6.9. Patient-to-nurse ratio (A-8) [updated on 26 August 2020] [see also the old sheet below]

6.9.1. Documentation sheet

Description	**Main indicator: Patient-to-nurse ratio on general nursing units**
Calculation	**Patient-to-nurse ratio on general nursing units in the previous RN4CAST study (2009 data)** Previously, an international comparison for several European countries was published with data from 2009. Nurse staffing was calculated based on the RN4CAST-data (survey in 12 countries, 488 hospitals, 33 659 nurses), as a ratio of patients to nurses (P2N). Nurses on general surgical and internal medicine nursing units were asked for how many patients they were responsible during their last shift. The results were averaged across all nurses providing direct inpatient care in the sampled nursing units (1). **Patient-to-nurse ratio on general nursing units in the KCE study (2019 data)** In 2019, the KCE performed an update of the RN4CAST study for Belgium, trying to replicate the 2009 survey methodology as closely as possible. The survey was conducted in 84 acute hospitals (compared to 56 in the 2009 Belgian survey), with 5 203 nurses having completed the survey (3 186 in 2009). For 49 of these hospitals, data are available for both 2009 and 2019. Nurses were asked to report on the number of patients they took care for during their last shift (**numerator**), and the number of nurses present during their last shift (**denominator**). Full details on the method can be found in the KCE report 325 (2). For the interested reader, additional indicators were also reported in this KCE report based on the analysis of administrative datasets (i.e. the Hospital Discharge Data Set (B-HDDS/MZG – RHM) and more in particular the B-NMDS II (VG-MZG/DI-RHM) as well as the registered staffing data (EMPLODAY)), including an additional estimation of the patient-to-nurse ratio: • Care Intensity per Patient Day (CIPPD): based on the B-NMDS II items a care intensity weight was calculated per patient day. A previously developed weight system was used; • Nursing Hours per Patient Day (NHPPD): based on the sum of the staffed hours of registered nurses (RN) (Bachelor's degree prepared and diploma level nurses – 'EMPLODAY') divided by the number of patient days (calculated as the average of 24 hourly patient censuses over the day); • Care intensity relative to the staffed nursing hours (CINURS): the 'care intensity' relative to the available RN hours per patient day; • Patient-to-nurse ratio: estimated as 24 hours/NHPPD NHPPD was an indicator analysed in the previous Performance reports (as main indicator in the 2015 report (3) and as secondary indicator in the 2019 report (4)). Nevertheless, because the registration of nurse staffing variables (EMPLODAY, EMPLOPER) is no longer compulsory since 2017, this indicator as well as the patient-to-nurse ratio estimated from the NHPPD (i.e. 24 hours/NHPPD) are not presented here (see also the section on rejected indicators in the 2019 report (4)). Previous NHPPD data can be found in the old document sheet below.
Limitation	Because the registration of nurse staffing variables (EMPLODAY, EMPLOPER) is no longer compulsory since 2017, the NHPPD indicator is not anymore updated (see the section on rejected indicators in the 2019 report (4)).

