is not easy and unpopular both towards patients (e.g. postponement of care or transfer to another hospital), hospital management and physicians (e.g. impact on hospital budget and physician's revenue; physicians have to disappoint patients).

In addition, it is important to involve nurses at the bedside when discussing staffing decisions. But consulting nurses on staffing decisions is only a first step, acting on this input is at least as important. Nurses feel that their efforts to give their input are not sufficiently taken into account by hospital management. Managers also have to guarantee attractive and acceptable working hours allowing nurses to maintain a good work-life balance. Nevertheless, this is not easy because of the application of the social laws.

"Der zijn heel veel, vragen naar de directie gegaan, voor hulp, voor van alles en nog wat, maar daar wordt niks aan gedaan. En dan is het zo, bij de, bij de collega's van weeral iets moeten invullen en wat wordt er mee gedaan? En dat is, een beetje, ja



dat stoot een beetje tegen de borst bij heel veel in onze groep. Er zijn ook de laatste jaren, ik denk, heel veel personeel ook weggegaan. Dus wij hebben op heel korte tijd, ik denk, alle, op pakt, 2-3 jaar, nu 15 mensen verloren door bepaalde omstandigheden en die niet door de directie willen gezien worden.” (FG (head) nurses)

Team stability also partly depends on the leadership skills of the managers, who are responsible for ensuring that newly recruited staff are properly integrated into the team. And in case of incidents, it is important to debrief with staff, especially young staff.

“Als je merkt dat het intensieve zorgen, dat zijn vaak mensen die los van de schoolbanken komen. Dat zijn niet mensen die al x-aantal tijd in zorg beschikbaar zijn, maar die mensen komen los van de schoolbanken. Waardoor dat die mensen gaan als het ware naar huis en die hebben nog altijd hun werk mee. Heb ik het goed gedaan? Hoe is dat verlopen? Hoe is er omgegaan met incidenten? Incidentbejegening maar ook personeel bejegening. Het is niet altijd zo dat dat een incident is uitgesproken voordat mensen naar huis gaan.” (Physician)

What was the impact of COVID-19 on the involvement of the ICU nurses and stability of the teams?

The COVID-19 crisis was described as very time-consuming and resource intensive. As a consequence, all available time was spent on the bare necessities (i.e. direct patient care and managing the crisis). There was no time left for nurses to work on care innovation projects, debriefing of critical incidents, etc. Also team building activities were not easy to organize. In terms of management, they stated that the management gave them the feeling that high workload was ‘normalised’.

Nevertheless, the COVID crisis did not increase turnover everywhere. It also has strengthened the mutual support and working relationships (e.g. within nursing teams, nurse-physician relationships, bedside nurses and management relations) in some ICUs. Solidarity (‘we are in this together’) was expressed with medical staff, other units and the hospital management.

3.4.5 Initiatives to improve the situation

Several initiatives have already been taken at the ICU or hospital level. Improvement initiatives by the public authorities (even before the COVID pandemic) were also mentioned.

3.4.5.1 Initiatives at the ICU level: sensibilization of the management based on objective arguments

The staff must objectify the situation in order to encourage the hospital management to take action and find solutions.

The measurement of **workload** via standardized measurement tools (e.g. NAS, TISS-28) helps to discuss about the (dis-)balance between patient acuity and staffing resources and support decision making (e.g. allocate staff from the floating pools). Also the ‘taxonomy of the nursing profession’ is mentioned. This refers to an inventory of nursing tasks and the task differentiation between nurses or other professional groups. This taxonomy not only allows to organize the unit in a better way but also make the needs in human resources visible in order to convince higher instances about the need to undertake action (government or managers).

“[De NAS] dat is eigenlijk invullen, elke shift. Dus elke verpleegkundige vult van zijn drie patiënten elke shift, een aantal parameters, dat is op basis van de TISS-28, en dan nog wat extra taken dat daar zijn in opgenomen. Wat zit daarbij onder andere, ja, als ge met iemand naar hyperbare moet of op transport moet zo een aantal extra zaken, ook reanimeren en zo dat, dat maken dat er toch wel kan gekeken worden hoeveel tijd per dag spendeer je nu aan, aan patiëntenzorg als verpleegkundige. Dus dat is wel goed, dat geeft ons een dashboard. Dat creëert een dashboard en op dat dashboard kunnen wij dan voort. Euhm, waar dat de verantwoordelijke van de dag eigenlijk samen met een arts op beslist van, waar gaan we de volgende opnemen? Euhm, waar is er nog ondersteuning nodig, of waar is er een beetje marge om iemand weg te nemen bijvoorbeeld.” (FG head nurses)



In terms of **mental health of the nursing staff**, a team decided to assess the risk of burnout among ICU staff using the Maslach Burnout Inventory survey. In addition, support from psychologist (e.g. including them in the teams) and organising all kind of supportive sessions (debriefing critical incidents, relaxation sessions, etc.) were offered during the COVID-19 crisis.

« Ce qu'on a essayé de faire justement par rapport aux réunions avec la direction, on s'est appuyé en tout cas sur le score de burn-out de Maslach. (...) il y a 46 infirmiers qui ont répondu anonymement à notre questionnaire. Et ben, sur les 46 infirmiers, il y a quand même 42 pour cent qui sont à haut degré de burn-out...c'est quand même assez conséquent. (...) C'était pour avoir un petit peu plus de poids auprès de notre direction, pour pas arriver en disant ben voilà rien ne va. On a quand même essayé d'arriver avec des preuves qu'on était au bout, au bout du bout » (FG nurses)

And there is also a room to **improve the communication** between the services to alleviate tensions in case of stressful situations. The use of a standardized language could be there useful.

« La communication téléphonique à l'intensiviste quand il est dans sa chambre de garde avec un langage ben type SBAR ou quelque chose comme ça pour vraiment que la communication soit claire, univoque et que ça puisse être tout à fait transparente en termes de gravité et de degré d'urgence, etc., et que ce soit personne dépendant quoi. (...) c'est les outils de communication pour la, entre guillemets, la standardiser dans ses modalités, ça n'a pas mal apporté aussi. Donc au début, évidemment, les, les équipes étaient un peu réticentes et maintenant quand ils communiquent en dehors de ces de ces clous, entre guillemets, si je peux dire, le médecin lui demande de reformule en lui demandant de respecter le, le, le canevas et vice-versa quoi, pour les situations urgentes notamment et ça, ça permet vraiment d'apaiser une partie des tensions en cas de réa, en cas de situation urgente, etc. » (FG middle managers)

3.4.5.2 Initiatives at the hospital level: guarantee the predefined patient-nurse ratio

When the pre-defined patient-nurse ratio cannot be obtained there is a clear threat for patient safety and quality of care. Nevertheless, during the first wave, due to the enormous influx of patients, there was no other option and patient-to-nurse ratios increased. This came with a price (e.g. the impact on quality of patient care and staff wellbeing).

“Maar in de eerste golf hebben we ook op gegeven ogenblik ons gigantisch vergist. U kent de klassieke pers gradaties, he, 1 op 2, 1 op 3, 1 op 4. In de eerste golf en ook de tweede golf hebben we ons mispakt aan het feit dat gezien de te hoge nood aan geschoold personeel en de hoge nood aan bedden dat wij naar een 1 op 4 zelfs gegaan zijn. Wel, daar hebben we zwaar de prijs voor betaald.” (physician)

Working with suboptimal patient-to-nurse ratios is therefore not a valid option when there is insufficient staff and other strategies have been followed (some already present pre-COVID).

A first possibility expressed during the interviews and focus groups is to **limit admissions in ICU** to patients who really need it or will benefit from it. Consequently, admissions could also be limited by using strict criteria, filtering patients at the entrance of the unit. This could be done by imposing a go ahead from a responsible of the ICU.

« chez nous, on a demandé que ce soit un patron et puis un assistant qui aille voir les patients, que ce soit aux urgences ou à l'étage. Parce que parfois il y avait des erreurs de casting où effectivement le patient ne devait pas nécessairement venir chez nous ou alors il venait chez nous et puis il mourrait dans l'heure parce qu'il était trop loin dans sa pathologie. » (FG nurses)

And when also this is not possible anymore, there is no other solution than **closing beds**. This solution was rarely taken in pre-pandemic times as it was not accepted by physicians and/or hospital management. As such, according to what was raised during interviews, the shortage of nursing staff was considered to be the problem of the nursing department and the



nurses. Only in very exceptional circumstances and on specific request of the nurses and nursing department ICU beds were closed to deal with staff shortages in pre-pandemic times. Now it seems that lessons have been learned and it became more and more acceptable, partly because trust in the head nurses has grown, but also because physicians were confronted with the clear impact of insufficient ICU staff on the quality of patient care (it became their problem as well).

« - Chez nous, dans notre hôpital en tout cas, on ne parlait pas du tout de fermeture de lits [avant le COVID]. C'était dotation infirmière, s'il y a un problème c'est votre problème, mais nous l'équipe médicale n'allons pas fermer des lits. » (FG head nurses))

Another strategy mentioned during the qualitative data collection to cope with situations where there is insufficient nursing staff is to **search for additional help** within or outside the ICU nursing team. To do this, several initiatives have been pursued:

- The strategies used to increase manpower **by increasing (temporary) workforce**

In "non-crisis period"

- Some social laws hamper to work on top off regular hours. A solution is sometimes to staff agency nurses. Yet, this comes with an additional costs and has several other consequences (e.g. these nurses are not always familiar with ICU-care or with the processes of the ICU/hospital; additional stress for ICU team). In some hospitals the own hospital staff is working as agency staff and in this way social laws are bypassed.

« L'intérim chez nous c'était autorisé et c'était même souhaitable de pouvoir réengager nos infirmières en intérim. C'est-à-dire que quand elles dépassent un certain nombre d'heures dans le service, elles peuvent plus travailler. Elles sont dans l'illégalité si elles font trop d'heures. z nous aussi ils ont développé, ça, ça ne s'appelle pas une prime de rappel, mais ils ont essayé de valoriser les, les heures supplémentaires dans... en restant dans

un cadre légal qui est vraiment un cadre extrêmement étriqué. » (FG physicians)

- The creation of a floating team. Sometimes these teams are allowing nurses to work part-time on an ICU and part-time on emergency care, to increase attractivity. However, in general, the attractivity to work in floating teams is low because most nurses prefer to work in a fixed unit/team with some exceptions such as the early stage of the career (e.g. to get familiar with several ICU domains).

« Alors nous avons mis en place une équipe mobile urgences réa. Je fais allusion à, à ce qui a été dit tantôt où les jeunes préféraient de loin être engagés dans un service d'urgence pour, pour des raisons qui leur sont propres et donc nous avons proposé à un certain nombre de personnes de faire mi-temps réa mi-temps urgences. Le Covid a détricoté à la vitesse VV' cette initiative. » (FG middle managers)

- The recall of nurses who were not supposed to work a certain day: they receive then an additional fee called 'recall fee'

« Lorsqu'un infirmier est rappelé est demandé à venir à retravailler dans un délai défini préalablement à la date de rappel, il a une petite prime euh qui permet de reconnaître cette flexibilité que l'infirmier a. Maintenant cette prime, je pense, est ridicule » (FG physicians)

- The use of head nurses in direct patient care. (see section 3.4.5.4)
- The hiring of healthcare assistants and other supporting staff (e.g. logistic assistants) to whom non-ICU/non-nursing tasks are delegated.



During the pandemic,

- The use of non-ICU nurses, including 'floating team' staff, emergency care staff or nursing staff from the operating theatre or 'recovery room' with or without an accelerated training on intensive care was mentioned. When this fast-track training has been provided by an e-learning training, there was not always sufficient time during working hours and it had to be followed at home and therefore with a mixed success.

"Bij ons hebben ze geïnvesteerd in e-learnings, e-learnings over het starten en het bekijken van dialysetoestellen en ECMO en de meest voorkomende beademingsvormen. En die zijn heel goed gemaakt, die e-learnings. Maar het is die extra inspanning dat hij bedoelt, want dat zult ge thuis moeten doen he. Ge zult thuis met uw werk moeten bezig zijn en dat is ook wel een beetje eigen aan natuurlijk een intensieve zorgen verpleegkundige, de bereidheid van thuis ook wel iets te doen, maar daar daartegenover zou moeten kunnen staan dat ge die uren terugkrijgt, he, van de tijd dat ge steekt om een expert te worden in wat dat ge doet." (FG (head) nurses)

However, hospitals did spend more and more time and efforts to familiarize new nursing staff with the work on ICU. Hospitals offered the opportunity to work in an ICU after rapid training, but ensured that they were staffed to a higher standard for the first 6-8 weeks. This gives the opportunity for some non-specialized nurses to discover the work on an ICU (as a buddy) and raise their interest to work on ICU and maybe persuade them to ask their mutation to ICU.

"Naar het inscholen, is bij ons nu wel sinds kort besloten om het inscholingstraject van 6 weken naar 8 weken, te brengen, waarbij het dan echt gaat over dat je dus die tijd dubbel staat. Euhm, dat is langs één kant veel tijd en langs de andere kant super weinig tijd. Wij rekenen zo dat een echt ervaren IZ-verpleegkundige, dat je daar pas over kan spreken in een jaar op intensieve zorgen, en dat is dan nog maar echt een volwaardige IZ-verpleegkundige,

maar nog geen echt ervaren IZ- verpleegkundige, dus dat is gewoon heel moeilijk om daar antwoord op te gaan bieden. Dat vergt ook extra personeel, om dat opleidingstraject te kunnen gaan uitwerken, gaan aanbieden dat enerzijds, binnen ons ziekenhuis zien we wel dat we een aantrekkingspool zijn voor verpleegkundigen die tijdens de golf, vorige golven, hebben ingesprongen als buddy, die dat dan wel een interessante afdeling vonden en die dan toch wel bij ons willen komen werken. Dus dat is dan wel een grote mutatielijst gehad, dat wel, dat is wel tof voor ons." (FG (head) nurses)

And help by other healthcare professionals and nursing staff from other units was possible (especially during the first wave) because the other (non-urgent) activities of the hospital were stopped.

« Chez nous ben comme dans beaucoup d'hôpitaux évidemment euh lors première et deuxième vague on a eu le renfort d'infirmières de salles de réveil qui sont venues euh prêtées main-forte aux équipes infirmières chez nous parce que le bloc opératoire était à l'arrêt ou avaient fortement ralenti selon, les, les vagues. Donc ça, ça a été évidemment une solution euh extrêmement importante, sans ça je ne sais pas comment on aurait traversé euh ces deux premières vagues euh, mais cette solution n'est plus applicable maintenant dès lors que euh à juste titre on a interrompu l'activité du bloc opératoire. » (FG physicians)

- The recall of retired nurses and the use of teachers from nursing schools or students, was also part of the strategy to staff the surge capacity (and compensate for absenteeism). Yet, although their help was warmly welcomed it appeared soon to be suboptimal as they were not having the necessary expertise and thus required supervision from ICU staff. This was an additional source of stress. Moreover it risks to decrease the motivation of students to continue in this kind of job because of the very bad work conditions during the pandemic



'Ik noem dat het knip-en plakwerk, he, dat is inzetten van, studenten verpleegkunde, inzetten van mensen die reeds gepensioneerd zijn en, quote on quote 'weg zijn' uit zorg. Maar dat is een soort van ersatz-flexibiliteit, dat is ersatz-flexibiliteit, want voordat je het weet begin je te branden aan deze jonge mensen die ook nog gaan binnenkomen. Je moet goed kijken waar, waar je die mensen inzet, op welke manier. En vooral goed kijken dat dat ene aspect zijnde opleiding niet verloren gaan. Dat zijn geen werkkrachten die zich aanbieden. Dat zijn mensen in opleiding, waarbij dat misschien de crisissituatie een opportuniteit is om hun kennis te laten maken met een specifiek aspect van de intensieve zorgen. Maar als men dan voorbijgaat aan, aan het aspect opleiding dan gaat het verkeerd mee, gaat het echt ernstig verkeerd lopen. En dat is ook iets dat we met de scholen duidelijk, hebben afgesproken'. (Physicians)

- Some ICU used trainees for the administrative tasks.
- Pilot project with diploma level (HBO5-level) nurses (who are normally not staffed on ICU) allowed to support ICU nurses by providing non-specialized care (e.g. hygienic care, vital monitoring).

"Voor intensieve zorgen is dat niet zo. Daar laat ik eigenlijk geen HBO5 verpleegkundigen toe. Euhm, behalve nu in een pilootproject. (...) wij eigenlijk, ook een HBO5 verpleegkundige als ondersteunend in de basiszorg toegevoegd hebben aan intensieve zorgteams. Dus met andere woorden, ik ga het op mezelf efkes, reflecteren. Ik ben verantwoordelijk voor twee patiënten. Maar gezien de, de, de zorgzwaarte van die twee patiënten, bijvoorbeeld, er is iemand ook met een ECMO aan gekoppeld enzovoort. Dan is er eigenlijk een tweede persoon die mij ondersteunt, die bijvoorbeeld perfect ook een aantal basishandelingen zou kunnen doen: (...) mondhygiëne, hygiënische zorg, goeie .. observatie, een aantal controles ook doen. Allez, 't is ook een verpleegkundige, he, maar waarbij dat die niet de eindverantwoordelijkheid draagt, maar wel een aantal dingen uit mijn handen neemt waardoor ik mijn tijd. En dat is een

pilootproject. Ondertussen doen we dat op drie afdelingen al en vooral op die afdelingen waar dat de ligduur van patiënten langer is na bijvoorbeeld intensieve zorgen B 5 14 heeft een, significant hogere ligduur en heeft te maken met ook de pathologie die er ook ligt, polytrauma, neuro, slokdarmpathologie dus wat langere verblijfsduur, waardoor dat er na verloop van tijd ook die typische zorgcomponent, ook wel een belangrijke factor wordt, en op die manier die ondersteuning kan geboden worden. (FG middle management)

- The strategies used to increase manpower **by optimizing recruitment**

- Partnerships with nursing schools are important to recruit future nursing graduates.

«Développer un partenariat avec une vraie politique d'accueil des étudiants, des nouveaux, vraiment avoir un respect, ne pas les considérer comme de la main-d'œuvre, etc. Ça, c'est la première source en tout cas pour nous de recrutement. C'est la plus belle publicité qu'on peut faire. C'est l'étudiant de voir de par ses yeux ben tout ce qu'Adrien vient de dire qui est une vraie philosophie institutionnelle, des valeurs qui sont partagées. Se sentir bien au sein, au sein du service. C'est comme ça qu'on le recrute. » (FG middle managers)

- In order to familiarize the student with the hospital, offering student jobs or pay a part of the education curriculum (e.g. the advanced ICU training postgraduate programs) is another strategy mentioned during the focus groups.

« On n'engage parfois du personnel qui vient, qui vient d'être diplômé infirmier et on soutien sa formation SISU. Donc ils l'étalent en deux ans, ils sont engagés chez nous et en même temps on paie et on intervient dans le paiement des frais d'inscription et on donne des quotas d'heures de formation. » (FG middle managers)



- To propose attractive shifts compared to other hospitals has been tested in some units. Yet it was acknowledged that they all fish in the same pool and that this competition is a solution at the hospital level, not for the country.

“Ik geef een voorbeeld voor spoedgevallen, he om die verpleegkundigen aan te trekken in een concurrentieel omgeving in Brussel, heeft men bij ons gevraagd om 12-uren shiften te kunnen werken. En we laten dat eigenlijk ook toe. Euhm, dat is iets dat bij andere ziekenhuizen soms niet toegelaten is. En dan zijn er een aantal verpleegkundigen die zeggen van ja maar ik wil liever, ‘k zeg maar iets, 3 dagen per week 12 uur werken of ietske meer. Dan het feit van de 8-uren shiften, en dat maakt dat het aantrekkelijk kan zijn om bij ons te komen werken. Maar natuurlijk dat is geen oplossing, he, dat is het wegtrekken van verpleegkundigen van andere ziekenhuizen naar ons ziekenhuis, allez, ik bedoel dat helpt de ziekenhuizen niet.” (hospital umbrella organisations)

- Other hospitals have hired foreign nurses (e.g. Lebanese nurses for French speaking hospitals). Yet, this is due to the language restrictions only concerning a very small group in Belgium which is expensive (e.g. recruitment, providing accommodation and additional training), often not resulting in long term employment and causes ethical questions (there are also staff shortages in most of the donor countries).
- Another strategy raised during the interviews was to collaborate with emergency care units to share skills.
- The strategies used to increase manpower **by increasing retention**
 - Create good work conditions including adapted shifts
 - Involve nursing staff in projects and stimulate collaboration between the nursing and the medical staff.

“C’est souvent lié à des initiatives personnelles, mais nous, en tant que membres du management, c’est de saisir la balle au bond comme on dit, pour les développer et donc deux nouveaux

médecins qui sont arrivés ne pouvaient travailler sans réaliser des staffs pluridisciplinaires que ce soit autour de pathologies, mais également autour de situations éthiques, autour simplement de nouveaux matériels assez techniques à utiliser Et donc ça, ça a vraiment créé un peu un effet de corps, un effet de groupe et qui a remis un peu de mortier entre les différentes briques si je peux dire. » (FG middle managers)

- By financial incentives such as covering training costs, some hospitals try to fidelize their staff
- Some hospitals allow that nurses employed by the hospital work as an agency nurse for the same hospital. This allows the nurses to increase their income. Nevertheless in other places it is prohibited.
- In order to support managers in their leadership skills, some hospitals offer specific trainings

« Nous ce qui a été mis en place depuis, on a une nouvelle direction des ressources humaines depuis un petit temps qui essaie de mettre à l’honneur, de donner du temps aux managers. Donc il y a tout un projet de formation ou d’encadrement, de soutien dans ce côté-là. Donc je pense que en tant que responsable d’équipe c’est quelque chose où en tout cas on se sent soutenu et moi j’ai l’impression quand même qu’ils se rendent compte que ce n’est pas si simple de gérer une équipe quand on a 30-40 personnes à gérer avec tous les problèmes qu’on a. » (FG head nurses)

During the COVID crisis, special attention has been paid to the wellbeing of the staff (support from psychologists, debriefings, relaxation moments, team breaks and activities, offer free lunch, massage sessions, ...). Nevertheless, these initiatives were mainly offered out of working hours and were therefore not always that successful.



“Op de, op een bepaald moment is dat niet alleen fysiek zeer zwaar maar is dat ook, mentaal zeer zwaar. Wat wij gedaan hebben is ook psychologen geprofessioneerd op die diensten, die op geheel natuurlijk wijze, die eigenlijk deel uitmaakten van de equipe bijna. Die mee, ja, die zelfs meehielpen soms in de zorg, er wel bijstonden maar ook aandacht hadden voor het welzijn van de verpleegkundigen. En, allez, dat is eigenlijk door iedereen zeer sterk geapprecieerd geweest. Wij hebben een soort relaxatiemomenten ingevoerd, zodanig dat zeefkes konden deconnecteren. Een van de dingen die heel zwaar zijn voor die mensen ook is het feit dat zij, ja, continu ingepakt zijn om het zo te zeggen. Dus dat is wel zeer lastig om op die manier te werken.”
(hospital umbrella organisations)

“We hadden, Covid-wandelingen opgericht om, allez, in minder drukke Covid-periode zijn we met het hele team wat gaan wandelen en vieruurtjes georganiseerd en samen buiten gepicknickt enzo,” (FG head nurses)

To improve communication, some hospitals created a weekly newsletter to keep everybody informed of the situation.

« Nous avons diffusé par e-mail une] petite newsletter hebdomadaire où on faisait à chaque fois le topo de, de la situation Covid au sein même de l'hôpital, des directives qui ont été décidées en interne et essayer d'expliquer le pourquoi du comment de, de nos décisions. » (FG middle managers)

The management showed its support by visiting the teams, even though some did not appreciate seeing managers walking around while they themselves were burdened by a very heavy workload.

« Le passage régulier du top management, donc direction générale, direction département infirmier au sein même des unités. Alors ça, c'est à la fois bien perçu parce que ça ouvre le dialogue, vous montre ben qu'on s'inquiète aussi du terrain et de voir un peu leurs difficultés, pouvoir en discuter. Mais ça peut

aussi avoir un effet négatif dans le sens ben nous on est au turbin et eux... » (FG Middle managers)

- The strategy used to increase manpower by increasing flexibility in the organisation of the teams (e.g. creating one pool of nurses for different ICUs within the hospital and allocate them based on the patient acuity), playing with the shift patterns within the legal boundaries in an attempt to offer a better work-life balance. Also permanent night staff was hired to reduce the amount of night shifts for the other team members.

“De eerste oplossing, ja, dat zijn oplossingen die voor ons, werken natuurlijk, Dus iets meer vaste nachtdiensten aannemen waardoor de belasting op de rest van het team, het aantal nachten iets verbetert.” (FG (head) nurses)

3.4.5.3 At the federal level: additional financing and creation of additional benefits

The additional budget for hospitals resulting from the ‘Fonds blouses blanches’/“Zorgpersoneelsfonds” was also discussed. Nurses (and by extension head nurses, middle management, ...) expect these resources to be used in an adequate and transparent way, thus improving the patient-to-nurse ratio. They understand that hiring nurses can be difficult because of the scarcity on the labour market and also welcome additional support from non-nursing staff when it allows them to alleviate them from non-nursing task and spend more time on direct patient care. What it regarded as unacceptable (and perceived as a real threat) is that these additional means are used to compensate losses in the hospital budget (e.g. due to structural underpayment for nursing staff imbedded in the current hospital payment system).

The use of ZP funds was appreciated in order to structurally expand the staff, but there was uncertainty about the perennial nature of the funding.

“Wij gaan nu een, effectief een extra buffer intensieve verpleegkunde voorzien van ongeveer 6 fulltime equivalenten om piekmomenten zoals we gekend hebben in de tweede, derde golf te kunnen opvangen. We gaan dus extra investeren om effectief



de piekmomenten beter te kunnen opvangen en effectief, een betere buffer te zijn voor je aanwezige personeel. Ja, omdat we toch vastgesteld hebben dat we zeer kwetsbaar zijn op intensieve zorgen. Op de andere afdelingen konden we, ja, selectief mensen inzetten. De ene afdeling, de andere afdeling, intensieve was altijd aan bod. Altijd. Ja, ik heb het gekregen via het zorgpersoneelsfonds. Om, eigenlijk na de eerste golf was de vraag er al, maar budgettair was dat niet mogelijk op dat moment. En dankzij het personeelsfonds, hebben we die extra's kunnen krijgen.”(FG middle managers)

Also some additional benefits were allowed. An example is the increased working time flexibility by reducing barriers to overtime, that were offered to ‘crucial sectors’ during the pandemic crisis by making some of them tax-free.

« La deuxième solution qui est mise en place, beaucoup trop tard à mon sens, c’est la défiscalisation des heures supplémentaires. Et donc Dieu sait si les infirmiers chez nous et j’imagine que c’est partout le cas ailleurs, on fait énormément d’heures supplémentaires durant toutes les vagues Covid et c’est seulement maintenant qu’on vient avec cette possibilité de défiscaliser les heures supplémentaires qui sont injustement taxées euh lorsqu’elles en font pour habitude. (FG physicians)

3.4.5.4 Limitations to implement solutions

In general, all the initiatives are perceived as ‘a drop in the bucket’ given the extent and complexity of the difficulties

“En is het te veel het gevoel van druppel op een hete plaat. Maar vraag mij hoe moet ge het dan anders doen, ‘k zou het niet weten op dit moment, hoor. Ik heb, ik heb daar ook geen alternatief voorstel voor, maar ik voelde wel dat we daar wat tussen twee stoelen dreigden terecht te komen. De goeie wil wel tonen, maar misschien net iets te weinig middelen hadden om er ook effectief iets aan te doen. En in de ziekenhuizen was dat een beetje hetzelfde probleem. Het was alle hens aan dek om de pandemie

zelfs te bestrijden om daarmee in het reine te komen, om het gevecht, ook met de buitenwereld en de overheid op een goede manier te kunnen voeren. En, en zij zitten daar ook wel met het hetzelfde probleem, denk ik. Goeie intenties bewustzijn dat er inderdaad iets moest gebeuren, maar niet altijd voldoende middelen of technieken bij de hand om dat, op een goeie manier op te vangen.” (Hospital umbrella organization)

To improve the situation, whatever the target (human resources, training costs, wellbeing initiatives...) all the ideas are rapidly downsized because of the financial implications required to implement them.

There also exist differences between private and public hospitals in what they can do. If a public hospital wants to improve the salary for a specific category of the staff, it has to raise the pay-schedules and it will imply that all the others have to be raised as well. Improving the attractiveness of the remuneration is therefore considered not to be an option.

« Chez nous en tous cas pour améliorer la situation en sachant qu’il n’y a personne sur le marché à engager même si on a des postes ouverts. Euh on aurait... on pourrait augmenter le salaire des, des infirmiers de réa, mais euh techniquement dans un hôpital comme le nôtre qui est public régional, c’est impossible de le faire puisque (...), les barèmes vont faire en sorte que si on le fait pour les infirmiers de réa ben toutes les autres professions vont suivre donc à chaque fois qu’on veut essayer de valoriser cette catégorie professionnelle particulière, et bien on a une levée de boucliers. (...) Et quand bien il y aurait des infirmières à engager sur fonds propres. Dans un hôpital il y a deux voies de financement, c’est le BMF et c’est les honoraires médicaux et donc dans un hôpital public où on ne fait pas de privé, ben les honoraires médicaux seront déjà un peu restreints et pour garder les médecins c’est déjà un peu difficile donc on arrive dans une espèce euh d’incohérence quoi. » (FG physicians)

Another limit to hire more ICU nurses is obviously the shortage of these profiles on the labour market. Even if you have the necessary budget, there are currently not enough potential candidates.



Initiatives to improve the wellbeing of nurses and to give them psychological support were hampered by several limitations. A first limitation is linked to the personalities of ICU nurses. They are, in general, proud and tend to push their limits to the maximum. They do not always welcome external help and are not always open to psychological help because they think they do not really need it.

« Les gens ne sont pas de nature à aller se confier, à aller partager c'est très difficile. » (FG physicians)

A second limitation is that ICU staff has no time to use such help during shifts and is not ready to use it outside their working hours.

« Au départ on a eu une démarche un peu intrusive où on était vraiment vers eux pour qu'ils puissent mordre à l'hameçon, entre guillemets. Et une fois qu'on les laisse aller prendre l'initiative de prendre un rendez-vous en, en privé, donc... donc c'est une démarche qui ne nous regarde pas, ben les psychologues nous ont dit après: on a eu très peu de retours par rapport aux démarches individuelles. Ils préfèrent parler entre eux, débriefer entre eux avec des personnes qu'ils connaissent que d'avoir une tierce personne qu'ils ne connaissent pas trop. C'est un peu le retour qu'on a eu. En tout cas, ça n'a pas trop, ça n'a pas trop fonctionné aux soins intensifs. » (FG middle managers)

4 DISCUSSION AND CONCLUSION

In this section we discuss the main results of the current study. Although our study had several limitations (see Box 1) it gives some important insights. Before we discuss the study findings it is important to look back to the main conclusions of two recent KCE reports: KCE report 325 'Safe staffing policies in acute hospitals' and KCE report 335 'Evaluation of surge capacity during the first wave of the COVID-19 pandemic'.^{8, 73}

The pre-pandemic starting point: no formal safe staffing policies for Belgian acute hospitals

Although KCE report 325 did not include a formal evaluation of ICU staffing, it gives some general insights in the state of play of staffing policies in Belgian hospitals prior to the COVID-19 pandemic.

Based on a pre-pandemic evaluation of nurse staffing levels of general hospital units, KCE concluded that Belgium, in contrast with other countries, did not sufficiently act upon the available evidence base about how to create safer healthcare organisations for patients and more attractive working places for nurses.

After all, evidence about the association of nurse staffing (qualification level and patient-to-nurse ratio's) with both nurse wellbeing and patient outcomes already exists for more than two decades.^{5, 9, 62, 70, 74-77} In several countries this evidence was used to develop 'safe staffing policies' aiming for hospitals being safe places for patients and attractive places for nurses to work.¹⁰ Although the focus and practical implementation of these safe policies differed between regions (e.g. setting thresholds for skill-mix such as maximal 20% of non-nursing staff; mandated patient-to-nurse ratios in California, Victoria & Queensland, Australia; adjusting staffing levels based on patient acuity measurement in Ireland; stimulating a board to nursing approach combined with data and transparency in England), the bottom-line of these staffing levels is to improve the bedside nurse staffing levels and create a relation between staffing and patient acuity.¹⁰

KCE report 325⁸ showed that also in Belgium and, despite the absence of a formal policy, between 2009 and 2019 nurse working environment improved (improvement in leadership, nurse-physician relationships, and



foundations for quality of care) and staffing levels evolved in the desired direction (e.g. patient-to-nurse ratios slightly decreased, proportion of Bachelor-prepared nurses increased). Despite these observed improvements the outcomes of nurses working on general units deteriorated (i.e. higher levels of burnout and job dissatisfaction) during that same period. In 2019, 36% of nurses working on general hospital units were at risk for emotional exhaustion, 27% were dissatisfied with their job, 32% had the intention to leave their job. Moreover, it was observed that patient-to-nurse ratios in general hospitalization units were still far above those considered safe internationally. The observed improvement in patient-to nurse ratios between 2009 and 2019 was completely offset by increased levels of 'intensity of nursing care'. In addition, the observed increase in 'missed nursing care' was considerable and considered as a potential indicator that the maximal capacity of what a nurse can perform in the time available is surpassed.⁸

Based on these observations, KCE recommended in 2019 to develop a safe staffing policy for Belgian hospitals. The improvement of patient-to-nurse ratios must be a central element of such a policy. After all, patient-to-nurse ratios were below international standards and the observed variation across hospitals was linked with variation in nurse wellbeing and missed care. Such a plan demands a joint effort of the hospital sector and public authorities: the public authorities have to invest in additional budget for nurse staffing and align the hospital payment system with the staffing-related licensing standards while the hospital sector have to adopt a culture in which staffing decisions are important from board to bedside.

The evaluation of surge capacity during the first COVID-19 wave showed the urgent need to develop a comprehensive plan to ensure a sustainable healthcare workforce fit for the future

In 2020, KCE studied the management of hospital surge capacity in the first wave of the COVID-19 pandemic in Belgium. One of the conclusions of this KCE report 335⁷³ was that the healthcare workforce (i.e. physicians, nurses, healthcare assistants, allied health professionals) is the backbone and the most valuable asset, but at the same time it is also the Achilles heel of our healthcare system. After all, the creation of additional hospital capacity required, in the first place, additional staff (i.e. nurses and

physicians). During the COVID-19 pandemic ICU staff and ICU nurses in particular were identified as the main bottleneck to provide the necessary hospital capacity. These highly skilled and educated professionals were clearly a scarce resource that could not be augmented with other nursing staff in the short term without a loss of skills and expertise. To ensure additional staff, Belgian hospitals employed similar approaches to those advised in consensus guidelines and used by other countries (e.g. increase working time, staff ICUs with mixed teams: ICU expertise and redeployed staff from ICU-related disciplines, extended role for students, upgrade skills by fast-track training programs). The KCE report 335 concluded that it was clear that healthcare workforce gave it their best effort, stretched itself in an attempt to ensure the best possible patient care in a difficult context (e.g. lack of PPE, fear to be contaminated or contaminate relatives, a high mortality rate, patients with a high patient acuity, uncomfortable and painful side-effects of PPE, long working days). Although there were no hard conclusions at that time on the impact of the COVID-19 crisis on staff wellbeing, the first preliminary finding already showed that this did not remain without consequences (e.g. increased levels of burnout, anxiety).^{27, 73, 78, 79}

The current study builds on both studies. First, this report allows us to evaluate the wellbeing and job satisfaction of nurses working in Belgian ICUs and, through the qualitative study, gain in-depth insights into the staff related issues before and after the COVID-19. Second, the replication of the nurse survey gives important insights in nurse staffing and nurse working environment measures in a large sample of Belgian ICUs. This allows us to make conclusions on what accents in a safe staffing policy are important for ICUs.



Box 1 – Study limitations and research agenda

- In this study we focused on ICU nurses by conducting a large scale survey (e.g. 2 321 participating nurses from about 150 nursing units in 83 hospitals and 102 hospital sites). This focus is legitimate since ICU nurses were one of the professional groups that were confronted substantially with the impact of COVID-19 throughout the entire pandemic. Nevertheless, the scope of the study is somewhat limited as the impact of COVID-19 also clearly impacted other healthcare professionals throughout the healthcare system. Although initiatives with a broader scope^{80, 81} already exist, it is important to mention that monitor these aspects in a wider range of setting and professional groups is clearly indicated.
- The current study is of observational nature. It allows us to describe the variation in nurse working environment and nurse outcomes across hospital sites and to study relationships between these concepts. Although our qualitative study gives additional insights in some of the problems identified in the nurse survey, some reasons of the variation and differences observed are unclear. This will require additional field research that studies in depth the best and worst performing nurses on some of the key indicators (e.g. why and how do some hospital sites succeeded in maintaining good nurse outcomes during the pandemic while others did not).
- Moreover, the results are self-reported and need to be further explored with additional, more objective measures (e.g. what proportion of nurses that report an intention to leave actually leave their job, what is the link between risk of burnout and a clinical diagnosed burnout, does the nurse-perceived quality of care corresponds with objectively measured quality indicators; do the reported care left undone rates when quantified by objective measures result in similar figures?). The associations found between aspects of the nursing work environment with perceived quality of care needs to be further studied with objective outcome measures. After all, literature suggests that the number and expertise level of nurses working on ICU's are associated with objective outcome measures.^{14, 26, 82}
- Although the response rate of 47.8% is acceptable it is not at the level of similar studies conducted prior to the pandemic.^{5, 8} Nevertheless, the response rate (both at the level of the hospitals and the nurses) can, given the specific context (i.e. high workload and absence of ICU nurses during the data collection), be considered as relatively high. In addition, to allow hospital site level analyses we have excluded hospital sites based on arbitrary criteria (i.e. >75% response rate of ICU nursing staff per hospital site or at least 10 ICU nurses responding). As a consequence it is possible that smaller ICUs are underrepresented in the sample. Moreover, it is possible that nurses included in the sample are biased (e.g. more nurses with complaints) compared to non-responders. Yet, it is also possible that nurses not included in the survey were absent because of problems such as burnout.
- The study focused on ICU nurse staffing levels. In addition, some data about supporting staff (e.g. healthcare assistants) were gathered. It is worthwhile to broaden the scope in future research including other disciplines such as physicians, physiotherapists, etc.
- Although our sampling strategy for the qualitative study allowed us to gather the perspectives of nurses, head nurses, middle management and CNOs representing a wide range of hospitals across the territory, it was more difficult to recruit physicians and policymakers. By consequence, the perspective of both groups might be underrepresented. Nevertheless, data sufficiency was observed during the analyses of the interviews and focus groups. This indicates that the probability we missed information is low.
- Although coding of the transcripts (chapter 3) was done by three authors, the thematic analyses was (mostly given time constraints) done by only one person. This is a potential limitation that can introduce bias. Nevertheless the two other researchers who also attended the focus groups and did the coding also critically reviewed the output of the thematic coding which might reduce the impact of this limitation.



- We observed that the participants to the qualitative data collection included no ICU nurses who only recently started working on an ICU (participants all had a number of years of ICU experience). Follow up research should pay attention to the specific expertise of recently recruited ICU nurses (with less experience to check if their perceptions are reflected in our analysis. In addition, there is a risk on social desirability bias in the answers as some people participating in the focus groups knew each other via their professional networks.
- Because of the high workload in ICUs and hospitals, and in order to increase participation, we decided to limit the duration of the focus groups to 2 hours. This was very short in order to deepen information.
- A budget impact analysis was out of scope for the current report. Based on the current study it was not possible to recommend particular patient-to-nurse ratios for Belgian ICUs. This will require next steps (e.g. review on effectiveness to differentiate ICU's in different care levels with accompanying patient-to-nurse ratios; international comparison of patient-to-nurse ratios' on ICU's) which is part of the ongoing KCE-studies within this domain. When these ratios are determined a budget impact analysis of a shift from the 'as is' to the 'desirable' situation can be calculated. While a budget impact analysis might be of interest for policy-makers for the implementation of such measure, it only gives a partial picture. After all improving patient-to-nurse ratios has the objective to improve patient care and increase the attractiveness and retention of the nursing profession. A cost-effectiveness analysis is therefore needed to make the business case of investments in ICU nurse staffing.^{83, 84}

After two years, the impact of the COVID-19 crisis on the wellbeing of ICU nurses and perceived quality of nursing care is high

The current study focused on ICU nurses staffing. Although a pre-pandemic period benchmark in the ICU setting is missing, the problems identified in the current study cannot be considered as short-term problems. Indeed, indirect evidence (from general hospital units and other smaller scale studies)^{8, 85} show, like in studies abroad⁶⁹, that high levels

of burnout and intention to leave were reported prior to the pandemic. Nevertheless, it is clear that the impact of two years of COVID-19 pandemic on the wellbeing of ICU nurses is huge. Yet, there are significant differences between hospitals and between regions. The average risk of burnout is high on all three dimensions (emotional exhaustion, depersonalization, reduced personal accomplishment). On average 43.1% of nurses are, for instance at high risk of emotional burnout with large differences between regions (33.1% in Flanders; 55.3% in Wallonia; 52.4% in Brussels) and hospitals (P25: 30.8%; P50: 42.9%; P75: 55.8%). This confirms high reported prevalence of burnout among ICU nurses during the COVID-19 pandemic reported elsewhere.⁴⁰ In addition, it is in line with the results of a Belgian study where in a sample of ICUs in French-speaking hospitals the risk of emotional exhaustion, increased from 33.6% in January 2020 to 48.9% (during the first COVID-19 wave).³⁹ While also for depersonalization (from 26.9% to 39.4%) and reduced personal accomplishment (from 19.1% to 28.3%) increased rates were reported during the first waves. This seems to be even more pronounced in the current study with an average of 43.7% of the nurses at high risk for depersonalization (31.5% in Flanders; 58.5% in Wallonia and 54.5% in Brussels) and 46.1% at high risk for reduced personal accomplishment (36.0% in Flanders; 57.7% in Wallonia and 57.5% in Brussels).

Alarming results are also observed in other indicators of nurses' well-being, with similar variation between hospitals and between regions. On average 39% of ICU nurses is dissatisfied with the current job (25.9% in Flanders, 56.6% in Wallonia and 47.6% in Brussels). The aspect with the highest level of dissatisfaction is the salary (75.1% of ICU nurses is dissatisfied). This is much higher than in the 2019 study where 57% of nurses working on general units reported to be dissatisfied with their wage. It is also remarkably given the historical investments to improve salaries of nurses and other hospital staff in 2020. Yet, the accelerated implementation of the new salary scheme (IFIC) was, depending on the years of experience, not beneficial for all nurses holding an special professional title in intensive and emergency care. Although, additional measures were announced to better compensate the nurses with special professional titles, the perception exists that ICU nurses are insufficiently rewarded. During the focus groups it became clear that ICU nurses feel



that they are insufficiently rewarded for the pivotal role that they played throughout the pandemic.

Also the average of 43.9% of nurses reporting to have an intention to leave is high (26.5% to a non-nursing job, 5.8% to a nursing job outside the hospital setting and 11.7% to another nursing job in the hospital). This seems to be in sharp contrast with the finding that nurses with a number of years of experience are very loyal to their employer. Indeed, the average experience in nursing (15.2 years) or an ICU context (13.7 years) is similar to the average experience in the hospital (13.6 years). Moreover, the reported intention to leave rates were the highest among nurses aged 25-40 years. Also higher intention-to-leave rates were observed among men compared to women. It seems, important that retention policies do take these differences into account.

Not only the wellbeing of nurses is impacted. 60.8% of the nurses (67.1% in Flanders, 74.2% in Wallonia and 69.5% in Brussels) reported that quality of care deteriorated compared to before the COVID-19 pandemic. Nevertheless with an average of 64.5%, most nurses still rate the quality of care on their unit as good or excellent (71.6% in Flanders, 53.9% in Wallonia and 63.6% in Brussels). However, it should be noted that an important number of care activities is left undone on the last shift with 1.6 out of 5 planning & communication activities and 1.8 out of 9 clinical activities reported as left undone. Although we did not analyse patient outcomes in the current study, these results are an indication of problems with patient care. After all, based on the scientific literature, 'care left undone' appears to play a mediating role in the relationship between nurse staffing and patient outcomes.⁸⁶

The most frequent reported clinical activities that are left undone are frequent position changing (35.1%) and timely medication administration (29.1%). It is also remarkably that 24.5% of the nurses that 'patient surveillance' was left undone during their last shift since this is one of the key activities of ICU nurses. The most frequent planning and communication activities reported as left undone are emotional support of patients and family (49.2%) and multidisciplinary consultation meetings (38.8%). During the focus groups the problems to give adequate emotional support to families was clearly discussed. On one hand, there was insufficient time to spend on these activities due to the high workload.

On the other hand, the COVID-19 restrictions (e.g. visitor restrictions, PPE) hampered sufficient support of relatives. This was especially true in case of end-of-life care with an impact on patients, families and staff.

The care left undone activities and reduced quality of care were clearly incriminated as a source of loss of meaning and a reduced sense of personal accomplishment.

The COVID-19 pandemic magnified existing problems and created new ones

The reasons for these poor nurse outcomes are multifactorial. While some factors already pre-existed before the COVID-19 pandemic, others are COVID-19 specific.

Although nurses felt a great sense of professional duty to work during the pandemic, the COVID-19 pandemic was clearly stressful for ICU nursing staff.³⁰ Many ICU nurses are physically, but most of all mentally exhausted, after two years of COVID-19 pandemic. As the duration of the pandemic seemed to be 'never-ending', these feelings of exhaustion seemed to increase. This is not a surprising finding since **the every day's work of an ICU nurse changed drastically** during the COVID-19 pandemic. The case-mix of ICUs changed and was dominated by COVID-19 patients. This new condition required a high level of care intensity (e.g. respiratory care in prone position, labor intensive mobilization procedures).³¹⁻³⁴ and patients were critically ill for a long period, had comorbidities (e.g. obesity) and often pessimistic prognostics.^{29, 30} The infection and control measures were complicating care. Wearing the PPE, for instance, was physically demanding. Yet the measures also created a barrier to patient and family involvement which was experienced as very disturbing in case of end-of life care.^{31, 33} The higher than usual mortality rates, even among young patients, were also pointed out as an important stress factor and a source of personal accomplishment.

The unprecedented need for ICU capacity also implied a decreased skill-mix (nurses from other units with no experience carrying for critically ill patients) and a new way of working (e.g. delegating tasks). ICU nurses reported an increased caseload as they had the end responsibility for the



patients assigned to them and their buddies. Such increases in patient-to-nurse ratios were also reported in the literature.²⁹

Moreover, as frontline caregivers ICU nurses felt extremely vulnerable (especially during the first waves). They feared being infected themselves or to infect family members.

As time progressed the content of the job became more and more monotonous, extremely focused on one type of patients. Other important aspects of the job, such as care innovation, mentoring students and new colleagues, personal career development and following training and education were due to time restrictions neglected. This was perceived as unsustainable.

COVID-19 reinforced frustrations that were already looming prior to the COVID-19 pandemic. Examples are the level of flexibility asked from ICU nurses regarding their shifts and units to which they were allocated to and the amount of overtime performed. COVID-19 did put issues as dissatisfaction with remuneration and the lack of praise and recognition from their management and the general public, politicians, mass media to the foreground. The latter was reported as an increasingly disturbing issue as the duration of the pandemic increased, and was in sharp contrast with the general voiced appreciation during the first COVID-19 wave.

Both from the literature and the focus group interviews it seems that **redeployed nurses** who were usually less skilled in the context of critical care were **more vulnerable to stress** compared to ICU nurses (e.g. sudden transition from an expert in their field to a novice in ICU, not used to take care of critically ill patients and the high mortality rates).^{25, 35, 38}

The above mentioned factors seem to have direct consequences on staff wellbeing. Yet, it will be important to also monitor the long-term consequences.^{24, 30}

Hospitals with a better nurse working environment have better nurse outcomes and higher perceived quality of care

The importance of the nurse working environment is underpinned by evidence illustrating the beneficial effects of a better work environment on both nurse- and patient outcomes.⁸⁷⁻⁹⁰ Several programs (e.g. Magnet

accreditation)⁹¹ exist to support hospitals in improving the nurse working environment. In the current study we evaluated the nurse working environment on Belgian ICUs via the 32-items of the NWI. When looking at the five subdimensions, favorable results are found for 'physician-nurse relationships' and 'foundations for quality of care'. The results for the 'leadership and management' dimensions are somewhat ambiguous with relative good scores for some items and relative poor scores on items like 'praise and recognition'. A remarkable finding is that only 10% of nurses report that they are (very) confident that management will act to resolve problems in patient care. The lack of praise and recognition from leadership and management was also discussed during the focus groups next to a lack of general recognition for their role during the entire pandemic (e.g. from the general public, policy-makers, mass media). The NWI-dimensions with poor results were 'staffing & resource adequacy' and 'nurse participation in hospital affairs'.

Our study confirmed the importance of investing in a good nurse working environment. After all, we found similar associations as those reported in the literature. Hospitals with a better (or the best) work environment scored consistently better on nurse outcomes. In other words, hospitals with a very good work environment managed, despite the challenges of the COVID-19 crisis, to limit the impact on the wellbeing of ICU staff. While variation across hospitals exists in all regions, it is clear from the survey that Flemish hospitals perform better than hospitals located in Brussels or Wallonia.

The Belgian ICU nurse staffing workforce is highly skilled, but a scarce resource that is difficult to substitute

The Belgian ICUs are staffed by highly skilled nurses. Indeed, nearly all of the nurses are trained at the Bachelor level (duration increased recently from 3 to 4 year) and most of them (i.e. 77%) followed an advanced education in ICU care at either the Bachelor or postgraduate level. With the reform of the Bachelor-level education challenges appear to maintain the same level of expertise in newly graduates. After all, the ICU traineeship during the 4th year of the Bachelor education is less focused on intensive care compared to the previously Bachelor-after-Bachelor program in intensive and emergency care. The latter has been abolished



in Flanders. As a consequence, when new graduates are hired, they start with less expertise in ICU care. This requires a more intensive on-the-job training with extra efforts from the ICU staff (e.g. supervising and mentoring new graduates) and the hospital (e.g. staff new graduates supernumerary during a certain period, education fees). Indeed, the costs of postgraduate courses in intensive care are much higher compared to the previously (by the Flemish authorities funded) Bachelor-after-Bachelor program and now have to be born by the student or his employer. Also an issue exist with the reimbursement of continuous education. Although this is obligatory to maintain the professional title the costs have in some hospitals be paid entirely by the ICU nurse while in other hospitals it is (partly) covered by the employer.