Rationale	Shortfalls in the nurse workforce have striking implications in light of a large and growing base of research literature demonstrating an association between nurse staffing and patient outcomes in hospitals (4-7). Thus, scarce nursing resources should be allocated appropriately so that excessive workload (and its negative impact on patient outcomes) is avoided.
Data sources	2009 data comes from the European survey called RN4CAST (1) 2019 data comes from the Belgian KCE survey replicating the RN4CAST method (2).
International comparability	The European RN4CAST survey (2009 data) was performed in 12 European countries (Belgium, England, Finland, Germany, Greece, Ireland, Netherlands, Norway, Poland, Spain, Sweden, and Switzerland) (1). Nurse staffing was calculated for each hospital from the nurse surveys, as a ratio of patients to nurses on the nursing units on each nurse's last shift, averaged across all nurses providing direct inpatient care in the sampled nursing units. Lower ratios indicated more favourable staffing. Primary data for nurse staffing allows the minimisation of differences in administrative reporting methods across countries and restrict staffing measures to nurses providing direct inpatient care. A "nurse" was defined as a fully qualified professional nurse by the standards of each country. The KCE report 325 only updated results for Belgium. To learn from international practices, an international comparison of safe staffing policies in four countries (Australia: Victoria, Queensland; United States: California, Massachusetts; United Kingdom: England; Ireland) was also performed through literature review. The selection of countries was based on the following criteria: variation of policy approaches; implementation realized or in a stage where evaluation of several policy elements is already possible; availability of published documents (legal and policy documents, grey- and peer-reviewed literature). Experts in the safe staffing policies in each of the regions were consulted for additional information. In addition, these experts were asked to review a first draft of the relevant region.
Related performance indicators	Number of practising nurses per 10 000 population; Nursing graduates; Nursing student following a bachelor track.

6.9.2. Results

Previous data from NR4CAST

In 2009 the average patient-to-nurse ratio in Belgium (10.7) was high compared to other EU countries studied (average for 12 countries: 9) as shown in Table 1. The average number of patients assigned to 1 nurse was only higher in Germany (13.0) and Spain (12.6), and nearly twice as high as in Norway (5.4). If besides registered nurses also lesser trained staff is counted, the number of patients per staff member is 7.9, which is only higher in Germany (see Table 1).

2009-2019 Evolution from KCE report 325.

In 2019, the overall patient-to-nurse ratio has improved to 9.4 on average (based on the 84 hospitals participating to the 2019 survey). This ratio, however, varies across hospitals from 6.1 to 12.7. Large differences in ratios can be observed according to shift type:

- Morning/day shift: 7.1 patients per nurse (variation across hospitals from 5.4 – 9.9);
- Afternoon/evening shift: 8.9 patients per nurse (variation across hospitals from 4.6 – 13.3);
- Night shift: 18.1 patients per nurse (variation across hospitals from 8.0 – 27.6).

The patient-to-nurse ratios do not differ much between week- and weekend days. The average ratio for university hospitals was 7.8 while it was 9.5 in non-university hospitals.

If we focus on the 49 hospitals for which we have both 2009 and 2019 data, the analysis shows a significant improvement in the patient-to-nurse ratio, overall but also per type of shift (morning – day – night), see Figure 1.

Based on the literature review, the international comparison learned that, when available, the patient-to-nurse ratio in Belgium is worse than in the studied countries (see Table 2) and seems still too high. Indeed, the observed patient-to-nurse ratios in Belgium are still far above what is internationally considered as safe. In California, Victoria and Queensland, a maximum number of patients per nurse is defined by law, reflecting what is considered as safe and in England, based on NICE guidance, a P2N superior to 8 is considered as manifestly unsafe. Moreover, because at the same time the intensity of nursing care increased (CIPPD), one can conclude that not much happened during the last decade to improve nurse staffing levels in Belgian hospitals.

Additional results can be found in the KCE report 325, including data on the intensity of nursing care and the importance of missed nursing care.

Table 1 - Patient-to-Nurse ratios in European Hospitals: NR4CAST international comparison (2009-2010)

	Nurse staffing ratio	
Country	Patients to professional registered nurses	Patients to total nursing staff (registered nurses + lesser trained care personnel)
Belgium	10.7 (2.2)	7.9 (1.7)
England	8.6 (1.5)	4.8 (0.6)
Finland	8.3 (2.2)	5.3 (0.8)
Germany	13 (2.3)	10.5 (1.6)
Greece	10.2 (2.8)	6.2 (2.1)

Ireland	6.9 (1.0)	5.0 (0.8)
Netherlands	7 (0.8)	5.0 (0.7)
Norway	5.4 (1.0)	3.3 (0.5)
Poland	10.5 (1.9)	7.1 (1.4)
Spain	12.6 (1.9)	6.8 (1.0)
Sweden	7.7 (1.1)	4.2 (0.6)
Switzerland	7.9 (1.5)	5.0 (1.0)

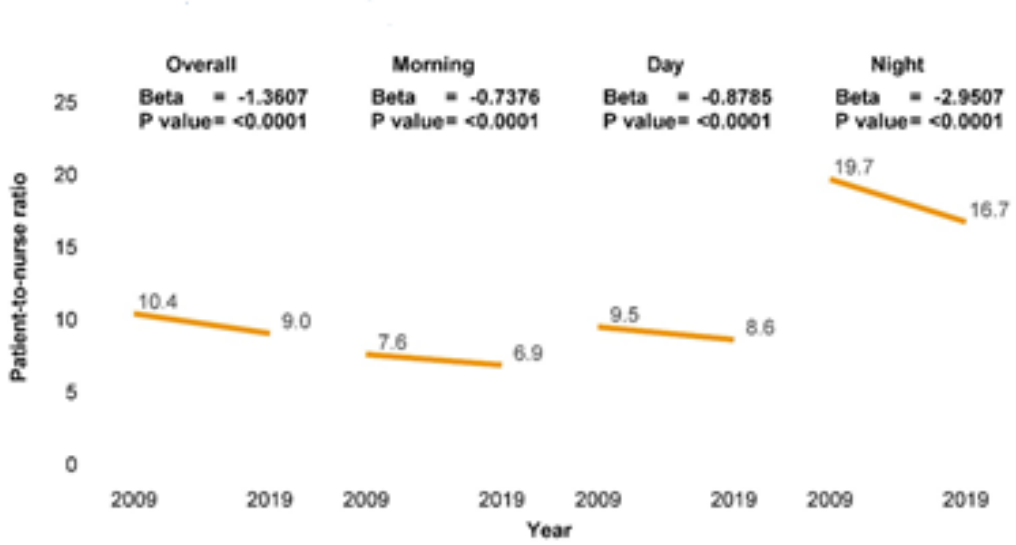
Source: RN4CAST

Table 2 - Patient-to-nurse ratio in selected countries

	California	Victoria	Queensland	England
Patient-nurse ratio	5:1	4:1 (day) 8:1 (night)	4:1 (day) 7:1 (night)	N/A (*More than 8 patients per nurse is considered as an unsafe ratio*)

N/A not available

Figure 1 – Patient-to-nurse ratio: evolution between 2009 and 2019 (n = 49 hospitals)



Key points

- **The number of nursing staff allocated to patient care is associated with quality of patient care. It is shown that staffing rates in Belgian hospitals are varying considerably.**
- **In 2010, one nurse was, on average, responsable for 10.7 patients, this was amongst the highest in Europe.**
- **KCE report 325 shows that in 2019 the average patient-to-nurse ratio has slightly improved to 9.4. This is far above what is internationally considered as a safe patient-to-nurse ratio. Moreover, because at the same time the intensity of nursing care increased (CIPPD), one can conclude that not much happened during the last decade to improve nurse staffing levels in Belgian hospitals.**