The COVID-19 stressed the importance of a nursing workforce with specific expertise in ICU care. Indeed, the work of ICU nurses is complex and multi-faceted. Working on ICU requires a combination of expertise and skills (e.g. medical knowledge, psychosocial and relational qualities, 'clinical view', medication management, stress resistant, ...) to perform a wide range of tasks (often simultaneously) and responsibilities with important potential consequences. The COVID-19 crisis showed that it is not easy nor desirable to staff ICUs with nurses without this specific expertise. The forced experiments during the pandemic with non-ICU staff turned out to be unsuccessful. Although highly appreciated, despite the huge efforts (fast-track training in ICU care, e-learning modules, shift towards team-nursing: ICU nurses buddied with a non-ICU nurse) non-ICU staff were generally not suited to the job. This caused not only stress for the ICU nurses and the redeployed nurses, it might also explain the poorer results in patient care observed in the surge ICU capacity.²⁶

Therefore it seems important to continue to invest in a nursing workforce with specific skills in ICU care. The quick fixes used during the COVID-19 pandemic had their merits to deal with an unprecedented crisis, but they are not to be considered as a solution on the long term.

^f Yet, a cautious interpretation of the so called non-nursing tasks I required. While a transport of a patient from an ICU to a general nursing unit or operation theatre, for instance, does not require the presence of two ICU

Nevertheless, there seems room to support ICU nurses in the units better. Indeed, ICU nurses perform a substantial amount of their time on tasks and activities for which 'stricto sensu' no specific (ICU) nursing expertise is required^f. ICU nurses reported to have, for example, performed the following tasks during their last shift: clerical duties (99.6%), ordering and storing medication (89.4%), cleaning patient rooms & equipment (80.9%). Moreover, in hospitals with higher levels of tasks below skill level performed by nurses, more task left undone in the domain 'planning and communication' were reported. Allocating healthcare assistants and other support staff to ICUs seems to be rather limited and mainly concentrated during day-time on weekdays. Enlarging the level of supporting staff to complement (not to substitute) ICU staff needs, therefore, to be considered as part of a general staffing plan and reform.

Patient-to-nurse ratios reveal little variation at the surface although considerable variation exists underneath the surface

When the Belgian nurse staffing related licensing standards for ICUs (i.e. 2 nurses per 6 ICU beds) are translated to patient-to-nurse ratios, one could state that a 3:1 ratio is the maximum. Based on the survey we have observed that on average the patient-to-nurse ratio on Belgian ICUs of 2.3 patients per nurse (2.2 during day-shifts and 2.7 during night shifts). This is above ICU standards used in other countries (e.g. in England the sickest critically ill patients correspond with a 1:1 ratio while a 1:2 ratio is used for those requiring critical care support for single non-respiratory organ failure^{35, 36}). In addition the variation across hospitals seems to be limited (IQR: 0.5).

While patient-to nurse ratios for ICUs were not always perceived as inadequate in the pre-pandemic period, the COVID-19 pandemic revealed problems underneath the surface. Several problems were expressed with patient-to-nurse ratios during the focus groups:

nurses, the presence of an ICU nurse together with one non-nursing staff member might be indicated. The current study finding therefore give an indication for domains that require further exploration on where task shifting could take place.



- The maximum number of 3 patients per nurse is (especially during nights) used as default staffing method. Moreover in some hospitals staff absenteeism is not or insufficiently compensated (e.g. during lunch breaks; meetings, transport or education outside the unit; sickness leave) resulting in higher patient-to-nurse ratios.
- Head nurses often have to spend part of their time on direct patient care to be able to meet the predefined ratios, hampering to spend sufficient time on their management and leadership role.
- There is no formal organisational system to differentiate ICUs in different levels of care. While several countries distinguish different levels of ICU care with accompanying patient-to-nurse ratios, in Belgium the licensing standards include a 3:1 ratio for all ICUs. This does not mean that all Belgian ICUs are the same. In practice the case-mix on some ICUs is much more severe compared to other ICUs and also the staffing levels differ. Although there is no direct link between the 'type of ICU' and 'patient-to-nurse ratios' in the hospital payment system, there are some mechanisms (e.g. additional budget based on patients with an intensive care profile) that compensate hospitals with a more severe case-mix for the higher staffing levels. A profound evaluation of the organisation and payment system of the Belgian ICU system seems to be indicated. Studying the link between the organisation of ICU and patient-to-nurse ratios needs to be integral part of such an evaluation.
- Moreover, an objective measurement of patient acuity adapted to the ICU specific context was clearly voiced as one of the missing element to differentiate staffing levels across ICUs in an adequate way (both across and within hospitals).

To conclude, it is clear that the COVID-19 pandemic comes with a price. The impact on the wellbeing of ICU nurses is huge and risks to have a long-term impact on the ICU nursing workforce. Nevertheless, many of the identified problems predate the start of the pandemic stressing that addressing the root causes is essential to make progress.⁶⁹ Although a formal evaluation of action points was out of scope of the current report, the findings of the current report stress the importance of the main conclusions of KCE reports 325 and 335. Several of the potential solutions

have been repeatedly addressed before. It would be a big mistake to only provide quick fix solutions as a response on the problems experienced during the crisis situation of the COVID-19 pandemic. Indeed, a general plan for the general healthcare workforce (including specific attention for ICU nurses) and a safe staffing policy are now more relevant than ever. The COVID-19 crisis placed investments in the healthcare workforce high on the political agenda. Large budgets were invested to improve working conditions of nurses and other healthcare workers (i.e. salary increase), and improve bedside nurse staffing levels and allow them to spend more time on direct patient care (Healthcare Fund). Although, these efforts can be called historical, given the importance of the budget, they do not yet result in a comprehensive and sustainable 'safe staffing policy'. The safeguards to spend the additional budget on direct patient care (e.g. approval by the local social concertation committee, obligation for hospitals to demonstrate a net increase in staffing levels, limit the use of the additional resources for nurses, healthcare assistants and supporting staff that allow nurses to spend more time on their core activities) are important first steps. Yet, similar actions recommended for general hospital units (see KCE report 325: e.g. mandated patient-to-nurse ratios for different types of units based on patient acuity measurement, investing in programs to reinforce the nursing work environment, building a culture where staffing matters from board-to-bedside) also apply for ICUs and need to be taken forward to obtain a safe staffing policy in Belgian hospitals.



■ REFERENCES

1. Marshall JC, Bosco L, Adhikari NK, Connolly B, Diaz JV, Dorman T, et al. What is an intensive care unit? A report of the task force of the World Federation of Societies of Intensive and Critical Care Medicine. *J Crit Care*. 2017;37:270-6.
2. Kerlin MP, Costa DK, Kahn JM. The Society of Critical Care Medicine at 50 Years: ICU Organization and Management. *Critical Care Medicine*. 2021;49(3):391-405.
3. Tan SS, Bakker J, Hoogendoorn ME, Kapila A, Martin J, Pezzi A, et al. Direct cost analysis of intensive care unit stay in four European countries: applying a standardized costing methodology. *Value Health*. 2012;15(1):81-6.
4. Bittner MI, Donnelly M, van Zanten AR, Andersen JS, Guidet B, Trujillano Cabello JJ, et al. How is intensive care reimbursed? A review of eight European countries. *Ann Intensive Care*. 2013;3(1):37.
5. Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Griffiths P, Busse R, et al. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet*. 2014;383(9931):1824-30.
6. Driscoll A, Grant MJ, Carroll D, Dalton S, Deaton C, Jones I, et al. The effect of nurse-to-patient ratios on nurse-sensitive patient outcomes in acute specialist units: a systematic review and meta-analysis. *Eur J Cardiovasc Nurs*. 2018;17(1):6-22.
7. Griffiths P, Recio-Saucedo A, Dall'Ora C, Briggs J, Maruotti A, Meredith P, et al. The association between nurse staffing and omissions in nursing care: A systematic review. *J Adv Nurs*. 2018;74(7):1474-87.
8. Van den Heede K, Bruyneel L, Beeckmans D, Boon N, Bouckaert N, Cornelis J, et al. Safe nurse staffing levels in acute hospitals. Health Services Research (HSR). Brussels: Belgian Health Care Knowledge Center; 2019. KCE Reports (325)



9. Wynendaele H, Willems R, Trybou J. Systematic review: Association between the patient-nurse ratio and nurse outcomes in acute care hospitals. *J Nurs Manag.* 2019;27(5):896-917.
10. Van den Heede K, Cornelis J, Bouckaert N, Bruyneel L, Van de Voorde C, Sermeus W. Safe nurse staffing policies for hospitals in England, Ireland, California, Victoria and Queensland: A discussion paper. *Health Policy.* 2020;124(10):1064-73.
11. Numata Y, Schulzer M, van der Wal R, Globberman J, Semeniuk P, Balka E, et al. Nurse staffing levels and hospital mortality in critical care settings: literature review and meta-analysis. *J Adv Nurs.* 2006;55(4):435-48.
12. Penoyer DA. Nurse staffing and patient outcomes in critical care: a concise review. *Crit Care Med.* 2010;38(7):1521-8; quiz 9.
13. West E, Mays N, Rafferty AM, Rowan K, Sanderson C. Nursing resources and patient outcomes in intensive care: a systematic review of the literature. *Int J Nurs Stud.* 2009;46(7):993-1011.
14. Rae PJL, Pearce S, Greaves PJ, Dall'Ora C, Griffiths P, Endacott R. Outcomes sensitive to critical care nurse staffing levels: A systematic review. *Intensive Crit Care Nurs.* 2021;67:103110.
15. Miranda DR, Nap R, de Rijk A, Schaufeli W, Iapichino G, System TWGTIS. Nursing activities score. *Crit Care Med.* 2003;31(2):374-82.
16. Reis Miranda D, Moreno R, Iapichino G. Nine equivalents of nursing manpower use score (NEMS). *Intensive Care Med.* 1997;23(7):760-5.
17. Bruyneel A, Tack J, Droguet M, Maes J, Wittebole X, Miranda DR, et al. Measuring the nursing workload in intensive care with the Nursing Activities Score (NAS): A prospective study in 16 hospitals in Belgium. *J Crit Care.* 2019;54:205-11.
18. Decock K, Casaer MP, Guiza F, Wouters P, Florquin M, Wilmer A, et al. Predicting patient nurse-level intensity for a subsequent shift in the intensive care unit: A single-centre prospective observational study. *Int J Nurs Stud.* 2020;109:103657.
19. Debergh DP, Myny D, Van Herzeele I, Van Maele G, Reis Miranda D, Colardyn F. Measuring the nursing workload per shift in the ICU. *Intensive Care Med.* 2012;38(9):1438-44.
20. Deprez N. Ijken van verpleegkundige zorgprofielen voor staffinstoepassingen op intensieve zorgen afdelingen. Diss. master (in de verpleegkunde en de vroedkunde), Leuven: KU Leuven. Groep Biomedische wetenschappen. Departement Maatschappelijke gezondheidszorg. 2006.
21. Wilderjans A. De evolutie in verpleegkundige zorgzwaarte op de intensieve zorgeenheden van UZ Leuven Gasthuisberg. Een retrospectieve data-analyse. Diss. master (in de verpleegkunde en de vroedkunde), Leuven: KU Leuven. Groep Biomedische wetenschappen. Departement Maatschappelijke gezondheidszorg. 2017.
22. Maes J, Bruyneel A, Di Pierdomenico L, Tack J, Pirson M. Etude comparative du temps de travail infirmier aux soins intensifs entre une échelle spécifique (Nursing Activities Score) et les Données Infirmières du Résumé Hospitalier Minimum (DI-RHM). [Preprint]. 2021]
23. Bruyneel A, Maes J, Di Pierdomenico L, Tack J, Bogaert M, Leclercq P, et al. Associations between two nursing workload scales and the cost of intensive care unit nursing staff: A retrospective study of one Belgian hospital. *J Nurs Manag.* 2022.
24. Fernandez R, Lord H, Halcomb E, Moxham L, Middleton R, Alananzeh I, et al. Implications for COVID-19: A systematic review of nurses' experiences of working in acute care hospital settings during a respiratory pandemic. *International journal of nursing studies.* 2020;111:103637.
25. Rattray J, McCallum L, Hull A, Ramsay P, Salisbury L, Scott T, et al. Work-related stress: the impact of COVID-19 on critical care and redeployed nurses: a mixed-methods study. *BMJ open.* 2021;11(7):e051326.
26. Taccone FS, Van Goethem N, De Pauw R, Wittebole X, Koen B, Vanoyen H, et al. The role of organizational characteristics on the



- outcome of COVID-19 patients admitted to the ICU in Belgium. *The Lancet Regional Health-Europe*. 2020:100019.
27. Bruyneel A, Smith P, Tack J, Pirson M. Prevalence of burnout risk and factors associated with burnout risk among ICU nurses during the COVID-19 outbreak in French speaking Belgium. *Intensive Crit Care Nurs*. 2021:103059.
 28. Arabi YM, Azoulay E, Al-Dorzi HM, Phua J, Salluh J, Binnie A, et al. How the COVID-19 pandemic will change the future of critical care. *Intensive Care Med*. 2021;47(3):282-91.
 29. Grimm C, Dickel S, Sachkova A, Popp M, Golinski M, Fichtner F, et al. Targeted Minimal Staff-to-Patient Ratios Are Unachievable - A Nationwide Survey in German ICUs During the COVID-19 Pandemic. *Cureus*. 2021;13(6):e15755.
 30. Petrisor C, Breazu C, Doroftei M, Maries I, Popescu C. Association of Moral Distress with Anxiety, Depression, and an Intention to Leave among Nurses Working in Intensive Care Units during the COVID-19 Pandemic. *Healthcare (Basel, Switzerland)*. 2021;9(10).
 31. Hoogendoorn ME, Brinkman S, Bosman RJ, Haringman J, de Keizer NF, Spijkstra JJ. The impact of COVID-19 on nursing workload and planning of nursing staff on the Intensive Care: A prospective descriptive multicenter study. *International journal of nursing studies*. 2021;121:104005.
 32. Bruyneel A, Gallani MC, Tack J, d'Hondt A, Canipel S, Franck S, et al. Impact of COVID-19 on nursing time in intensive care units in Belgium. *Intensive & critical care nursing*. 2021;62:102967.
 33. Bruyneel A, Lucchini A, Hoogendoorn M. Impact of COVID-19 on nursing workload as measured with the Nursing Activities Score in intensive care. *Intensive & critical care nursing*. 2021:103170.
 34. Lucchini A, Iozzo P, Bambi S. Nursing workload in the COVID-19 era. *Intensive & critical care nursing*. 2020;61:102929.
 35. Endacott R, Pearce S, Rae P, Richardson A, Bench S, Pattison N, et al. How COVID-19 has affected staffing models in intensive care: A qualitative study examining alternative staffing models (SEISMIC). *Journal of advanced nursing*. 2021.
 36. Wynne R, Davidson PM, Duffield C, Jackson D, Ferguson C. Workforce management and patient outcomes in the intensive care unit during the COVID-19 pandemic and beyond: a discursive paper. *Journal of clinical nursing*. 2021.
 37. Beckett CD, Zadvinskis IM, Dean J, Iseler J, Powell JM, Buck-Maxwell B. An Integrative Review of Team Nursing and Delegation: Implications for Nurse Staffing during COVID-19. *Worldviews on evidence-based nursing*. 2021;18(4):251-60.
 38. Tang CJ, Lin YP, Chan EY. 'From Expert to Novice', Perceptions of General Ward Nurses on Deployment to Outbreak Intensive Care Units during the COVID-19 Pandemic: A Qualitative Descriptive Study. *Journal of clinical nursing*. 2021.
 39. Butera S, Brasseur N, Filion N, Bruyneel A, Smith P. Prevalence and Associated Factors of Burnout Risk Among Intensive Care and Emergency Nurses Before and During the Coronavirus Disease 2019 Pandemic: A Cross-Sectional Study in Belgium. *Journal of emergency nursing*. 2021;47(6):879-91.
 40. Gualano MR, Sinigaglia T, Lo Moro G, Rousset S, Cremona A, Bert F, et al. The Burden of Burnout among Healthcare Professionals of Intensive Care Units and Emergency Departments during the COVID-19 Pandemic: A Systematic Review. *Int J Environ Res Public Health*. 2021;18(15).
 41. Gecoördineerde wet van 10 mei 2015 betreffende de uitoefening van de gezondheidszorgberoepen - Loi coordonnée du 10 mai 2015 relative à l'exercice des professions des soins de santé. B.S. 18 juni 2015.
 42. Bruyneel L, Van den Heede K, Sermeus W. Belgium. In: Rafferty AM, Busse R, Zander-Jentsch B, Sermeus W, Bruyneel L, editors. *Strengthening health systems through nursing: evidence from 14 European countries* Copenhagen: European Observatory on Health Systems and Policies; 2019. Available from: <https://pubmed.ncbi.nlm.nih.gov/31465172/>



43. Organisation for Economic Co-operation and Development (OECD). Hospital beds and occupancy [Web page]. 2021 [cited 18 March 2022]. Available from: <https://www.oecd-ilibrary.org/sites/e5a80353-en/index.html?itemId=/content/component/e5a80353-en>
44. Cel Planning van het Aanbod van de Gezondheidszorgberoepen. PlanKad Verpleegkundigen 2004-2018. Brussels: FOD Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu; 2021.
45. Koninklijk besluit van 27 april 1998 houdende vaststelling van de normen waaraan een functie voor intensieve zorg moet voldoen om erkend te worden - Arrêté royal du 27 avril 1998 fixant les normes auxquelles une fonction de soins intensifs doit répondre pour être agréée.: B.S. 19 juni 1998.
46. Eisenkader Functie voor intensieve zorg. [cited 21 March 2022]. Available from: <https://www.zorg-en-gezondheid.be/sites/default/files/atoms/files/eisenkader%20intensieve%20zorg%20mei%202018.pdf>
47. Van de Voorde C, Van den Heede K, Mertens R, Annemans L, Busse R, Callens S, et al. Conceptual framework for the reform of the Belgian hospital payment system. Health Services Research (HSR). Brussels: Belgian Health Care Knowledge Center; 2014. KCE Reports (229)
48. Collectieve arbeidsovereenkomst van 28 september 2016 tot het bepalen van sectorale referentiefuncties en een sectorale functieclassificatie. Paritair Comité voor de gezondheidsinrichtingen en -diensten (PC 330).
49. Collectieve arbeidsovereenkomst van 8 november 2021 over de rapporteringsprocedure aan de vzw IFIC Paritair Comité voor de gezondheidsinrichtingen en -diensten (PC 330).
50. Collectieve arbeidsovereenkomst van 11 december 2017 betreffende de invoering van een nieuw loonmodel voor de federale gezondheidsdiensten. Paritair Comité voor de gezondheidsinrichtingen en -diensten (PC 330).
51. Collectieve arbeidsovereenkomst van 31 maart 2021 betreffende de volledige invoering van een nieuw loonmodel voor de federale gezondheidsdiensten : IFIC. Paritair Comité voor de gezondheidsinrichtingen en -diensten (PC 330).
52. Wet van 30 juni 2020 tot bestendiging van het Zorgpersoneelfonds en tot toewijzing van de desbetreffende middelen voor de jaren 2019 en 2020 - Loi du 30 juin 2020 pérennisant le Fonds blouses blanches santé et affectant ses moyens correspondants pour les années 2019 et 2020.: B.S., 28 augustus 2020.
53. Koninklijk besluit van 22 december 2020 tot vaststelling van de financiering en de modaliteiten voor de invoering van een solidariteitspremie in de federale gezondheidssectoren - Arrêté royal du 22 décembre 2020 fixant le financement et les modalités pour l'instauration d'une prime de solidarité dans les secteurs des soins de santé fédéraux. B.S. 29 december 2020.
54. Koninklijk besluit van 14 december 2020 tot wijziging van het koninklijk besluit van 25 april 2002 betreffende de vaststelling en de vereffening van het budget van financiële middelen van de ziekenhuizen - Arrêté royal du 14 décembre 2020 modifiant l'arrêté royal du 25 avril 2002 relatif à la fixation et à la liquidation du budget des moyens financiers des hôpitaux. B.S. 24 december 2020.
55. Wet van 20 december 2020 houdende tijdelijke ondersteuningsmaatregelen ten gevolge van de COVID-19-pandemie - Loi du 20 décembre 2020 portant des mesures de soutien temporaires en raison de la pandémie du COVID-19. B.S. 30 december 2020.
56. Fuentelsaz-Gallego C, Moreno-Casbas T, Gomez-Garcia T, Gonzalez-Maria E, Consorcio RNC-E. [Work setting, satisfaction and burnout of the nurses in critical care units and hospitalization units. RN4CAST-Spain project]. Enferm Intensiva. 2013;24(3):104-12.



57. Sermeus W, Aiken LH, Van den Heede K, Rafferty AM, Griffiths P, Moreno-Casbas MT, et al. Nurse forecasting in Europe (RN4CAST): Rationale, design and methodology. *BMC Nurs.* 2011;10:6.
58. Kiekkas P, Tsekoura V, Fligou F, Tzenalis A, Michalopoulos E, Voyagis G. Missed Nursing Care in the Postanesthesia Care Unit: A Cross-Sectional Study. *J Perianesth Nurs.* 2021;36(3):232-7.
59. Pereira Lima Silva R, Goncalves Meneguetti M, Dias Castilho Siqueira L, de Araujo TR, Auxiliadora-Martins M, Mantovani Silva Andrade L, et al. Omission of nursing care, professional practice environment and workload in intensive care units. *J Nurs Manag.* 2020;28(8):1986-96.
60. Chaboyer W, Harbeck E, Lee BO, Grealish L. Missed nursing care: An overview of reviews. *Kaohsiung J Med Sci.* 2021;37(2):82-91.
61. Zorgnetiuro. Van vier naar vijf zonder pauze: recept voor een verdere neerwaartse spiraal van ons zorgsysteem [Web page]. 2021 [cited 21/02/2022]. Available from: <https://www.zorgnetiuro.be/nieuws/van-vier-naar-vijf-zonder-pauze-recept-voor-een-verdere-neerwaartse-spiraal-van-ons>
62. Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Jama.* 2002;288(16):1987-93.
63. Lake ET. Development of the practice environment scale of the Nursing Work Index. *Res Nurs Health.* 2002;25(3):176-88.
64. Kutney-Lee A, Wu ES, Sloane DM, Aiken LH. Changes in hospital nurse work environments and nurse job outcomes: an analysis of panel data. *Int J Nurs Stud.* 2013;50(2):195-201.
65. Van den Heede K, Florquin M, Bruyneel L, Aiken L, Diya L, Lesaffre E, et al. Effective strategies for nurse retention in acute hospitals: a mixed method study. *Int J Nurs Stud.* 2013;50(2):185-94.
66. Lake ET, Friese CR. Variations in nursing practice environments: relation to staffing and hospital characteristics. *Nurs Res.* 2006;55(1):1-9.
67. Rotenstein LS, Torre M, Ramos MA, Rosales RC, Guille C, Sen S, et al. Prevalence of Burnout Among Physicians: A Systematic Review. *JAMA.* 2018;320(11):1131-50.
68. De Witte H, Schaufeli W. Burnout Assessment Tool [Web page]. 2020 [cited 15/03/2022]. Available from: https://burnoutassessmenttool.be/project_eng/
69. Aiken LH. Nursing Outcomes and Nurses' Wellbeing. *Prof Infirm.* 2021;74(4):255.
70. Aiken LH, Sermeus W, Van den Heede K, Sloane DM, Busse R, McKee M, 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.
71. Hardin JW, Hilbe JM. Generalized estimating equations. *chapman and hall/CRC*; 2002.
72. Kohn L, Christiaens W. The use of qualitative research methods in KCE studies. Brussels: Belgian Health Care Knowledge Centre (KCE); 2012. Method KCE Report 187C
73. Van de Voorde C, Lefèvre M, Mistiaen P, Detollenaere J, Kohn L, Van den Heede K. Assessing the management of hospital surge capacity in the first wave of the COVID-19 pandemic in Belgium. Health Services Research (HSR). Brussels: Belgian Health Care Knowledge Centre (KCE); 2020. KCE Reports (335)
74. Aiken LH, Clarke SP, Cheung RB, Sloane DM, Silber JH. Educational levels of hospital nurses and surgical patient mortality. *Jama.* 2003;290(12):1617-23.
75. Haegdorens F, Van Bogaert P, De Meester K, Monsieurs KG. The impact of nurse staffing levels and nurse's education on patient mortality in medical and surgical wards: an observational multicentre study. *BMC Health Serv Res.* 2019;19(1):864.



76. Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse-staffing levels and the quality of care in hospitals. *New England Journal of Medicine*. 2002;346(22):1715-22.
77. Musy SN, Endrich O, Leichtle AB, Griffiths P, Nakas CT, Simon M. The association between nurse staffing and inpatient mortality: A shift-level retrospective longitudinal study. *Int J Nurs Stud*. 2021;120:103950.
78. Vanhaecht K. Zorgverleners zijn veerkrachtig, maar opvolging en ondersteuning zijn wenselijk. Dat blijkt uit het Barometer onderzoek bij 8350 medewerkers uit zorg & welzijn tijdens de COVID-19 pandemie. [Preprint]. 2020]
79. Bruyneel A, Smith P. Comparison of the prevalence of burnout risk between ICU and non-ICU nurses during the COVID-19 outbreak in French-speaking Belgium. *Intensive & critical care nursing*. 2021;66:103086.
80. Peeters B, Doggen K, De Schreye R, Demarest S, Drieskens S, Seys D, et al. OWER TO CARE De enquête naar het welzijn van zorgverleners, hulpverleners en mantelzorgers. Belangrijkste resultaten van de derde nationale enquête juni 2021. Sciensano; 2021. Available from: <https://www.sciensano.be/nl/biblio/power-care-de-enquete-naar-het-welzijn-van-zorgverleners-hulpverleners-en-mantelzorgers-0>
81. Universiteit Antwerpen. Zorgdruk Barometer [Web page].2022 [cited 29/03/2022]. Available from: <https://uantwerpen.eu.qualtrics.com/reports/RC/public/dWFudHdIcnBibi02MTIIMWQ4YjYxMWVjOTAwMGY2NTZmYTETVVJfY3U5NUNPOWtyYVI4NUVo>
82. Jimenez JV, Olivas-Martinez A, Rios-Olais FA, Ayala-Aguillon F, Gil-Lopez F, Leal-Villarreal MAJ, et al. Outcomes in Temporary ICUs Versus Conventional ICUs: An Observational Cohort of Mechanically Ventilated Patients With COVID-19-Induced Acute Respiratory Distress Syndrome. *Crit Care Explor*. 2022;4(4):e0668.
83. Twigg DE, Myers H, Duffield C, Giles M, Evans G. Is there an economic case for investing in nursing care--what does the literature tell us? *J Adv Nurs*. 2015;71(5):975-90.
84. Wieczorek-Wojcik B, Gaworska-Krzeminska A, Szykiewicz P, Wojcik M, Orzechowska M, Kilanska D. Cost-Effectiveness Analysis of Improving Nurses' Education Level in the Context of In-Hospital Mortality. *Int J Environ Res Public Health*. 2022;19(2).
85. Bruyneel A, Smith P. Comparison of the prevalence of burnout risk between ICU and non-ICU nurses during the COVID-19 outbreak in French-speaking Belgium. *Intensive Crit Care Nurs*. 2021;66:103086.
86. Ball JE, Bruyneel L, Aiken LH, Sermeus W, Sloane DM, Rafferty AM, et al. Post-operative mortality, missed care and nurse staffing in nine countries: A cross-sectional study. *Int J Nurs Stud*. 2018;78:10-5.
87. Stimpfel AW, Sloane DM, McHugh MD, Aiken LH. Hospitals Known for Nursing Excellence Associated with Better Hospital Experience for Patients. *Health Serv Res*. 2016;51(3):1120-34.
88. Stalpers D, de Brouwer BJ, Kaljouw MJ, Schuurmans MJ. Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: a systematic review of literature. *International Journal of Nursing Studies*. 2015;52(4):817-35.
89. Petit Dit Dariel O, Regnaud J-P. Do Magnet-accredited hospitals show improvements in nurse and patient outcomes compared to non-Magnet hospitals: a systematic review. *JBI database of systematic reviews and implementation reports*. 2015;13(6):168-219.
90. Copanitsanou P, Fotos N, Brokalaki H. Effects of work environment on patient and nurse outcomes. *British journal of nursing (Mark Allen Publishing)*. 2017;26(3):172-6.



91. ANCC. ANCC Magnet Recognition Program [Web page].2019
[cited 26/09/2019]. Available from:
<https://www.nursingworld.org/organizational-programs/magnet/>

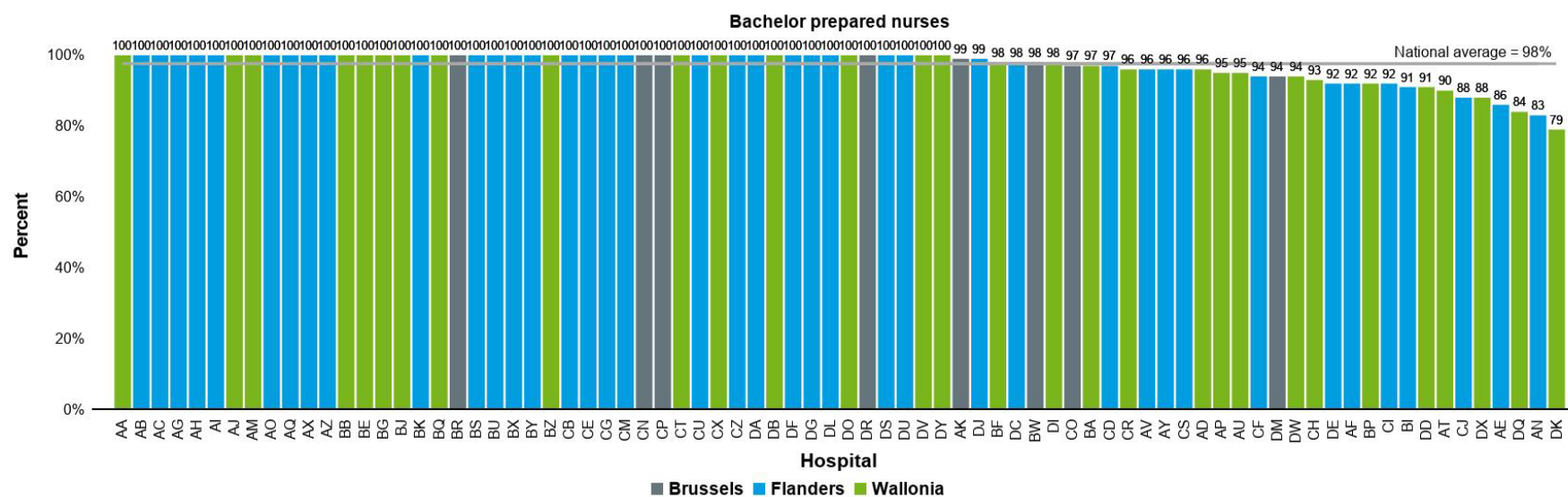


APPENDIX 1. ADDITIONAL FIGURES

Appendix 1.1. Educational level and special ICU certification

Most nurses working on ICU are Bachelor-prepared. The average percentage across hospital sites is 98% with only 6 hospital sites with a percentage <90% (Figure 43).

Figure 43 – Percentage of Bachelor-prepared nurses, at hospital site and regional level

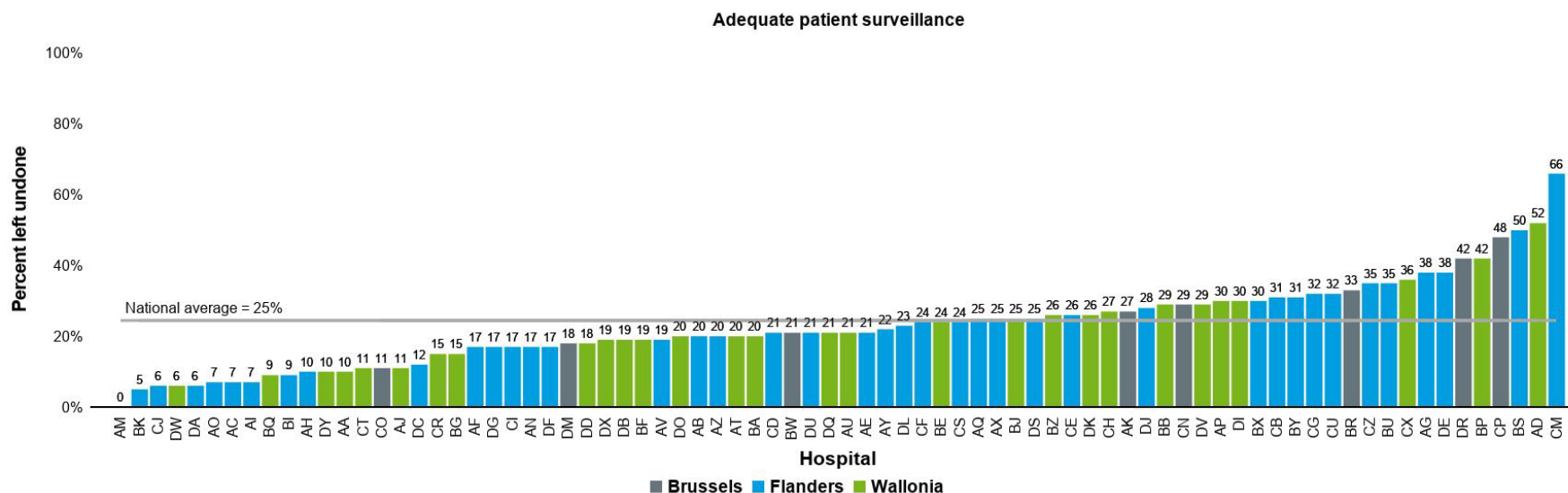




Appendix 1.2. Nursing activities: clinical care left undone

The average percentage of nurses who reported leaving adequate patient surveillance undone during their last shift due to lack of time is 25% (0% to 66%) (Figure 44).

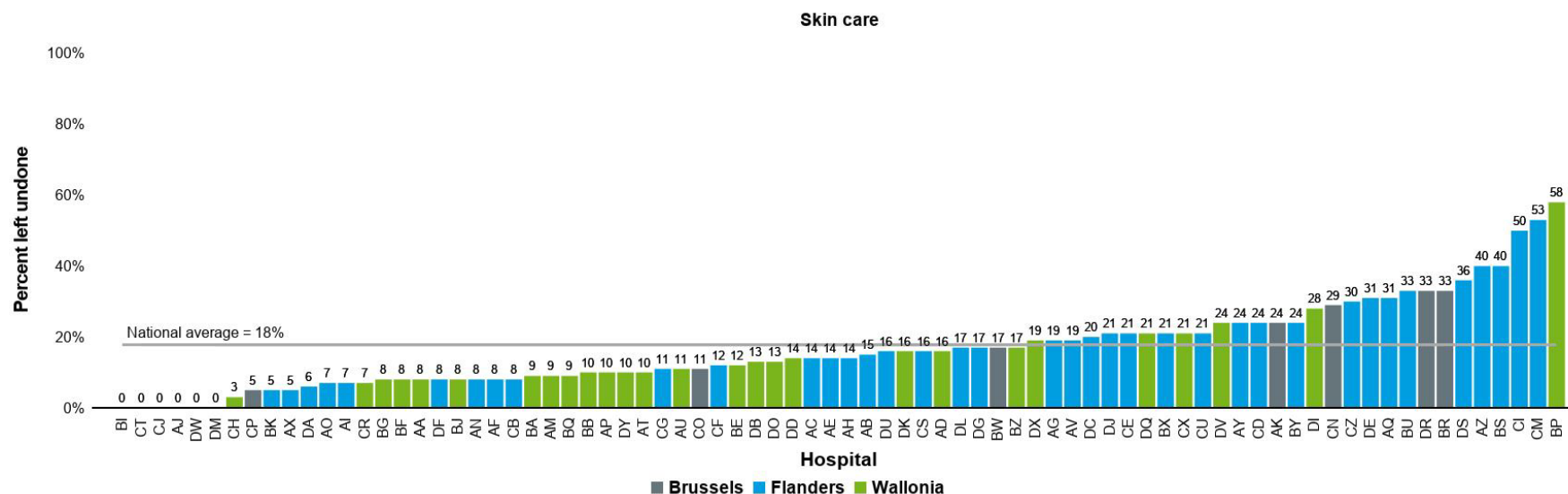
Figure 44 – Percentage of nurses who reported leaving adequate patient surveillance undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving skin and wound care undone during their last shift due to lack of time is 18% (0% to 58%) (Figure 45).

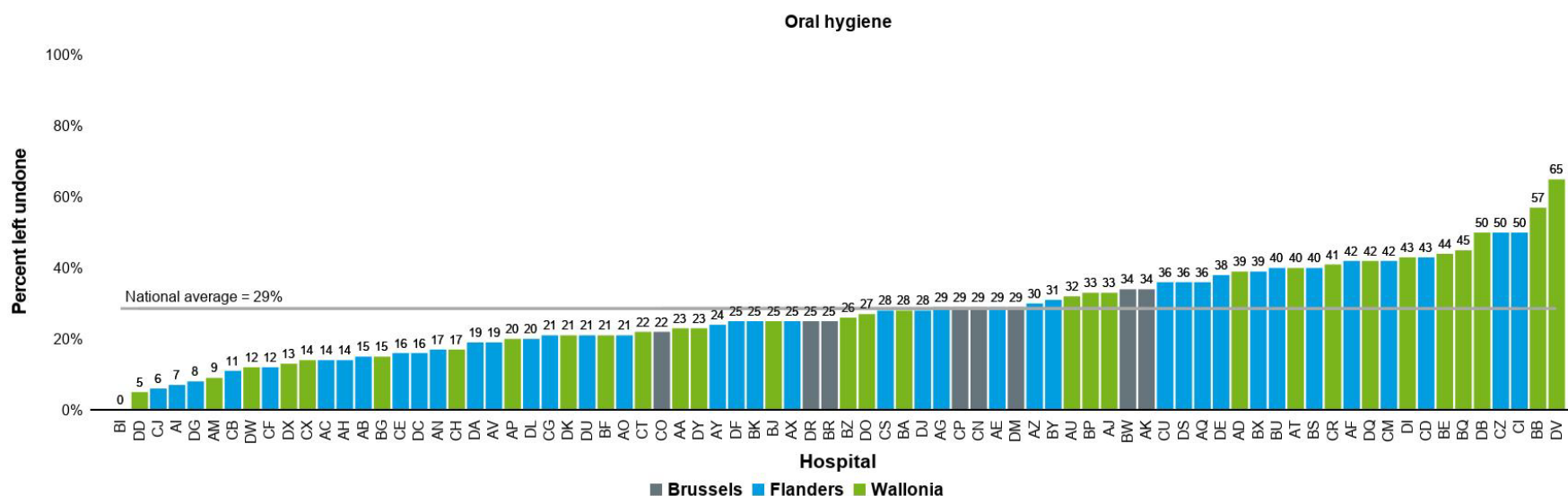
Figure 45 – Percentage of nurses who reported leaving skin and wound care undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving oral hygiene undone during their last shift due to lack of time is 29% (0% to 65%) (Figure 46).

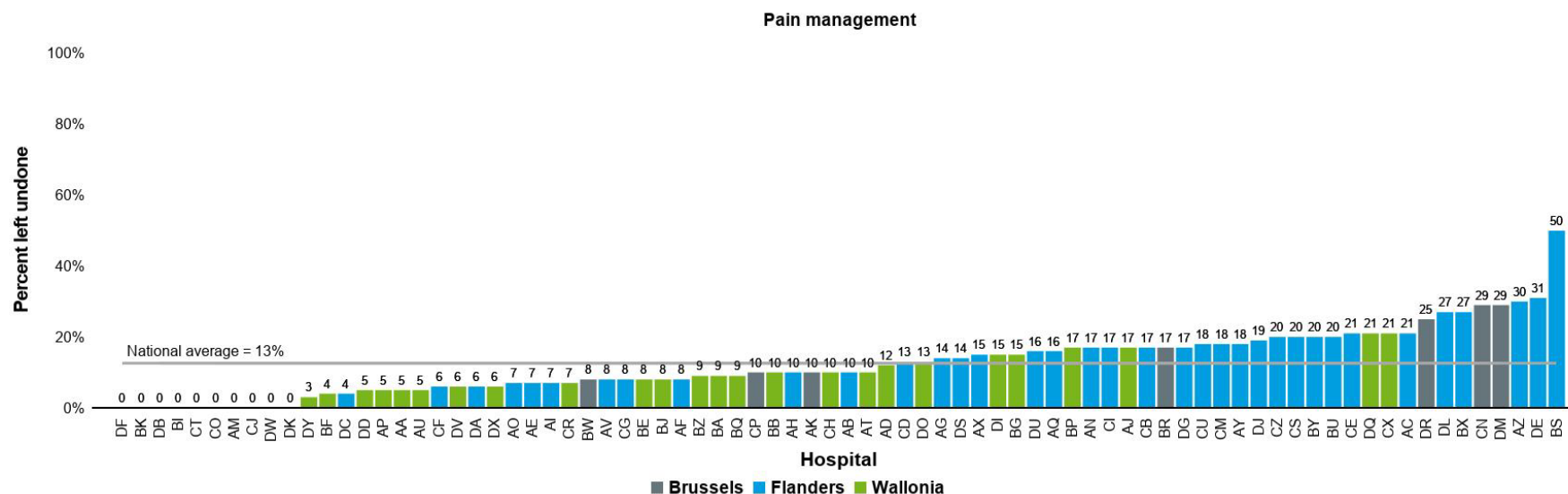
Figure 46 – Percentage of nurses who reported leaving oral hygiene undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving pain management undone during their last shift due to lack of time is 13% (0% to 50%) (Figure 47).

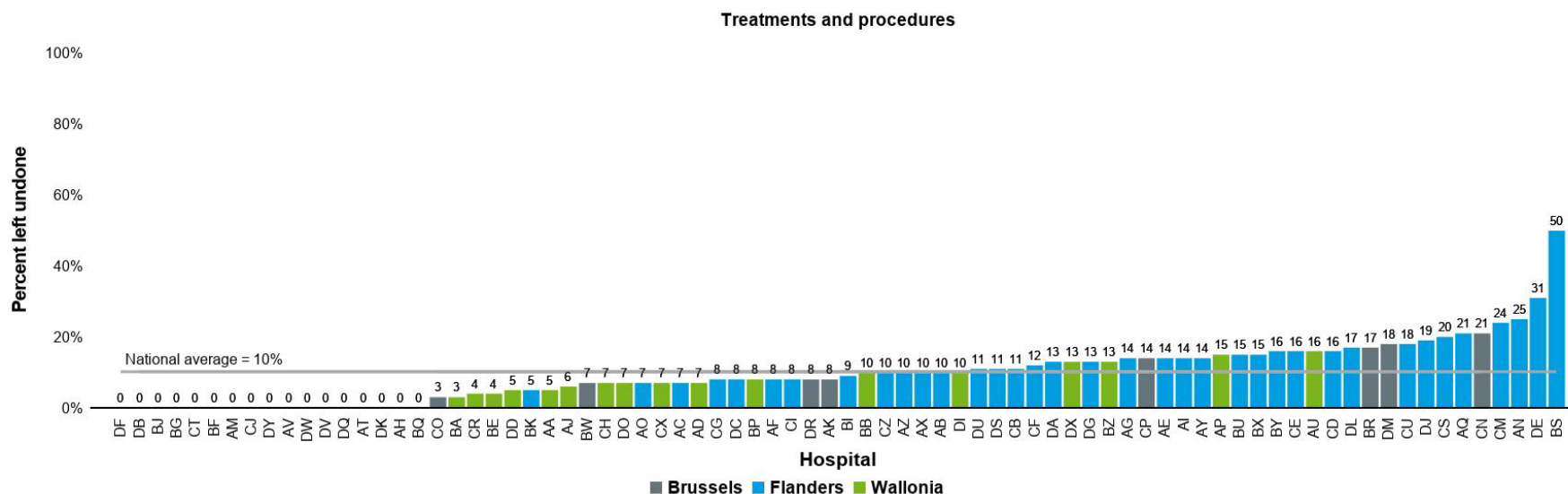
Figure 47 – Percentage of nurses who reported leaving pain management undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving treatments/procedures undone during their last shift due to lack of time is 10% (0% to 50%) (Figure 48).

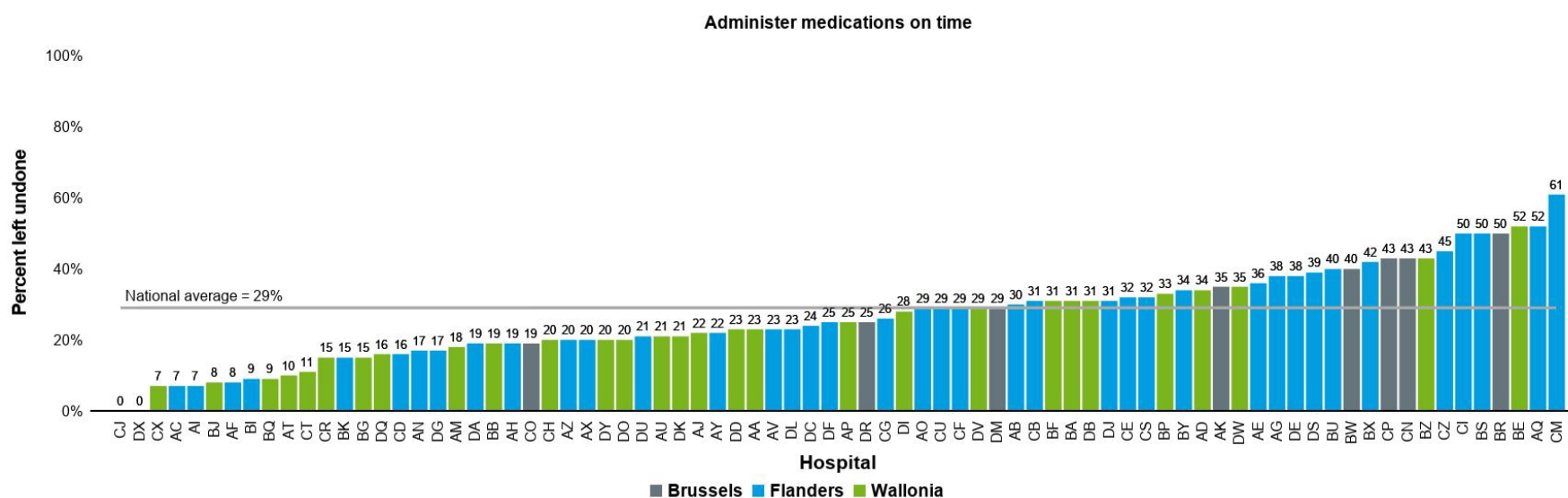
Figure 48 – Percentage of nurses who reported leaving treatments/procedures undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving timely medication administration undone during their last shift due to lack of time is 29% (0% to 61%) (Figure 49).

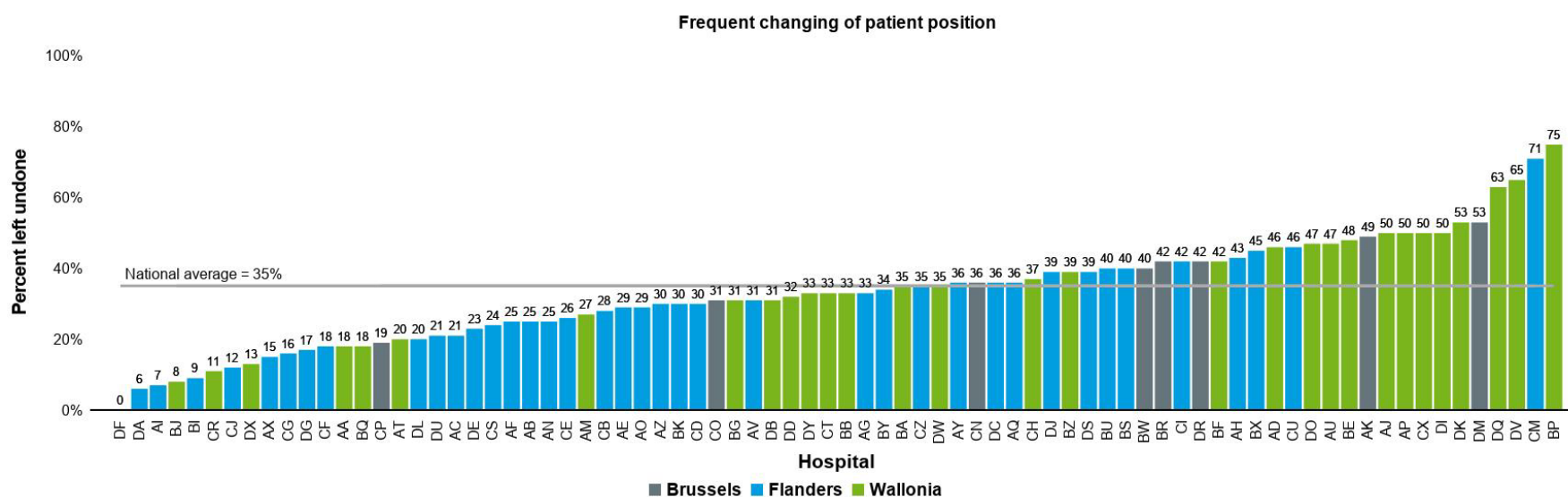
Figure 49 – Percentage of nurses who reported leaving timely medication administration undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving frequent changing of patient position undone during their last shift due to lack of time is 35% (0% to 75%) (Figure 50).

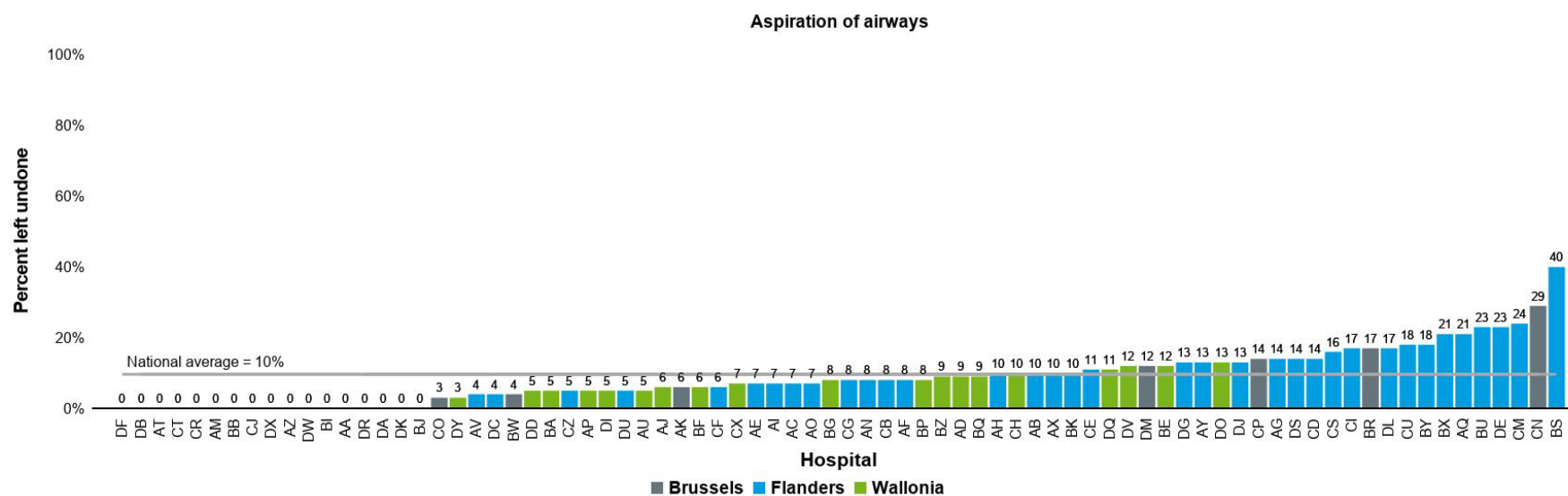
Figure 50 – Percentage of nurses who reported leaving frequent changing patient position undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving airway aspiration left undone during their last shift was 10% (0% to 40%) (Figure 51).

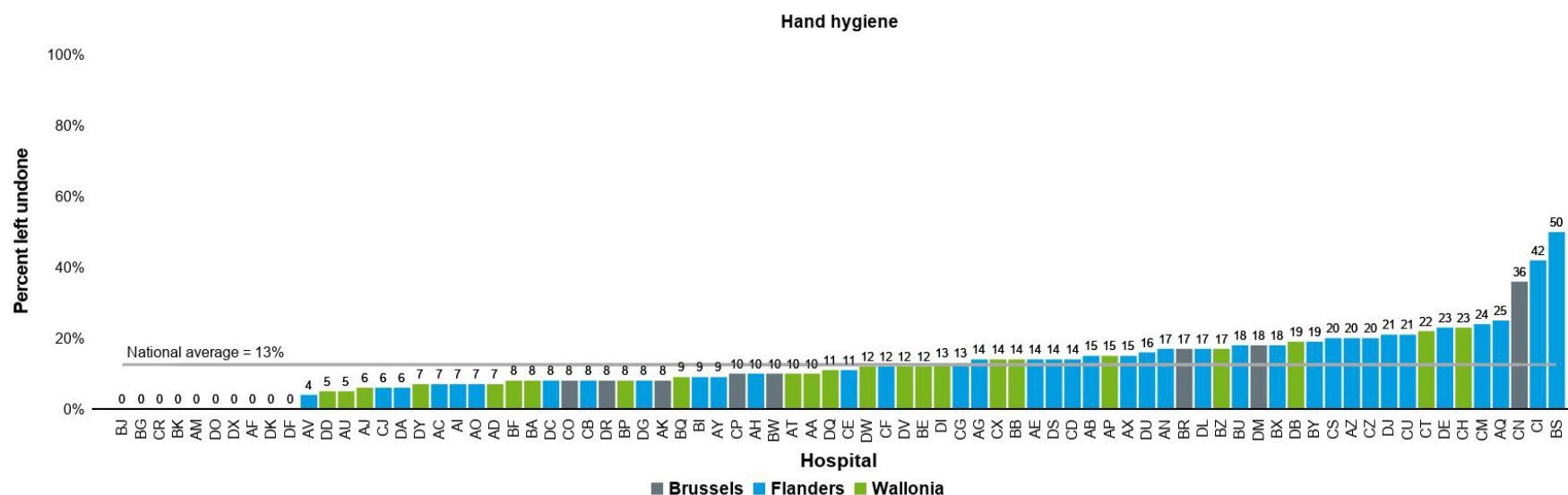
Figure 51 – Percentage of nurses who reported leaving aspiration of airways undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving hand hygiene activities left undone during their last shift was 13% (0% to 50%) (Figure 52).

Figure 52 – Percentage of who reported hand hygiene activities left undone, at hospital site and regional level

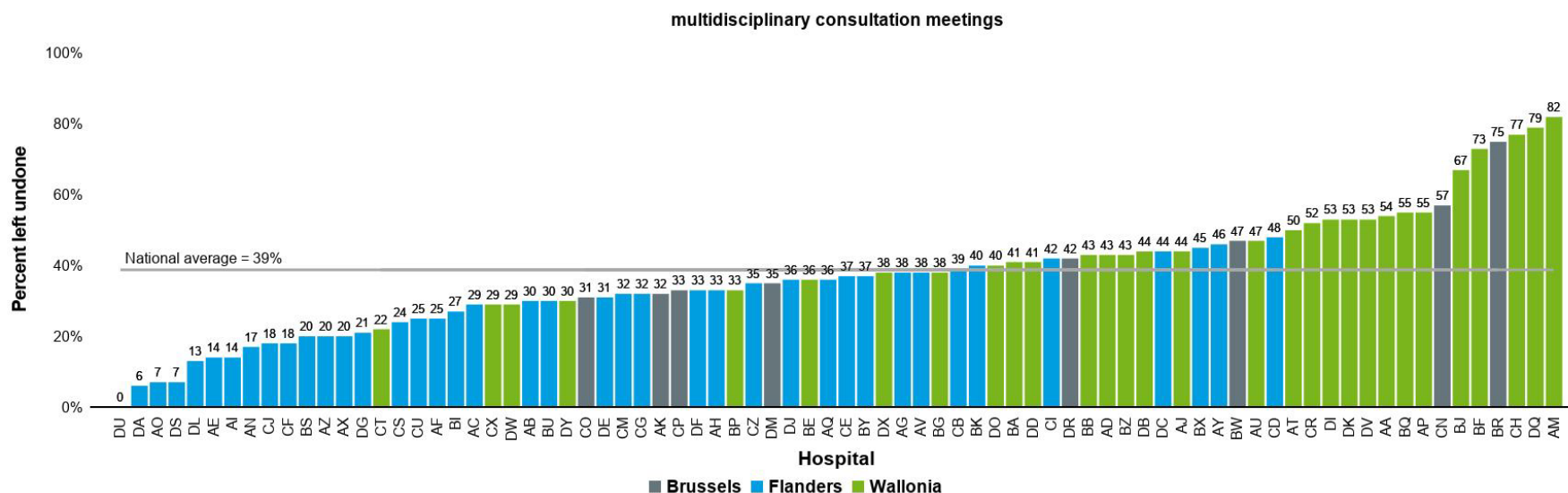




Appendix 1.3. Nursing activities: planning and communication left undone

The average percentage of nurses who reported leaving participation on multidisciplinary meetings undone during their last shift due to lack of time is 39% (0% to 82%) (Figure 53).

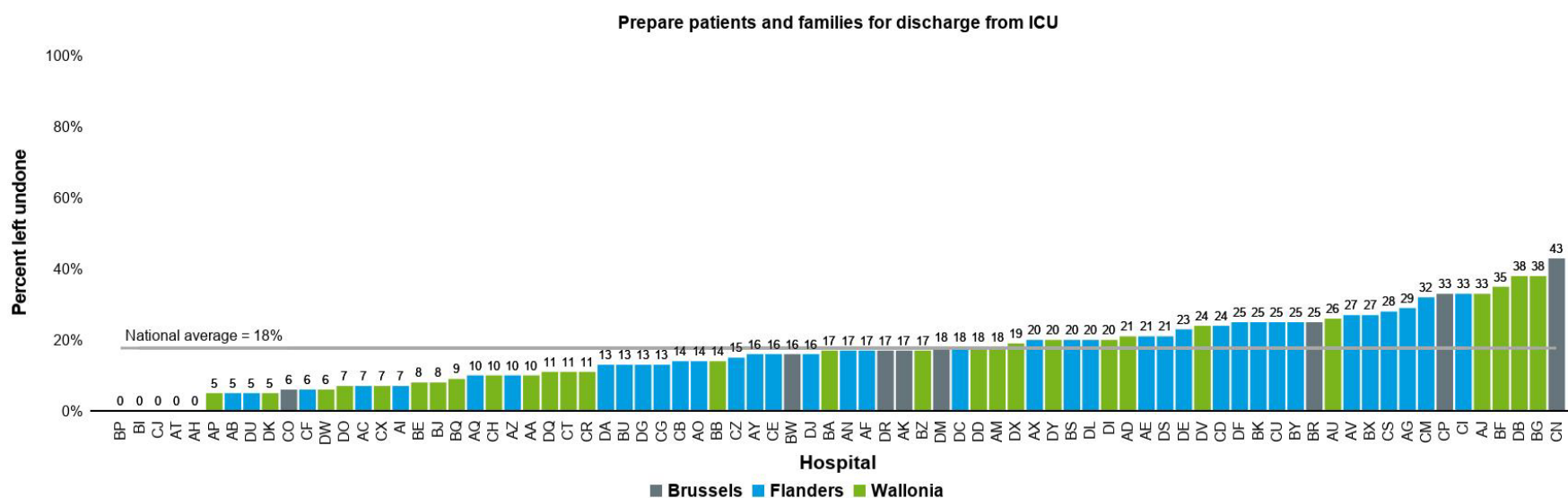
Figure 53 – Percentage of nurses who reported leaving ‘multidisciplinary concertation’ undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving preparing patients and their family for discharge from the ICU undone during their last shift due to lack of time is 18% (0% to 43%) (Figure 54).

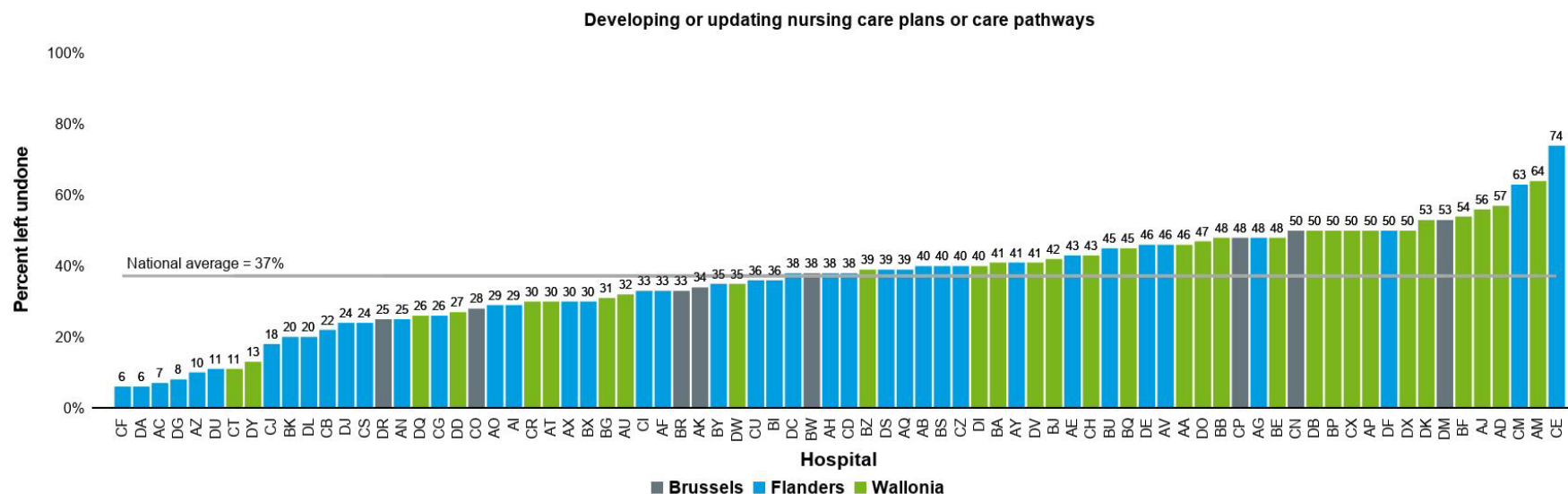
Figure 54 – Percentage of nurses who reported preparing patients and their family for discharge from the ICU undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving developing or updating nursing care plans or care pathways undone during their last shift due to lack of time is 37% (6% to 74%) (Figure 55).

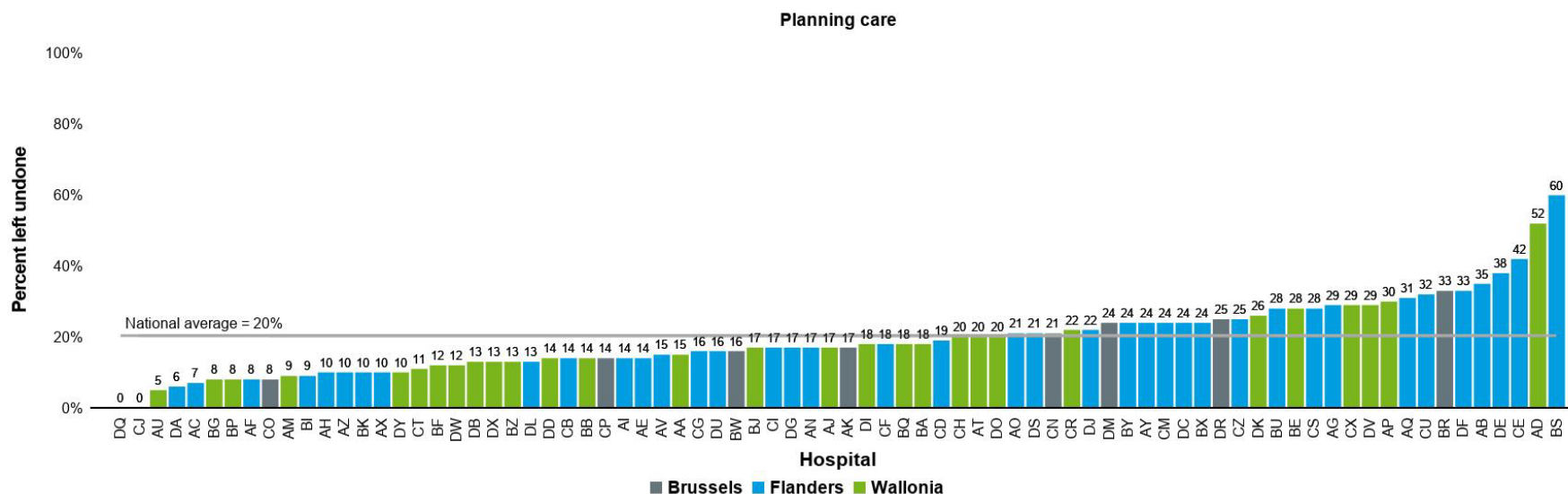
Figure 55 – Percentage of nurses who reported leaving updating care plans undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving planning care undone during their last shift due to lack of time is 20% (0% to 60%) (Figure 56).

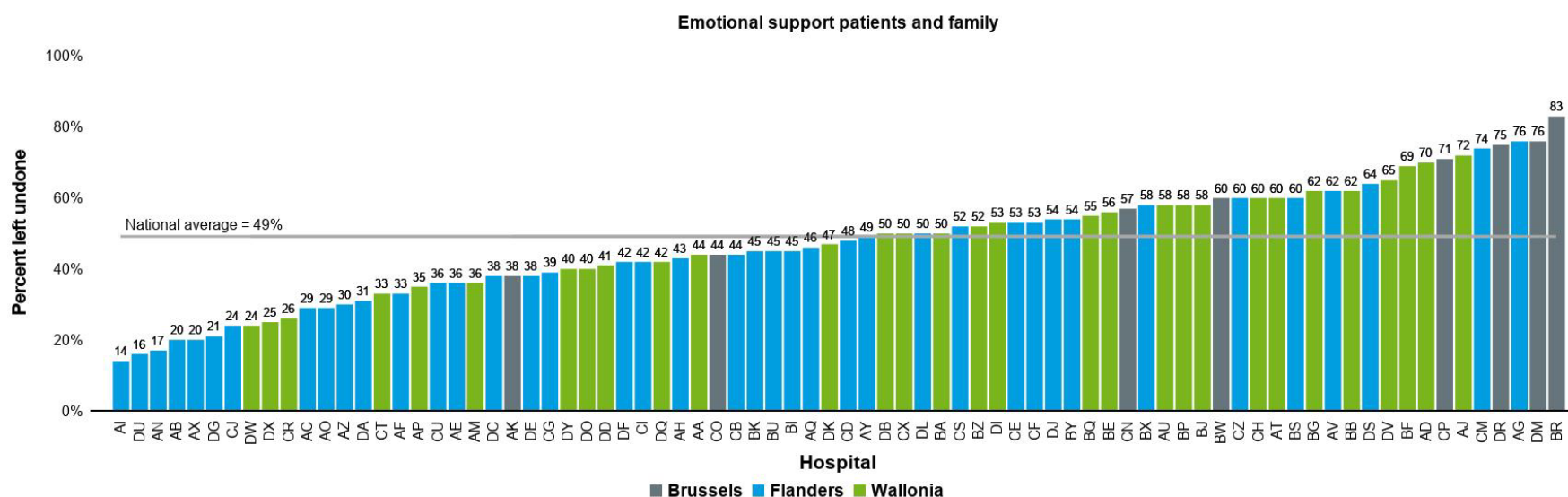
Figure 56 – Percentage of nurses who reported leaving planning care undone during the last shift, at hospital site and regional level





The average percentage of nurses who reported leaving emotional support for patient and family undone during their last shift due to lack of time is 49% (14% to 83%) (Figure 57).

Figure 57 – Percentage of nurses who reported leaving emotional support (patient and family) undone during the last shift, at hospital site and regional level

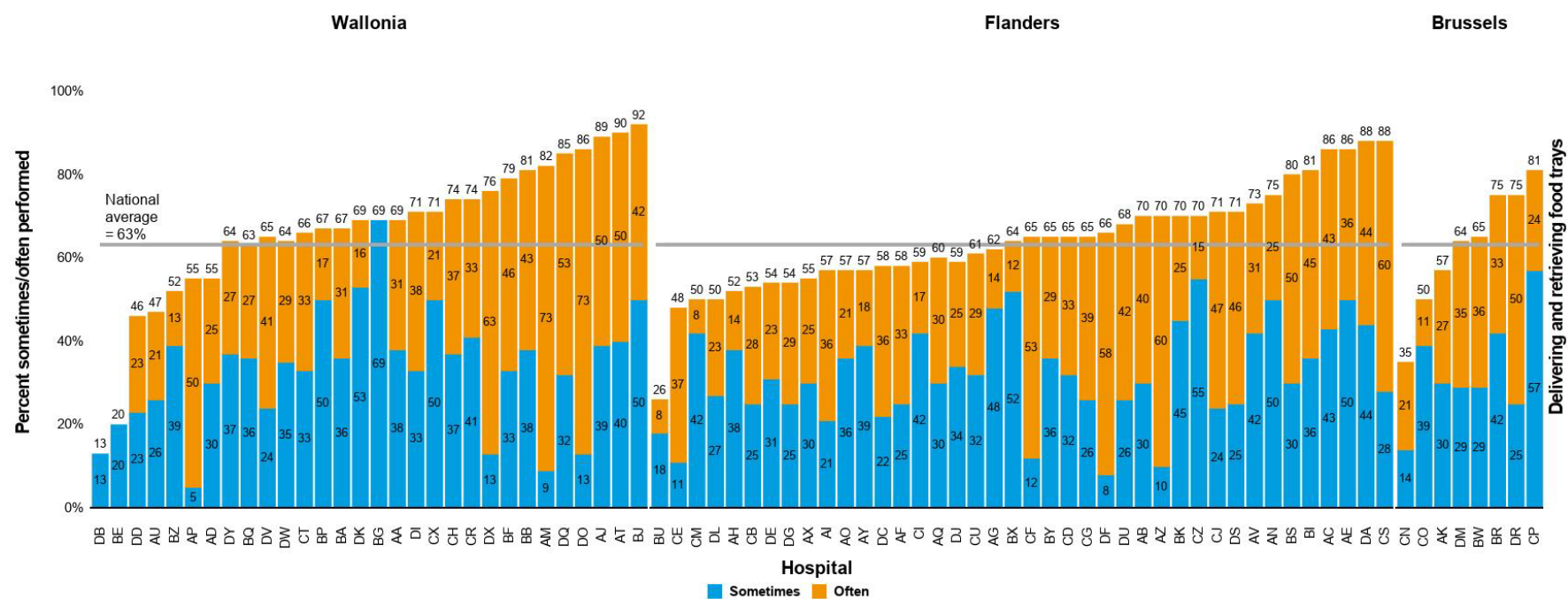




Appendix 1.4. Tasks below nurses' skill level

The average percentage of nurses reporting to sometimes/often distribute food trays is 63% (13% to 92%) (Figure 58).

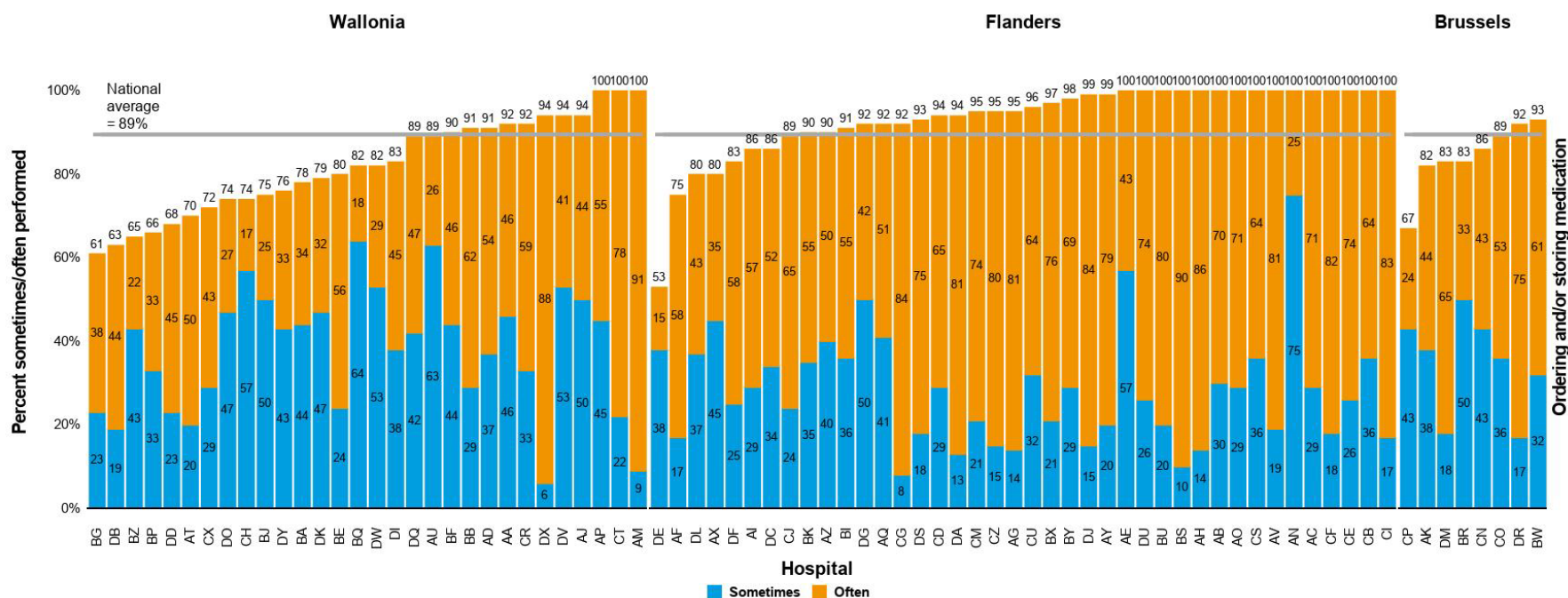
Figure 58 – Percentage of nurses reporting to sometimes/often distribute food trays, at hospital site and regional level





The average percentage of nurses reporting to sometimes/often ordering or storing medication discharge is 89% (53% to 100%) (Figure 59).

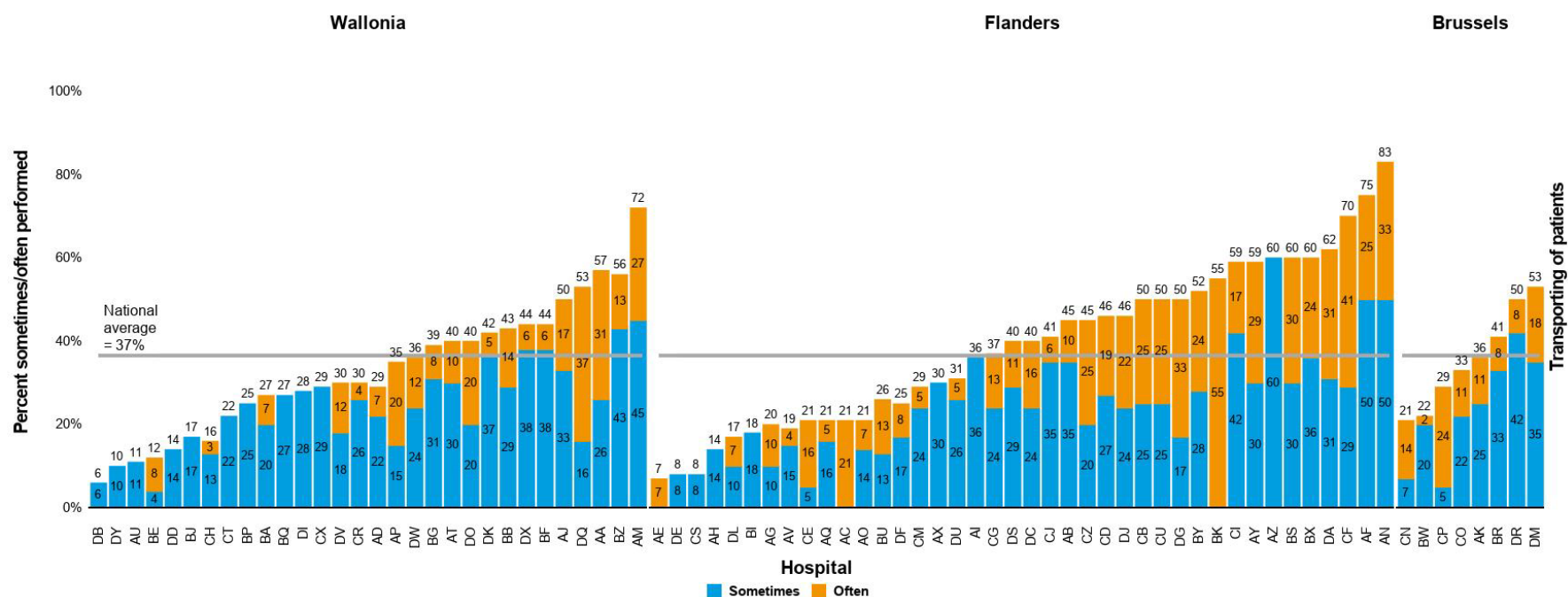
Figure 59 – Percentage of nurses reporting to sometimes/often order or store medication, at hospital site and regional level





The average percentage of nurses reporting to sometimes/often transport patients is 37% (6% to 83%) (Figure 60).

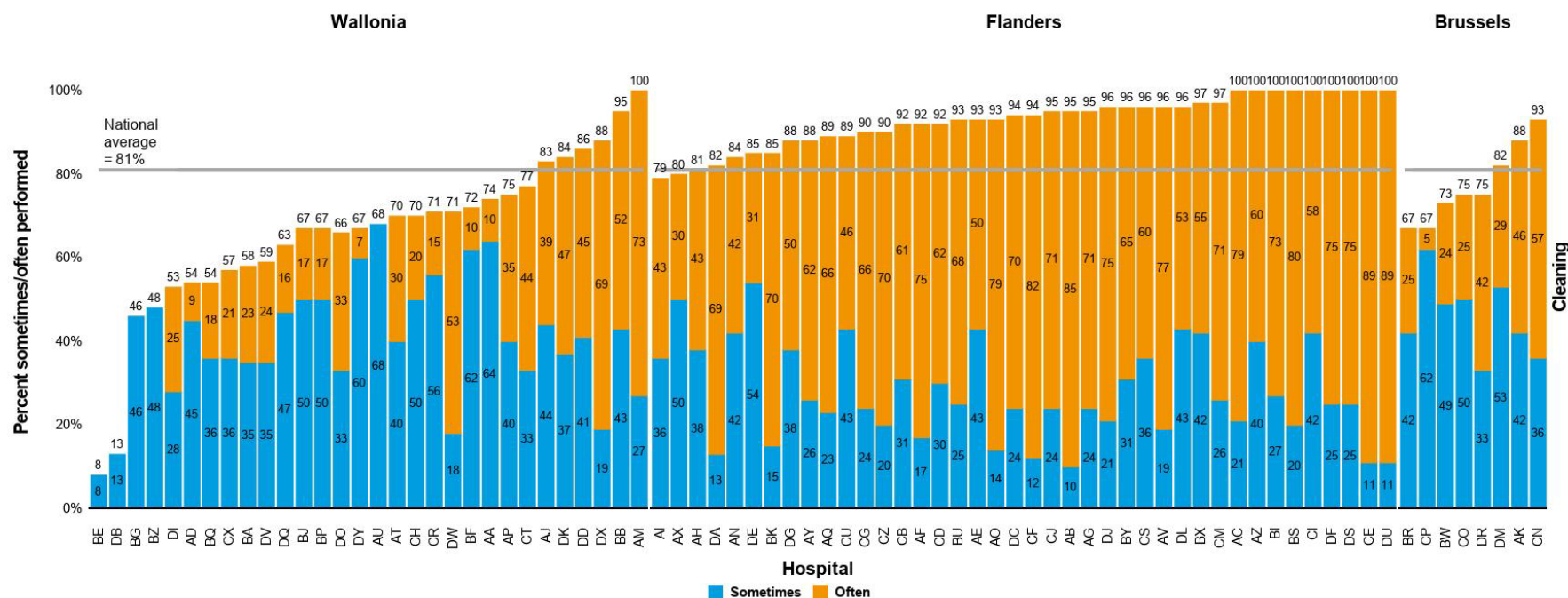
Figure 60 – Percentage of nurses reporting to sometimes/often transport patients, at hospital site and regional level





The average percentage of nurses reporting to sometimes/often clean is 81% (8% to 100%) (Figure 61).

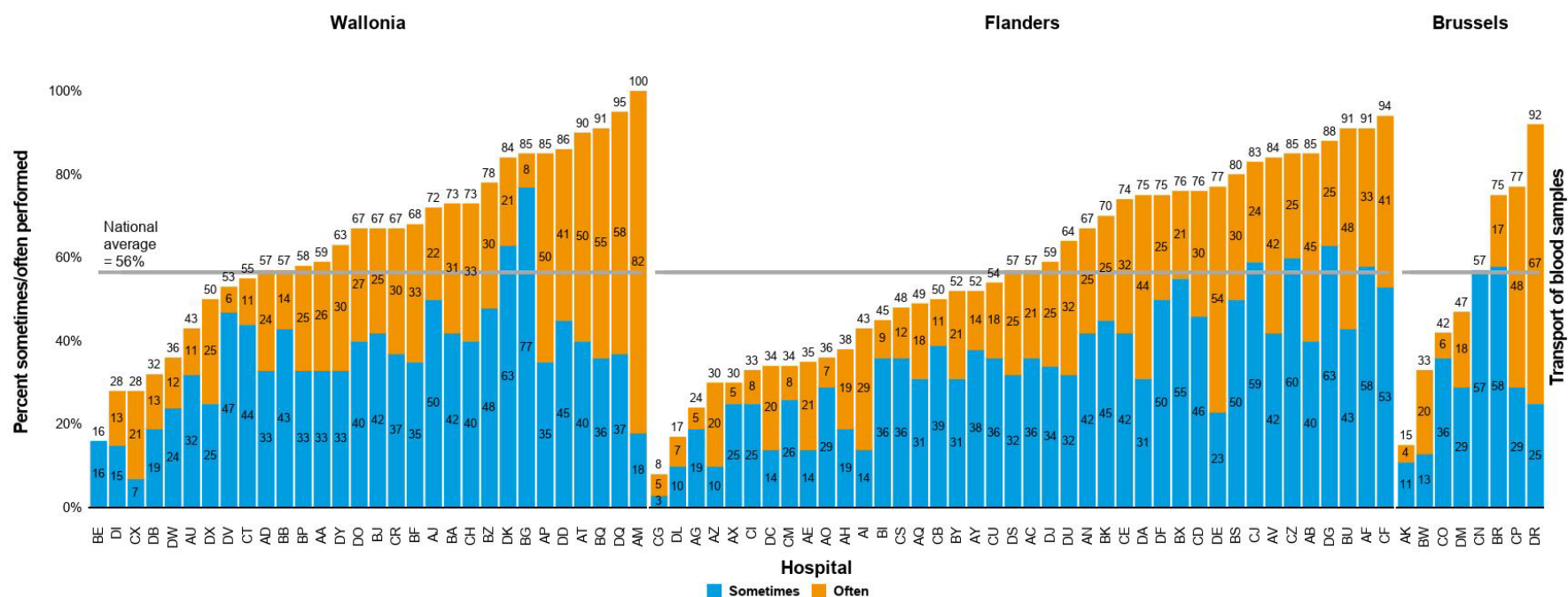
Figure 61 – Percentage of nurses reporting to sometimes/often clean, at hospital site and regional level





The average percentage of nurses reporting to sometimes/often transport blood and lab samples is 56% (8% to 100%) (Figure 62).

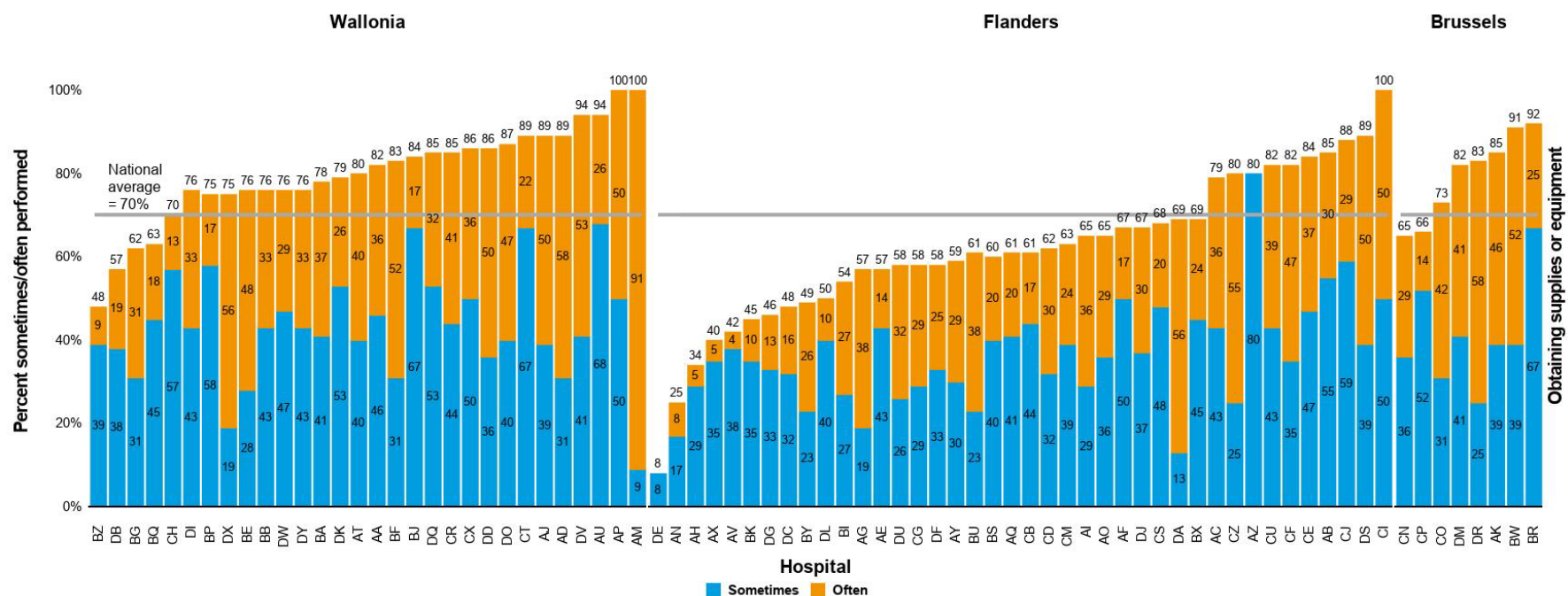
Figure 62 – Percentage of nurses reporting to sometimes/often transport blood & lab samples, at hospital site and regional level





The average percentage of nurses reporting to sometimes/often obtain supplies is 70% (8% to 100%) (Figure 63).

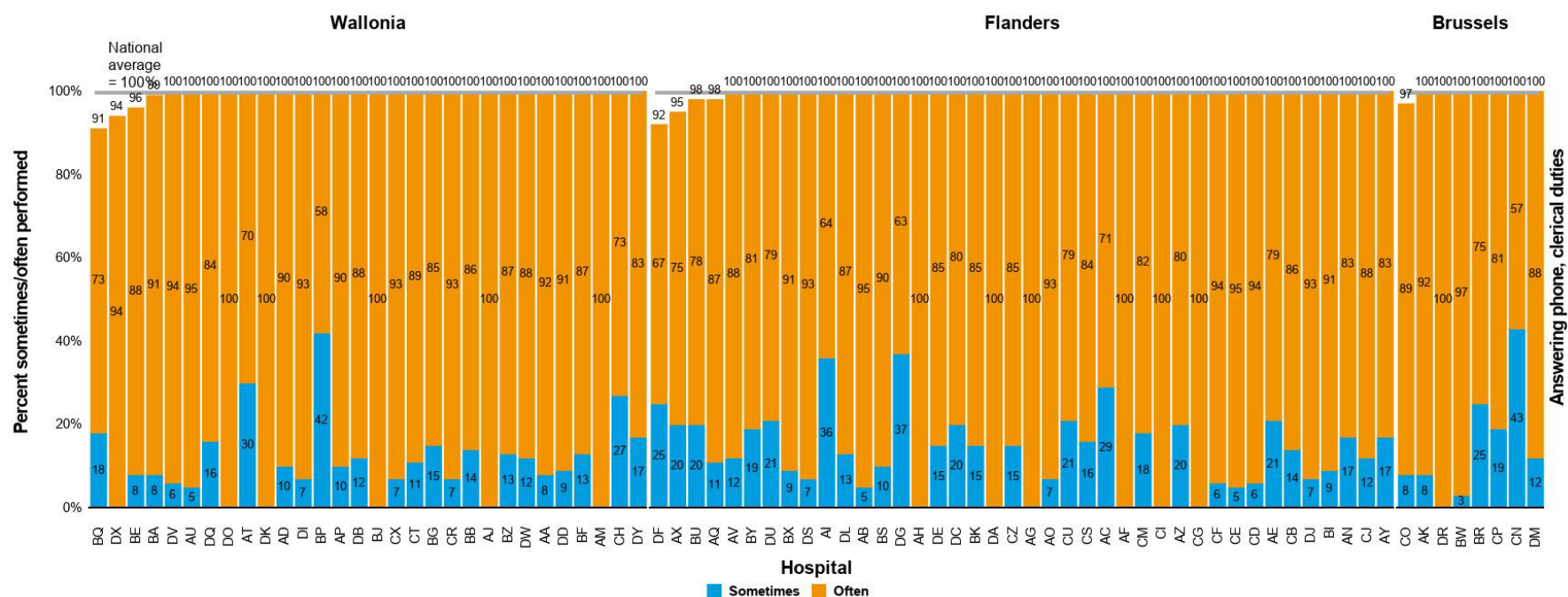
Figure 63 – Percentage of nurses reporting to sometimes/often obtain supplies, at hospital site and regional level





The average percentage of nurses reporting to sometimes/often perform clerical duties is 100% (91% to 100%) (Figure 64).

Figure 64 – Percentage of nurses reporting to sometimes/often perform clerical duties, at hospital site and regional level

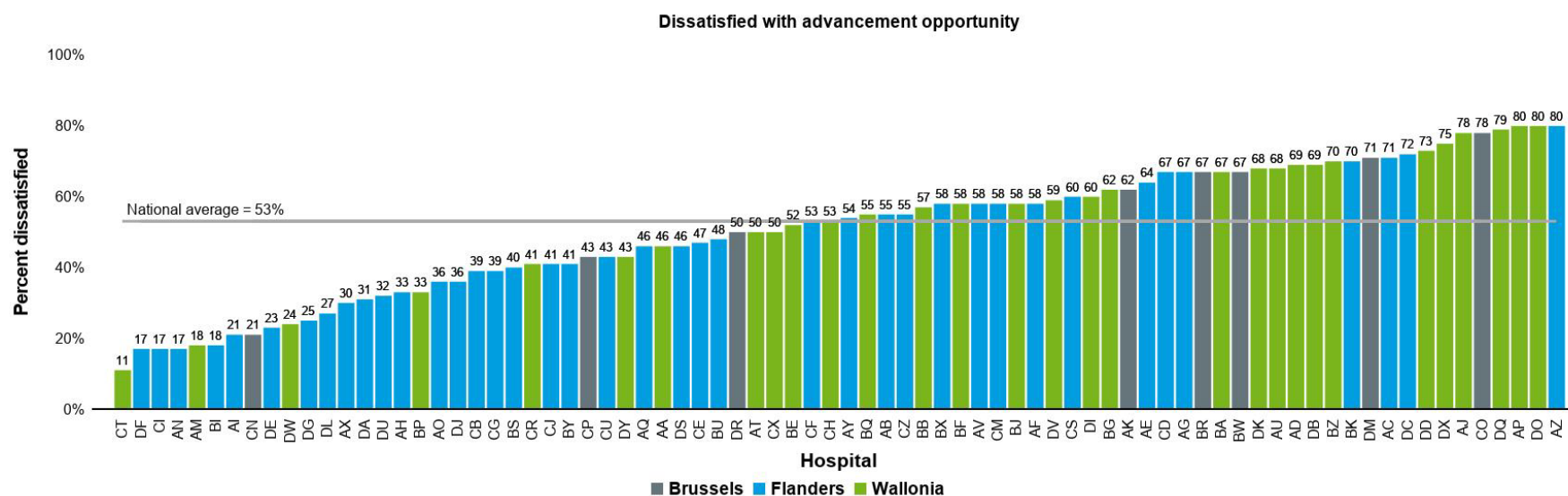




Appendix 1.5. Job dissatisfaction

The average percentage of nurses dissatisfied with advancement opportunity is 53% (11% to 80%) (Figure 65).

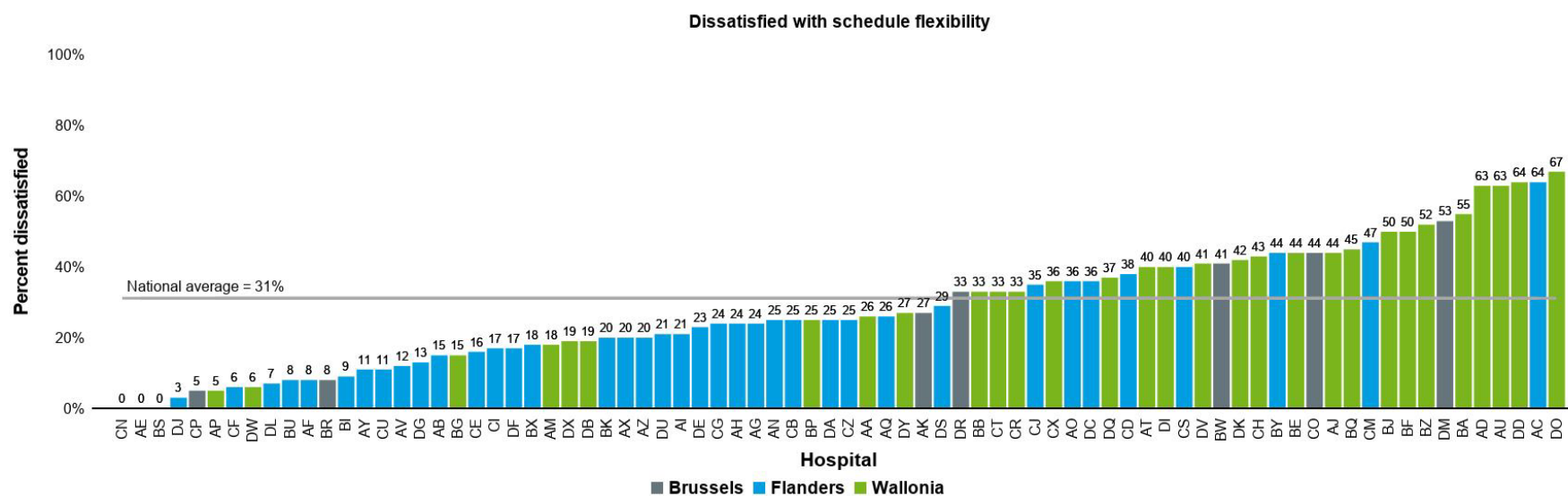
Figure 65 – Percentage of nurses dissatisfied with advancement opportunity, at hospital site and regional level





The average percentage of nurses dissatisfied with schedule flexibility is 31% (0% to 67%) (Figure 66).

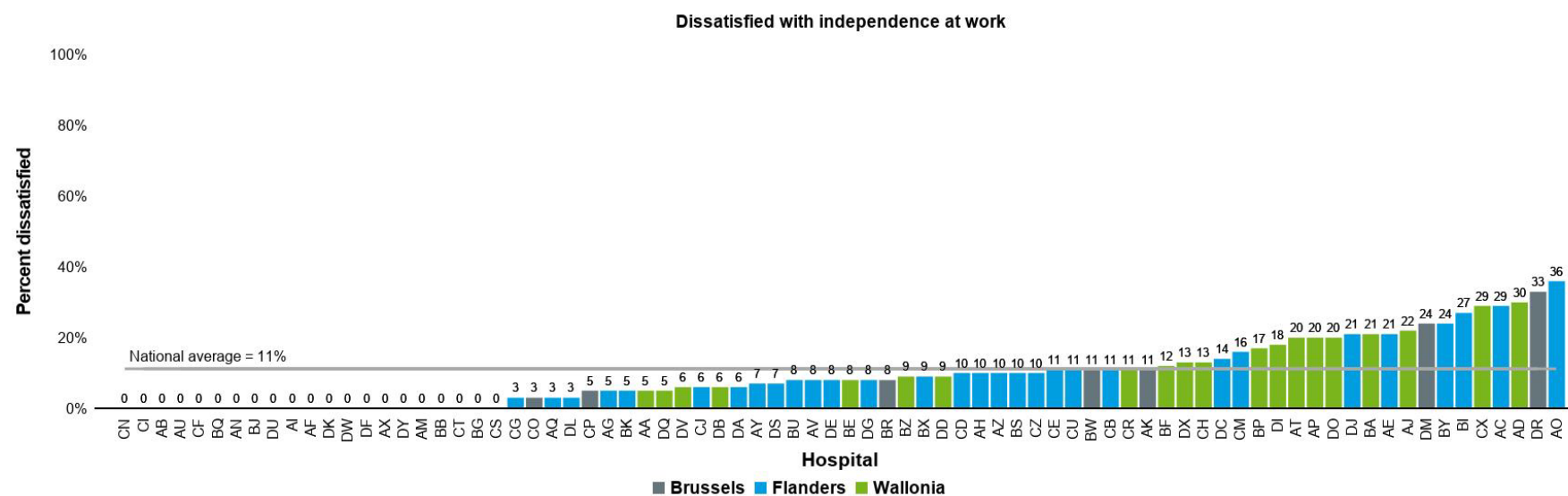
Figure 66 – Percentage of nurses dissatisfied with schedule flexibility, at hospital site and regional level





The average percentage of nurses dissatisfied with independence at work is 11% (0% to 36%) (Figure 67).

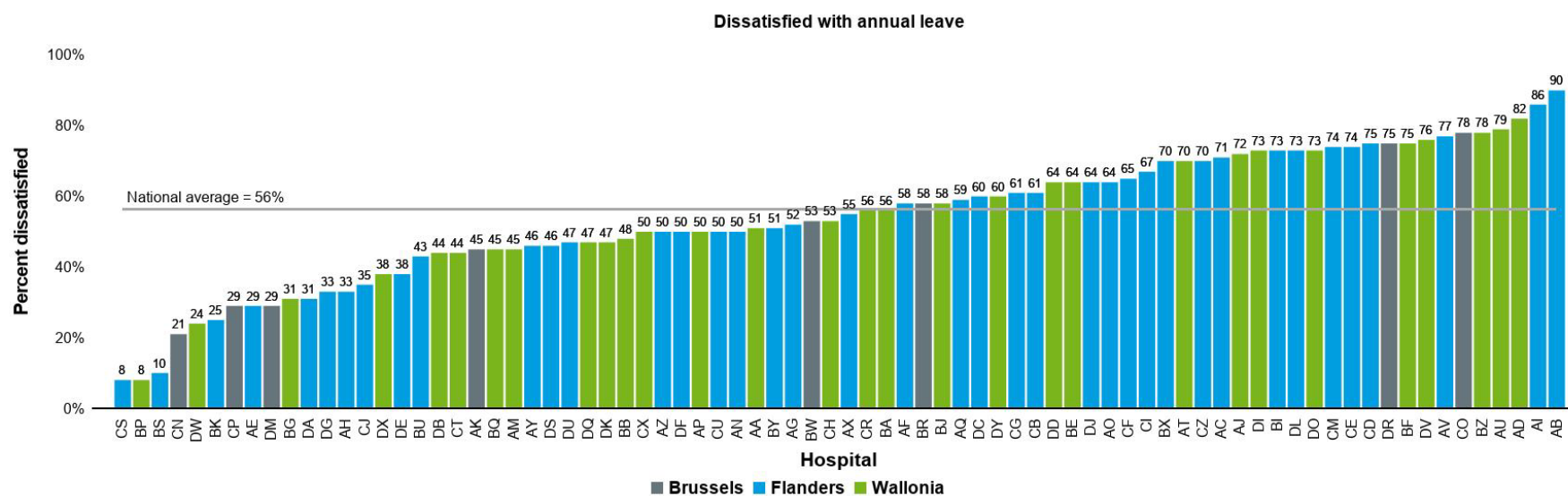
Figure 67 – Percentage of nurses dissatisfied with independence at work, at hospital site and regional level





The average percentage of nurses dissatisfied with annual leave is 56% (8% to 90%) (Figure 68).

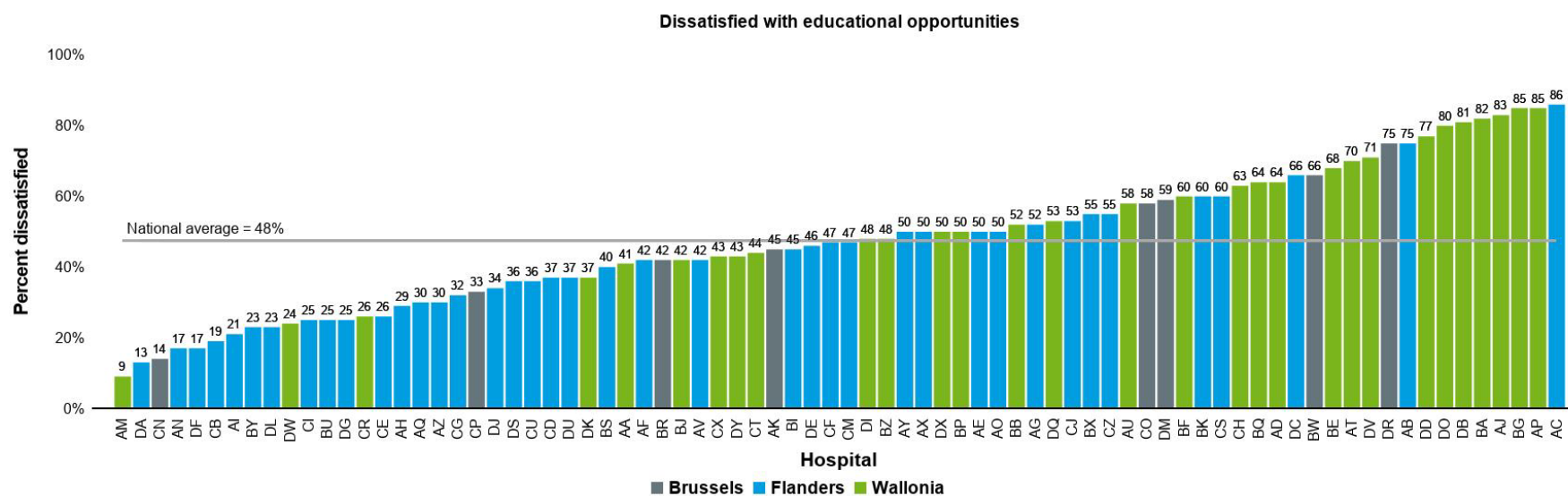
Figure 68 – Percentage of nurses dissatisfied with annual leave, at hospital site and regional level





The average percentage of nurses dissatisfied with educational opportunity is 48% (9% to 86%) (Figure 69).

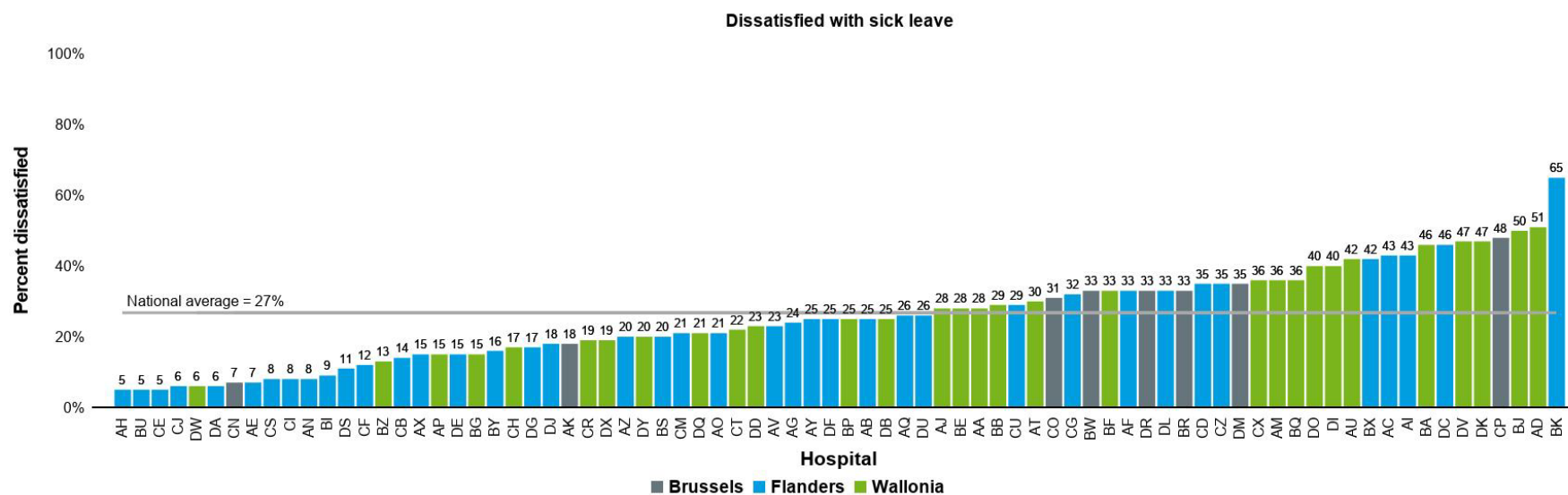
Figure 69 – Percentage of nurses dissatisfied with educational opportunity, at hospital site and regional level





The average percentage of nurses dissatisfied with sick leave is 27% (5% to 65%) (Figure 70).

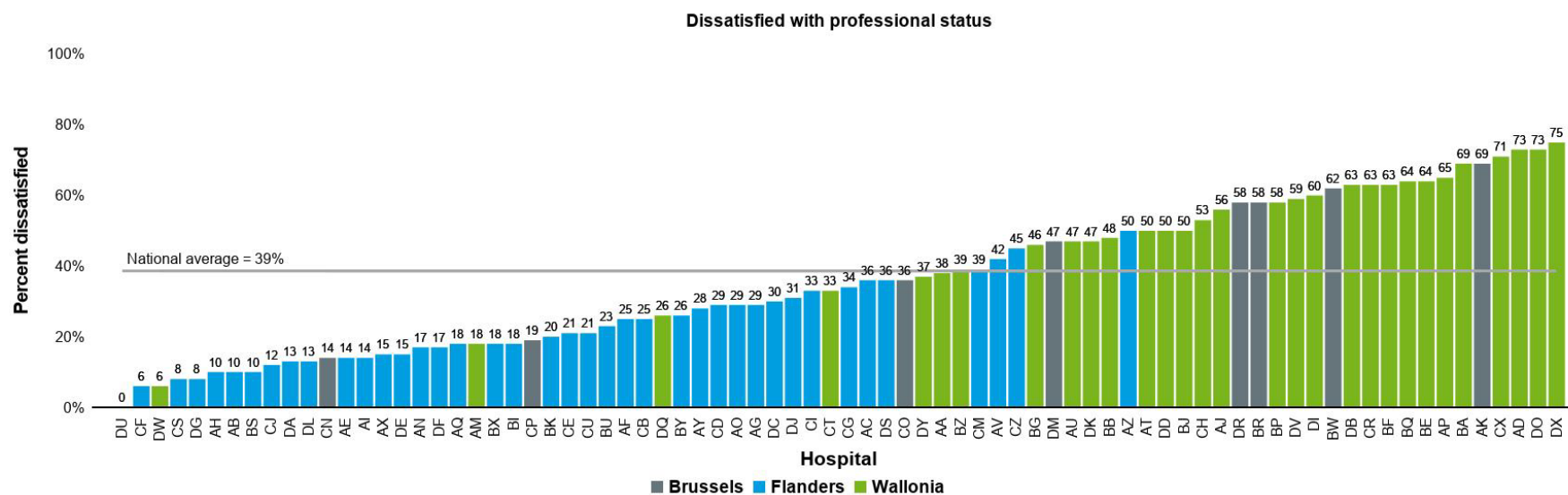
Figure 70 – Percentage of nurses dissatisfied with sick leave, at hospital site and regional level





The average percentage of nurses dissatisfied with professional status is 39% (0% to 75%) (Figure 71).

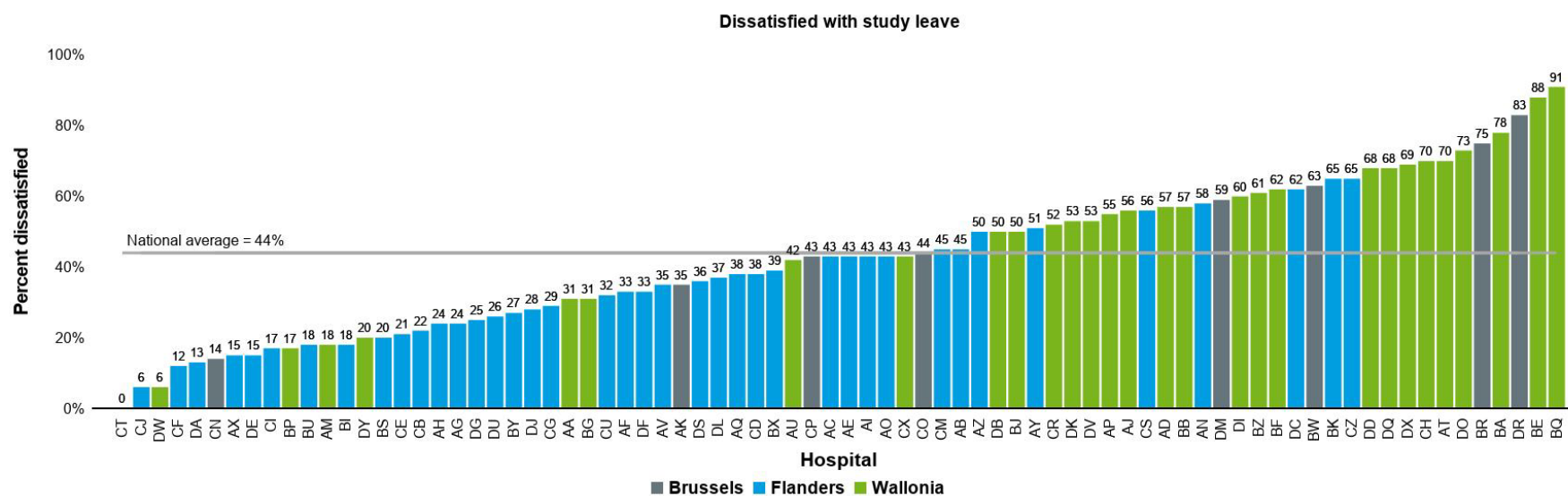
Figure 71 – Percentage of nurses dissatisfied with professional status, at hospital site and regional level





The average percentage of nurses dissatisfied with study leave is 44% (0% to 91%) (Figure 72).

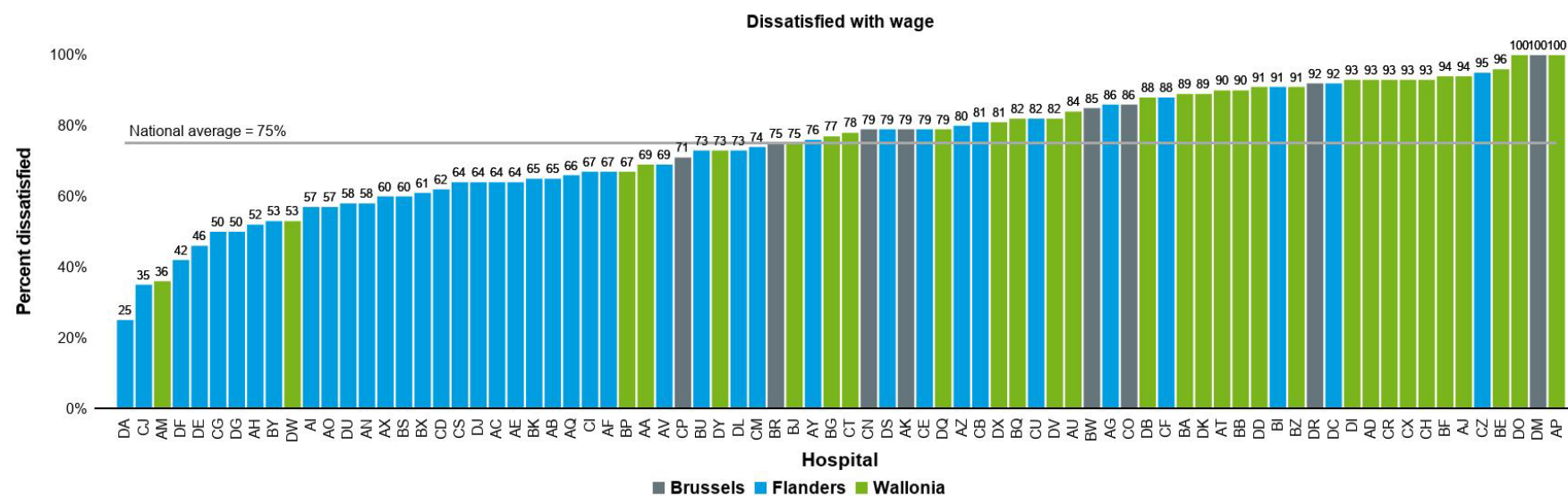
Figure 72 – Percentage of nurses dissatisfied with study leave, at hospital site and regional level





The average percentage of nurses dissatisfied with wages is 75% (25% to 100%) (Figure 73).

Figure 73 – Percentage of nurses dissatisfied with wages, at hospital site and regional level

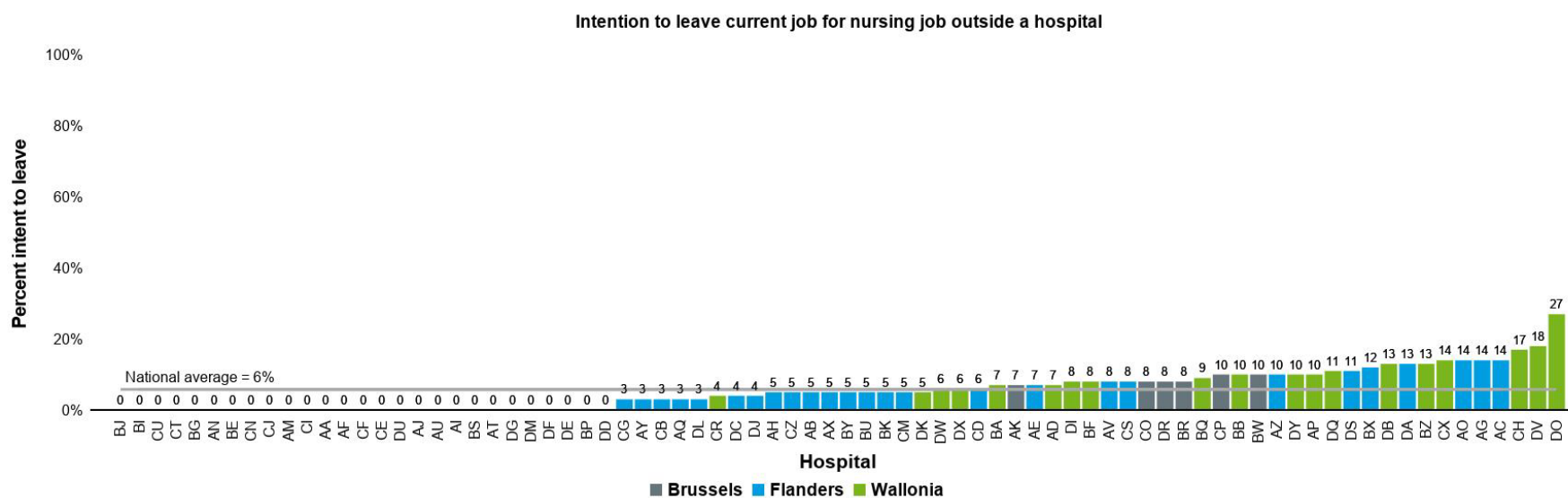




Appendix 1.6. Intention to leave

The average percentage of nurses considering to leave the hospital for a nursing job in a non-hospital setting is 6% (0% to 27%) (Figure 74).

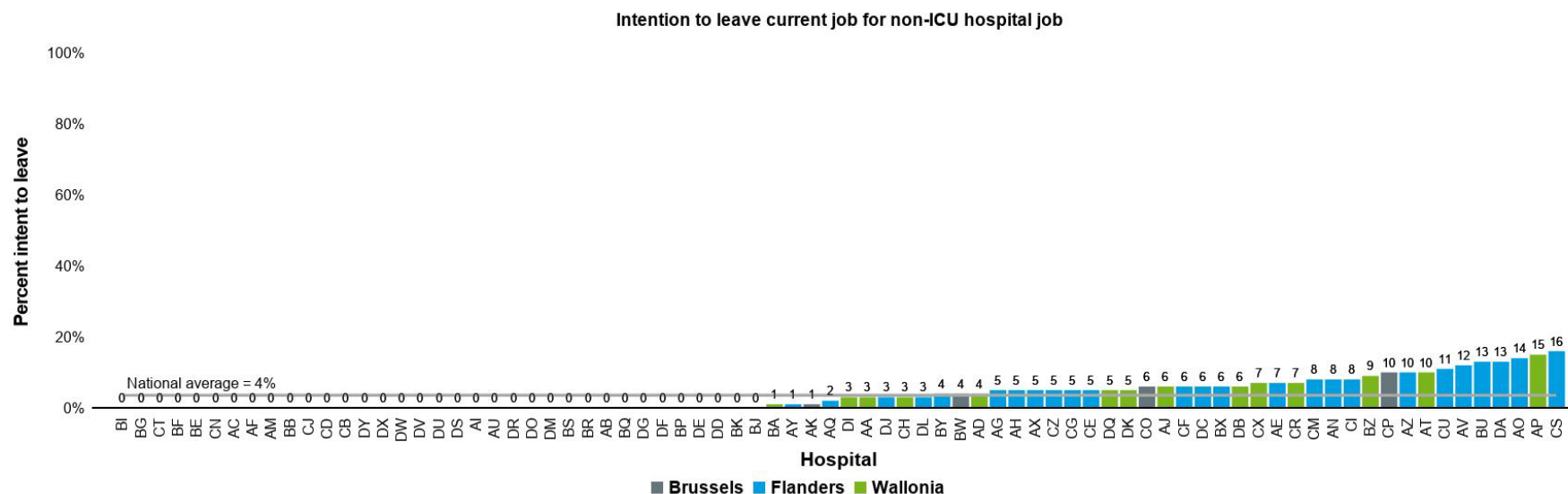
Figure 74 – Percentage of nurses indicating they intend to leave the hospital in the next year for a nursing job outside a hospital, at hospital site and regional level





The average percentage of nurses considering to leave the hospital for a non-ICU job in hospital setting is 4% (0% to 16%) (Figure 75).

Figure 75 – Percentage of nurses indicating they intend to leave their job in the next year for a non-ICU hospital nursing job, at hospital site and regional level

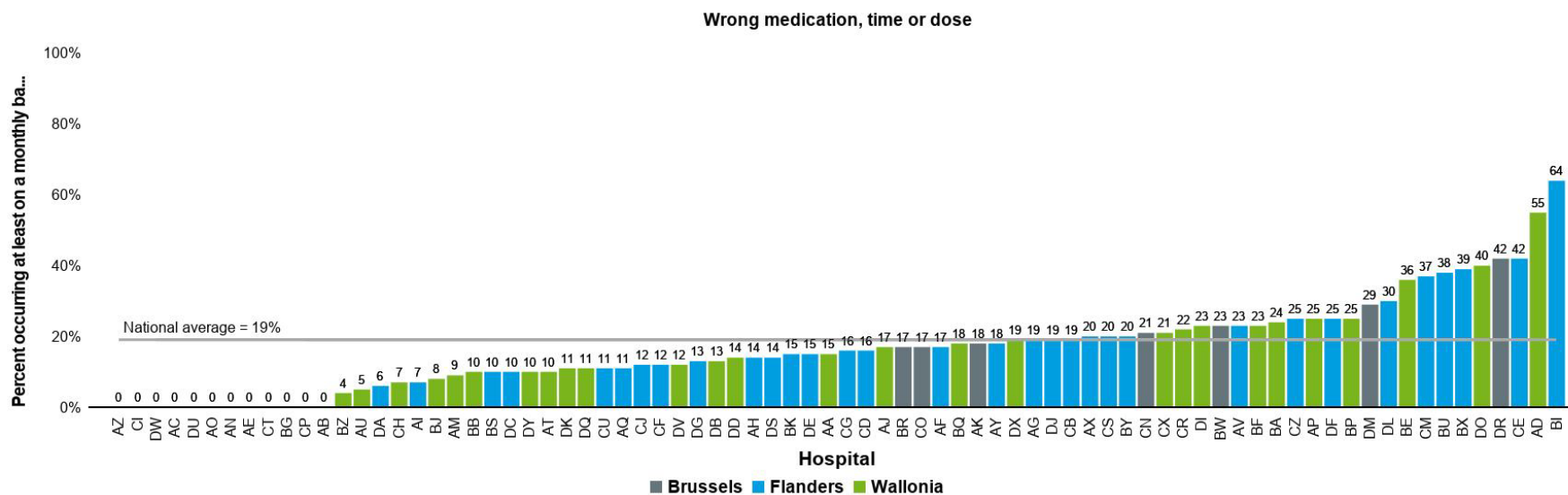




Appendix 1.7. Nurses' reports on adverse events, errors and incidents

The average percentage of nurses who report that wrong medication, time or dose occurred at least once a month during the past year is 19% (0% to 64%) (Figure 76).

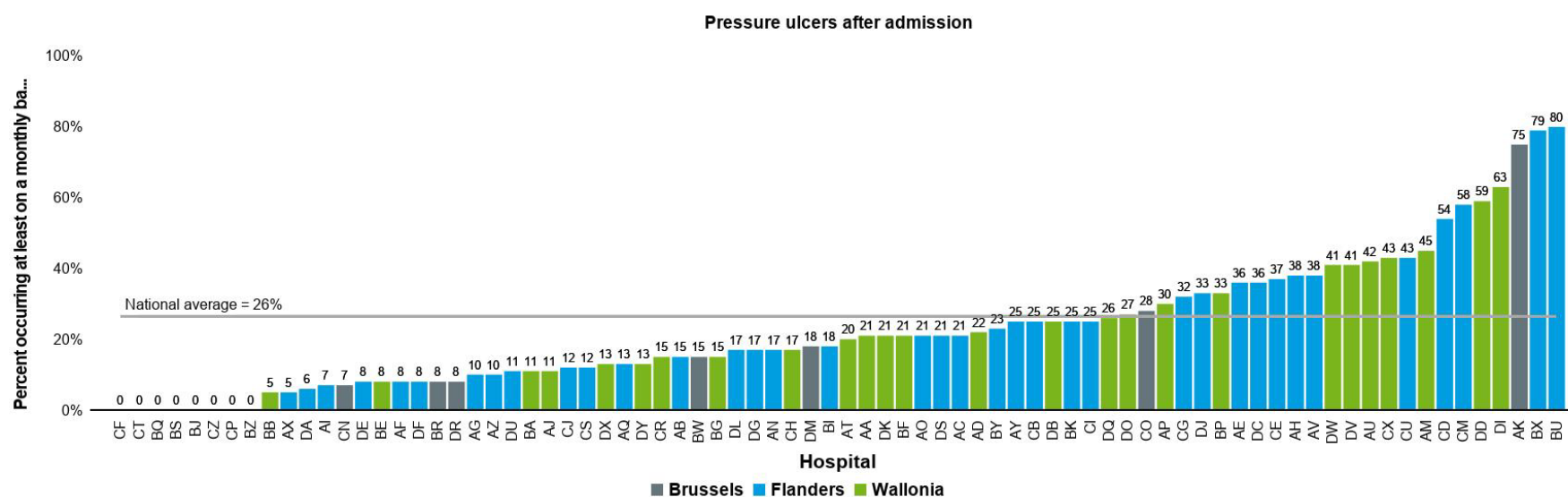
Figure 76 – Percentage of nurses reporting that wrong medication, time or dose occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that pressure ulcers after admission occurred at least once a month during the past year is 26% (0% to 80%) (Figure 77).

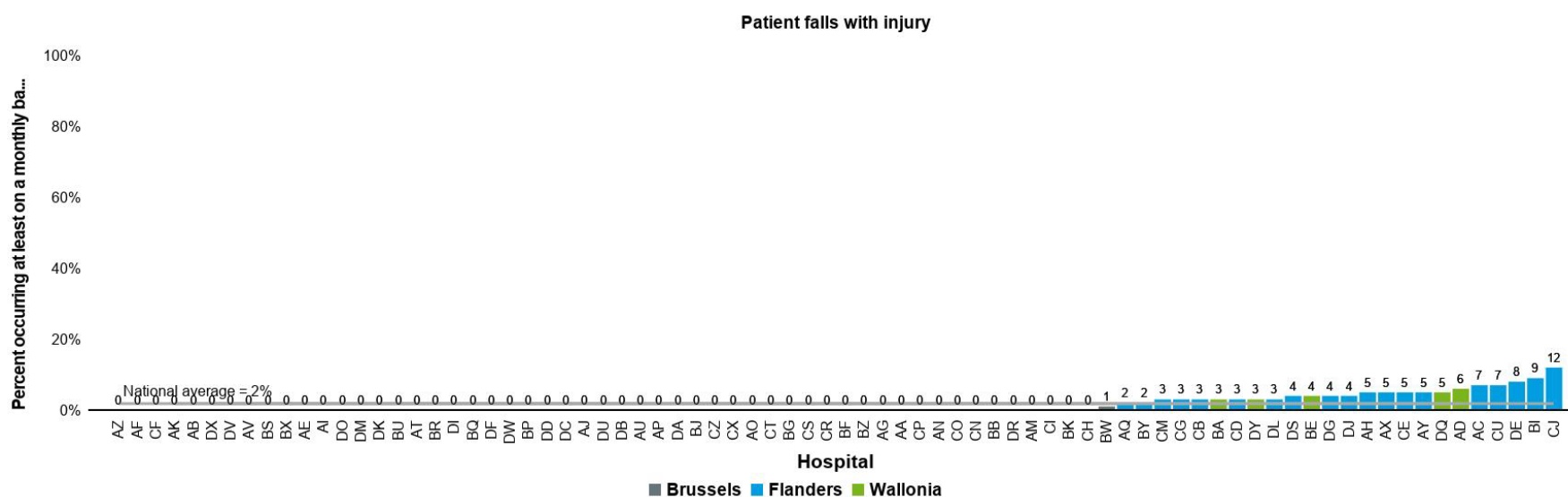
Figure 77 – Percentage of nurses reporting that pressure ulcers occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that patient falls with injury occurred at least once a month during the past year is 2% (0% to 12%) (Figure 78).

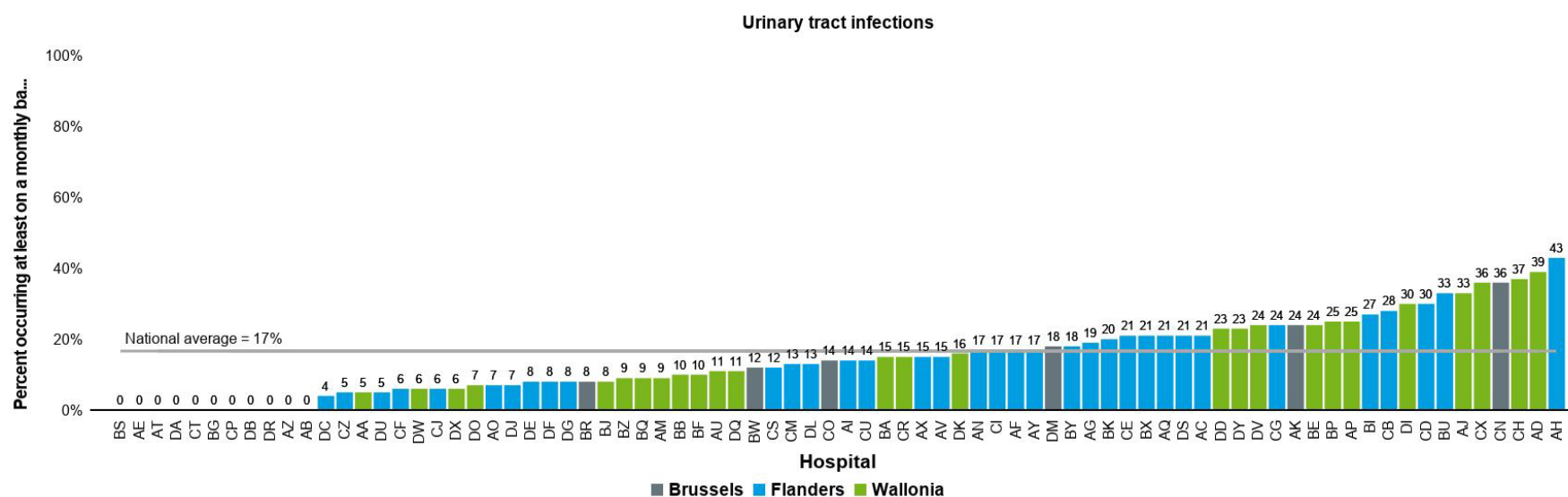
Figure 78 – Percentage of nurses reporting that patient falls with injury occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that urinary tract infections occurred at least once a month during the past year is 17% (0% to 43%) (Figure 79).

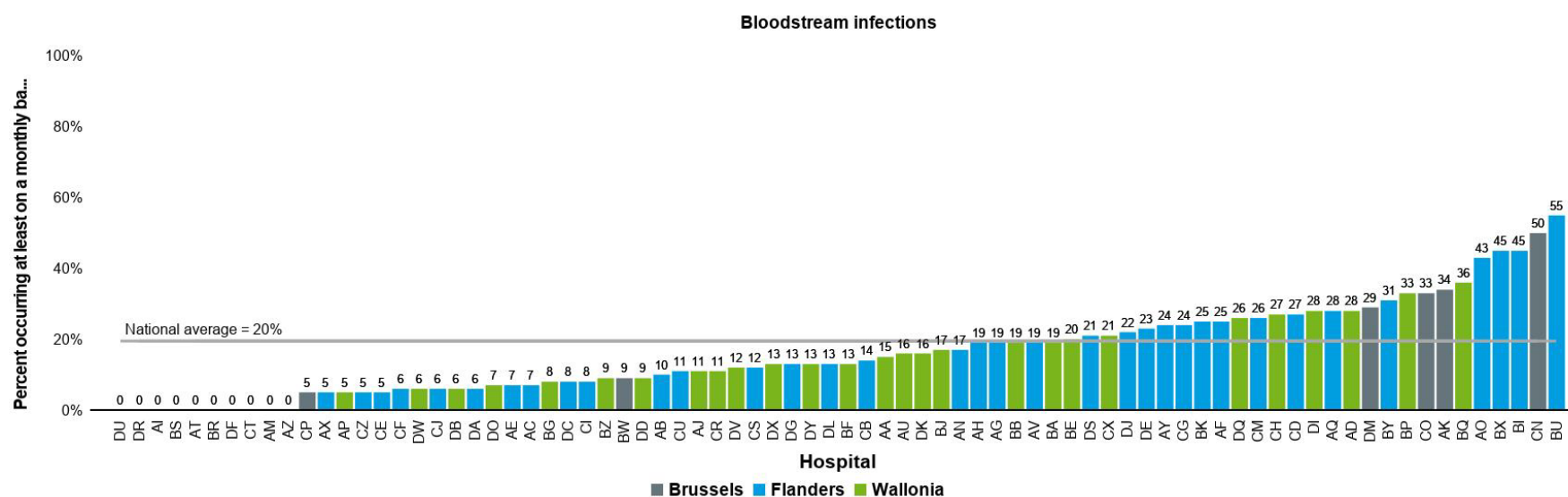
Figure 79 – Percentage of nurses reporting that urinary tract infections occurred at least once a month during the past year, at hospital and regional level





The average percentage of nurses who report that bloodstream infections occurred at least once a month during the past year is 20% (0% to 55%) (Figure 80).

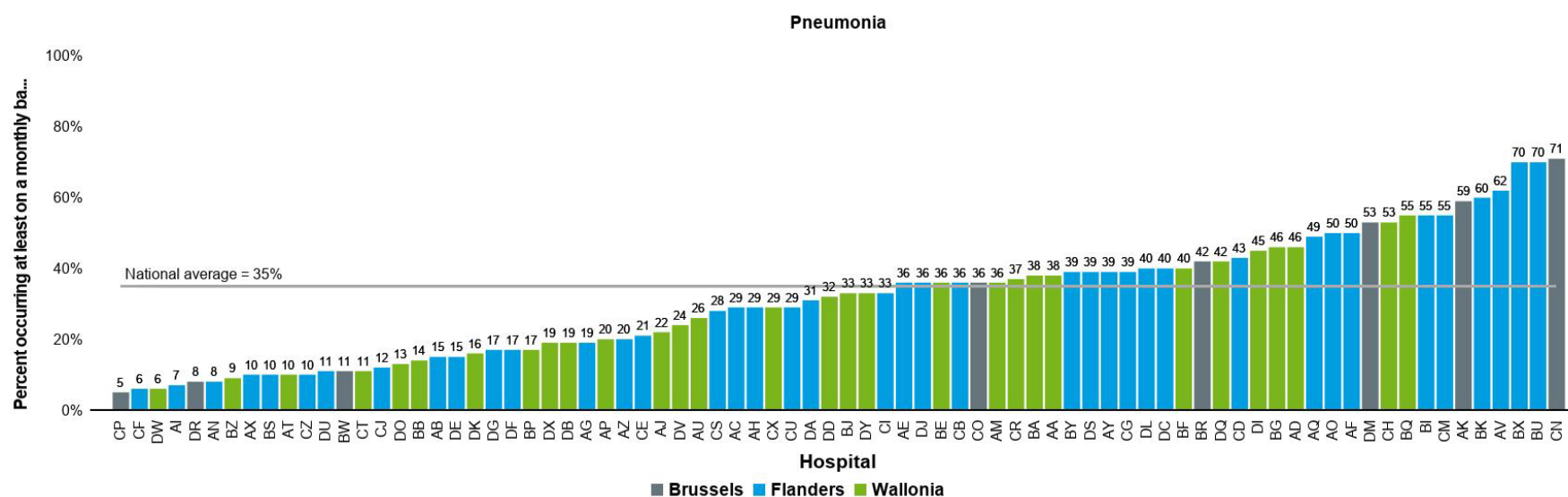
Figure 80 – Percentage of nurses reporting that bloodstream infections occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that pneumonia occurred at least once a month during the past year is 35% (5% to 71%) (Figure 81).

Figure 81 – Percentage of nurses reporting that pneumonia occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that work-related physical injuries occurred at least once a month during the past year is 13% (0% to 43%) (Figure 82).

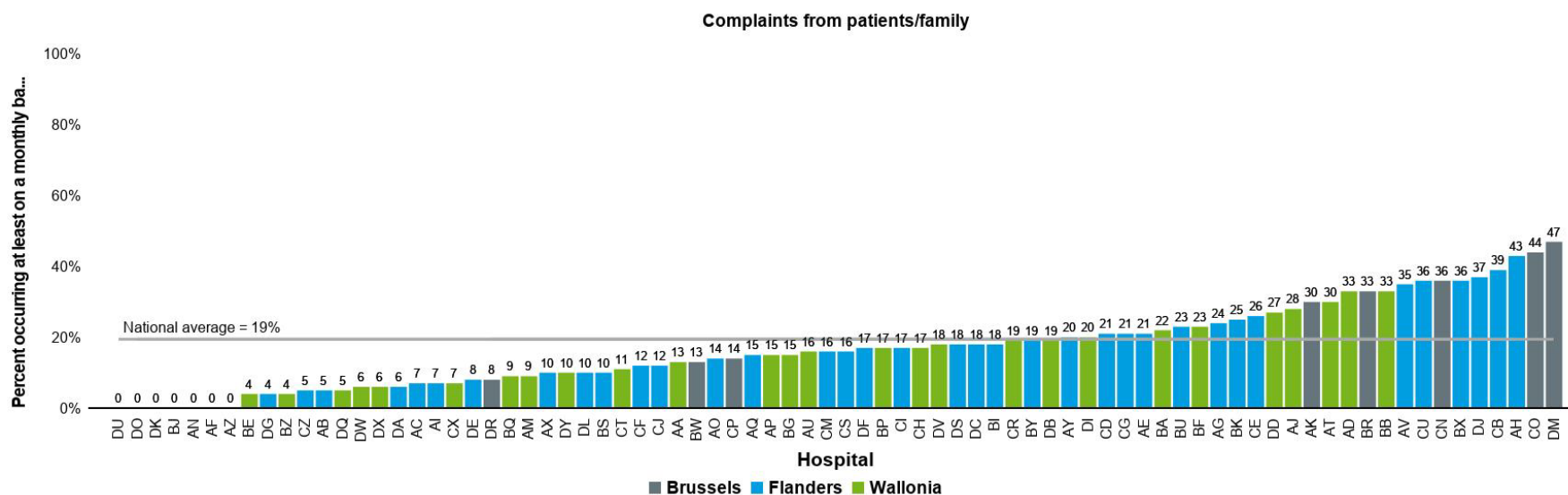
Figure 82 – Percentage of nurses reporting that work-related physical injuries occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that complaints from patients and/or patient's family occurred at least once a month during the past year is 19% (0% to 47%) (Figure 83).

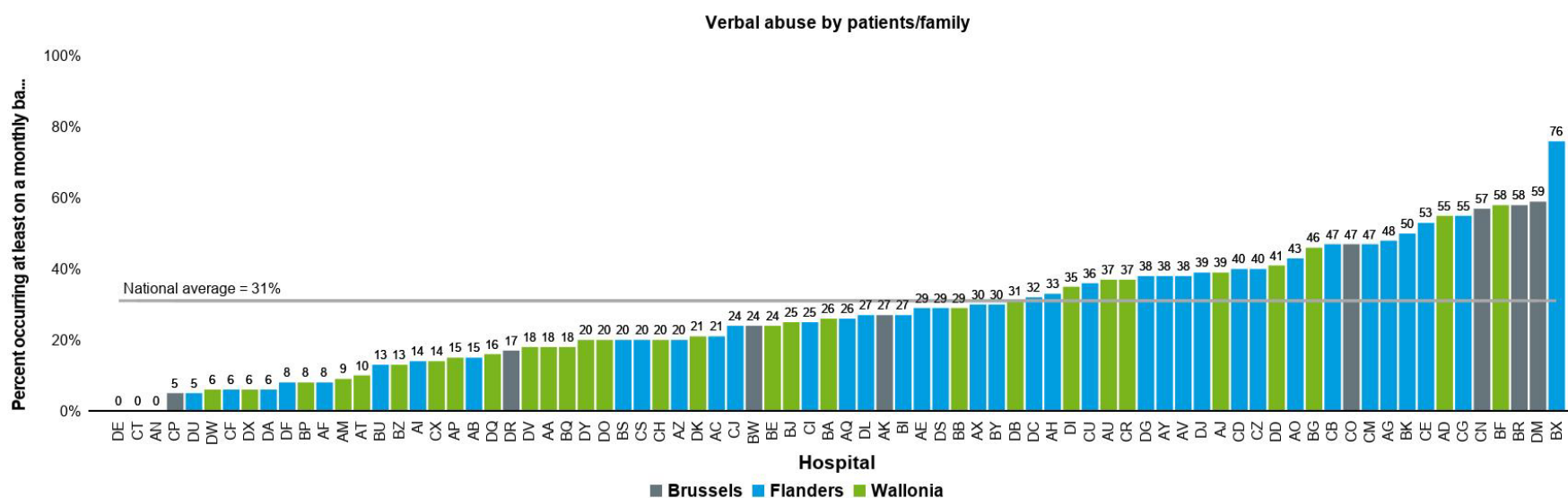
Figure 83 – Percentage of nurses reporting that complaints from patients/family occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that verbal abuse by patients and/or their family occurred at least once a month during the past year is 31% (0% to 76%) (Figure 84).

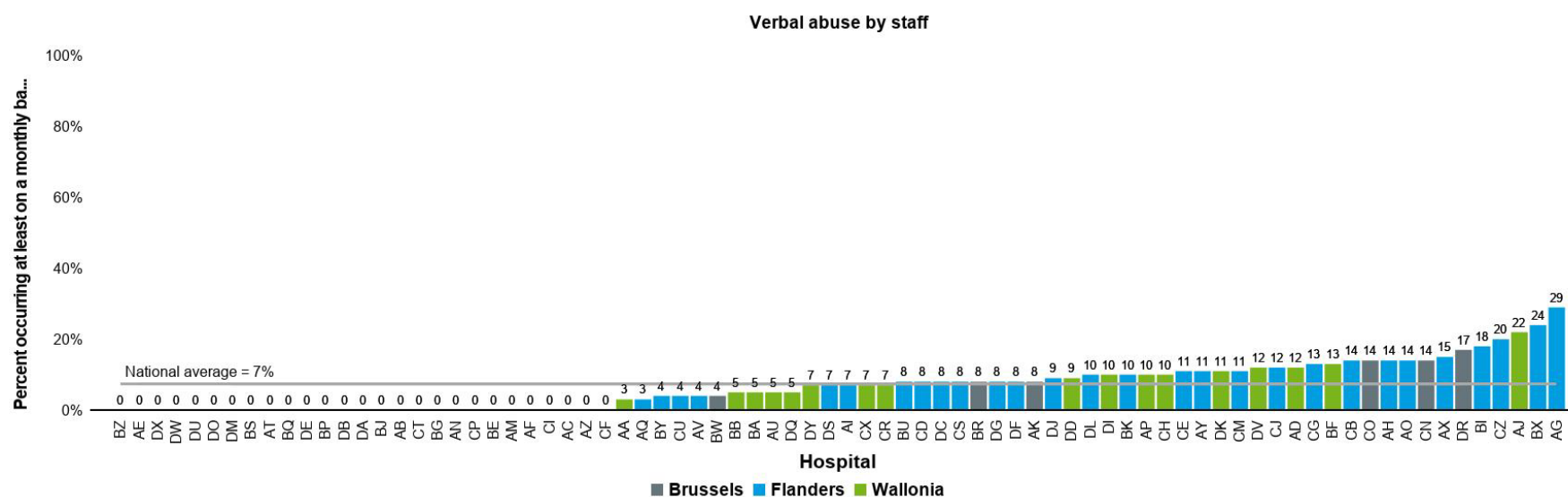
Figure 84 – Percentage of nurses reporting that verbal abuse by patients/family occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that verbal abuse by staff occurred at least once a month during the past year is 7% (0% to 29%) (Figure 85).

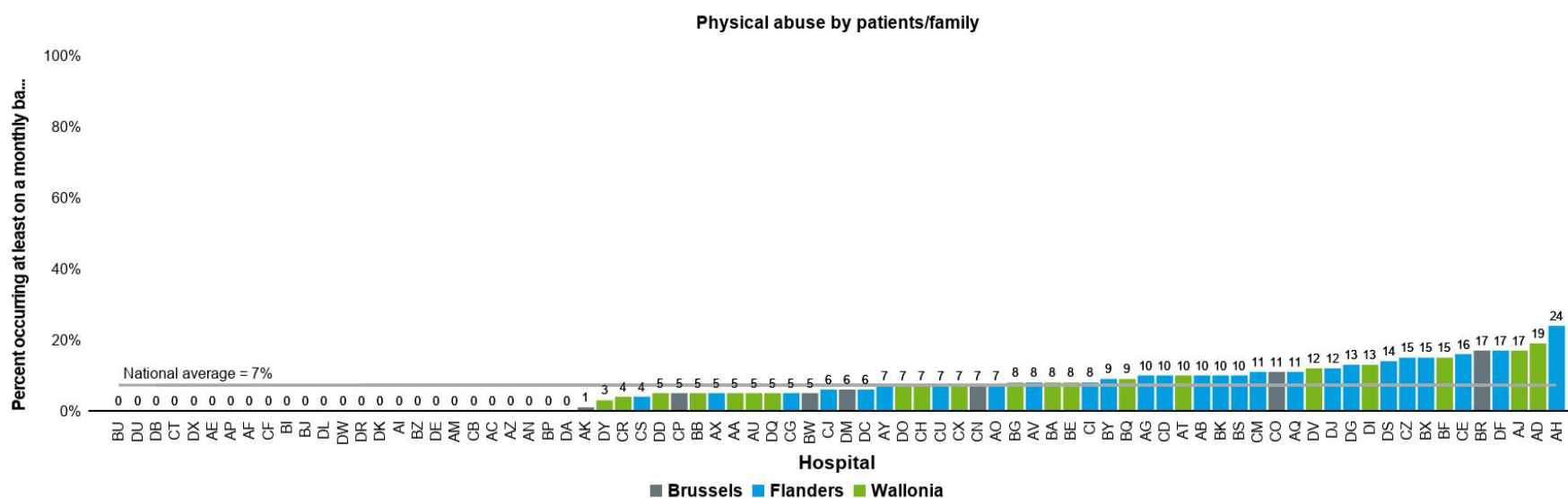
Figure 85 – Percentage of nurses reporting that verbal abuse by staff occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that physical abuse by patients and/or their family occurred at least once a month during the past year is 7% (0% to 24%) (Figure 86).

Figure 86 – Percentage of nurses reporting that physical abuse by patients/family occurred at least once a month during the past year, at hospital site and regional level





The average percentage of nurses who report that physical abuse by staff occurred at least once a month during the past year is 1% (0% to 10%) (Figure 87).

Figure 87 – Percentage of nurses reporting that physical abuse by staff occurred at least once a month during the past year, at hospital site and regional level





Appendix 1.8. Performance by nurse working environment

Table 18 – Comparison of outcomes in hospital sites subdivided by nurse working environment (best-performers versus worst-performers)

Outcome	Worst-performing 25%	Middle 50%	Best-performing 25%	Improvement factor best over worst	Outcome	Worst-performing 25%	Middle 50%	Best-performing 25%	Improvement factor best over worst
Nurse working environment					Hold nurses in high esteem	0.31	0.44	0.63	2.02
<i>Nurse manager ability, leadership and support of nurses</i>					<i>Nursing foundations for quality of care</i>				
dimension score	0.52	0.56	0.77	1.47	dimension score	0.54	0.65	0.76	1.40
Supportive supervisory staff	0.63	0.65	0.82	1.31	Active staff development	0.46	0.60	0.70	1.52
Good nurse manager	0.64	0.67	0.88	1.37	Expect high standards of care	0.65	0.79	0.87	1.34
Praise and recognition	0.19	0.28	0.52	2.70	Philosophy of nursing	0.52	0.59	0.81	1.55
Backup in decision making	0.63	0.66	0.86	1.37	Clinically competent nurses	0.76	0.83	0.88	1.16
<i>Nurse participation in hospital affairs</i>					Quality assurance program	0.35	0.53	0.64	1.84
dimension score	0.19	0.27	0.39	2.02	Preceptor program for nurses	0.48	0.63	0.75	1.58
Career development	0.29	0.37	0.48	1.68	Nursing model of care	0.54	0.59	0.70	1.29
Participate in policy	0.10	0.16	0.25	2.44	Care plans	0.36	0.48	0.65	1.83
CNO visible and accessible	0.15	0.23	0.36	2.42	Foster continuity of care	0.78	0.78	0.85	1.09
CNO equal to other executives	0.33	0.39	0.52	1.58	<i>Staffing and resource adequacy</i>				
Opportunities for advancement	0.29	0.39	0.56	1.93	dimension score	0.24	0.31	0.46	1.89
Listens and responds to concerns	0.11	0.20	0.30	2.65	Adequate support services	0.38	0.45	0.59	1.57
Involved in internal governance	0.05	0.10	0.19	4.11	Time to discuss problems	0.39	0.47	0.70	1.77
Serve on committees	0.23	0.34	0.47	2.00	Enough nurses for quality	0.11	0.17	0.28	2.54
<i>Nurse-physician relation</i>					Enough staff to get work done	0.09	0.17	0.27	2.96
dimension score	0.56	0.71	0.84	1.49	Staffing levels				
Good work relations	0.66	0.81	0.90	1.36	patient-to-nurse ratio	2.44	2.33	2.22	1.10
Value nurses' observations	0.61	0.74	0.89	1.46	Further education in intensive / emergency care	0.77	0.78	0.74	0.96
Recognize nurses' contributions	0.56	0.69	0.83	1.47	Professional title in intensive / emergency care	0.81	0.81	0.76	0.94
A lot of teamwork	0.48	0.70	0.85	1.78	Care left undone				
Respect nurses as professionals	0.69	0.77	0.86	1.24	<i>All care performed</i>				
Collaboration	0.61	0.78	0.89	1.47	dimension score	0.24	0.24	0.40	1.68



Outcome	Worst-performing 25%	Middle 50%	Best-performing 25%	Improvement factor best over worst	Outcome	Worst-performing 25%	Middle 50%	Best-performing 25%	Improvement factor best over worst
<i>Clinical activities</i>					Transport of blood samples	0.63	0.50	0.65	0.96
Number of clinical activities missed (max 9)	1.76	1.89	1.59	1.11	Transporting of patients	0.38	0.35	0.39	0.98
Adequate patient surveillance	0.26	0.25	0.20	1.26	Cleaning	0.75	0.83	0.86	0.87
Skin care	0.16	0.19	0.16	1.02	Ordering and/or storing medication	0.87	0.91	0.90	0.96
Oral hygiene	0.27	0.31	0.24	1.13	Obtaining supplies or equipment	0.71	0.70	0.68	1.05
Pain management	0.12	0.13	0.12	0.99	Answering phone, clerical duties	1.00	1.00	0.99	1.01
Treatments and procedures	0.09	0.11	0.10	0.85	Intention to leave				
Administer medications on time	0.27	0.31	0.26	1.05	Intention to leave current job	0.56	0.42	0.27	2.08
Frequent changing of patient position	0.40	0.35	0.26	1.53	Intention to leave nursing profession	0.34	0.27	0.12	2.83
Hand hygiene	0.11	0.13	0.14	0.78	Intention to leave ICU, but continue as hospital nurse	0.04	0.03	0.05	0.76
Aspiration of airways	0.08	0.11	0.10	0.78	Dissatisfaction				
<i>planning and communication</i>					Dissatisfied with job	0.56	0.36	0.18	3.21
Number of planning and communication items missed (max 5)	1.79	1.66	1.25	1.44	Dissatisfied with advancement opportunity	0.62	0.53	0.36	1.71
Emotional support patients and family	0.53	0.51	0.37	1.45	Dissatisfied with schedule flexibility	0.36	0.33	0.16	2.33
Prepare patients and families for discharge from ICU	0.17	0.19	0.16	1.09	Dissatisfied with independence at work	0.17	0.10	0.03	4.95
Developing or updating nursing care plans or care pathways	0.41	0.38	0.28	1.46	Dissatisfied with annual leave	0.61	0.55	0.52	1.17
Planning care	0.24	0.19	0.18	1.29	Dissatisfied with educational opportunity	0.60	0.45	0.32	1.87
multidisciplinary consultation meetings	0.44	0.40	0.26	1.71	Dissatisfied with sick leave	0.35	0.24	0.22	1.59
<i>Document care</i>					Dissatisfied with professional status	0.50	0.38	0.20	2.55
Document care left undone	0.43	0.41	0.35	1.24	Dissatisfied with study leave	0.58	0.40	0.29	2.00
Tasks below skill level					Dissatisfied with wages	0.86	0.72	0.65	1.31
Number of tasks	4.97	4.91	5.09	0.98	Risk of burnout				
Delivering and retrieving food trays	0.64	0.63	0.61	1.05	High risk of burnout	0.29	0.19	0.07	4.07



Outcome	Worst-performing 25%	Middle 50%	Best-performing 25%	Improvement factor best over worst
high risk of emotional exhaustion	0.54	0.43	0.23	2.36
high risk of depersonalization	0.52	0.44	0.26	1.96
high risk of reduced personal accomplishment	0.52	0.46	0.34	1.52
Perceived quality				
Good or excellent quality of care on unit	0.49	0.69	0.80	1.61
Quality of care remained the same or improved	0.25	0.28	0.48	1.95
Very good or excellent patient safety grade	0.30	0.47	0.59	1.99
Confident or very confident in management actions	0.07	0.10	0.18	2.82
Incidents				
Wrong medication, time or dose	0.23	0.19	0.12	1.89
Pressure ulcers after admission	0.26	0.28	0.24	1.09
Patient falls with injury	0.02	0.02	0.01	1.50
Urinary tract infections	0.19	0.17	0.12	1.57
Bloodstream infections	0.19	0.22	0.14	1.37
Pneumonia	0.37	0.36	0.27	1.36
Complaints from patients/family	0.22	0.20	0.12	1.87
Verbal abuse by patients/family	0.34	0.34	0.16	2.12
Verbal abuse by staff	0.09	0.08	0.04	2.39
Physical abuse by patients/family	0.09	0.08	0.04	2.39
Physical abuse by staff	0.01	0.00	0.01	1.07
Work related physical injuries	0.17	0.12	0.06	2.81