References

1. 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.
2. Van den Heede K, Bruyneel L, Beeckmans D, Boon N, Bouckaert N, Cornelis J, Dossche D, Van de Voorde C, Sermeus W. Safe nurse staffing levels in acute hospitals. Health Services Research (HSR) Brussels: Belgian Health Care Knowledge Centre (KCE). 2019. KCE Reports 325. D/2019/10.273/75. Available from: https://kce.fgov.be/sites/default/files/atoms/files/KCE_325_Safe_nurs_staffing_Report_2nd_edition.pdf
3. Vrijens F, Renard F, Camberlin C, Desomer A, Dubois C, Jonckheer P, Van den Heede K, Van de Voorde C, Walckiers D, Léonard C, Meeus P. Performance of the Belgian Health System - Report 2015 – Health Services Research (HSR) Brussels: Belgian Health Care Knowledge Centre (KCE). 2016. KCE Reports 259C. D/2016/10.273/03.
4. Devos C, Cordon A, Lefèvre M, Obyn C, Renard F, Bouckaert N, Gerkens S, Maertens de Noordhout C, Devleesschauwer B, Haelterman M, Léonard C, Meeus P. Performance of the Belgian health system – report 2019. Health Services Research (HSR) Brussels: Belgian Health Care Knowledge Centre (KCE). 2019. KCE Reports 313. D/2019/10.273/34.
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. Audet LA, Bourgault P, Rochefort CM. Associations between nurse education and experience and the risk of mortality and adverse events in acute care hospitals: A systematic review of observational studies. Int J Nurs Stud. 2018;80:128-46.
7. 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).
8. Griffiths P, Ball J, Bloor K, Bohning D, Briggs J, Dall'Ora C, et al. In: Nurse staffing levels, missed vital signs and mortality in hospitals: retrospective longitudinal observational study. Southampton (UK); 2018. Available from: https://www.ncbi.nlm.nih.gov/pubmed/30516947

6.9. Patient-to-nurse ratio (A-8) [old sheet]

6.9.1. Documentation sheet

Description	Main indicator: Patient-to-nurse ratio on general nursing units Secondary indicator: Nursing Hours per Patient Day in Acute Hospitals (NHPPD)
Calculation	**Patient-to-nurse ratio on general nursing units** For international comparison we report patient-to-nurse ratios. Nurse staffing was calculated based on the RN4CAST-data (survey in 12 countries, 488 hospitals, 33 659 nurses), as a ratio of patients to nurses. Nurses on general surgical and internal medicine nursing units were asked for how many patients they were responsible during their last shift. The results were averaged across all nurses providing direct inpatient care in the sampled nursing units. A new RN4CAST survey will start in 2019 in Belgium. The indicator will be updated on the website. **Nursing Hours per Patient Day in Acute Hospitals (NHPPD)** Numerator: the sum of the staffed hours of Registered Nurses (bachelor's degree prepared and diploma level nurses). Students are not taking into account (CAT006). Denominator: the number of inpatient days per nursing unit per observation day. The NHPPD-measure is calculated for general surgery nursing units (C) and general internal medicine units (D). It should be noted that we aim to measure the nursing staff availability (Bachelor prepared nurses and Diploma prepared nurses). However, the general feedback includes an aggregate measure including all nursing and caring staff: • CAT001: nurses with a Master's degree • CAT002: nurses with a Bachelor's degree • CAT003: nurses with a Diploma degree • CAT004: care assistants • CAT005: Supporting staff • CAT006: Students from categories CAT001-CAT004 with a clinical placement. (Excluded from the NHPPD calculation) We will therefore also report the NHPPD for the disaggregated numbers CAT001-CAT003. It should be noted that the distribution statistics are only reported for the nursing units with data available in the respective categories.

Limitation	**Nursing Hours per Patient Day in Acute Hospitals (NHPPD):** Since 2017, the registration of workforce data is not mandatory anymore. As a consequence, the indicator NHPPD will not be available anymore.
Rationale	Shortfalls in the nurse workforce have striking implications in light of a large and growing base of research literature demonstrating an association between nurse staffing and patient outcomes in hospitals.[1-3] Thus, scarce nursing resources should be allocated appropriately so that excessive workload (and its negative impact on patient outcomes) is avoided.
Data source	**Patient-to-nurse ratio on general nursing units:** RN4CAST. A new RN4CAST survey will start in 2019 in Belgium. When data will be available, the indicator will be updated on the website. **Nursing Hours per Patient Day in Acute Hospitals (NHPPD):** Since 1988, all Belgian acute hospitals have been obliged by law to submit to the Ministry of Public Health data about nurse staffing levels and nursing activities. Data are submitted quarterly (March, June, September and December), and these data form the basis of the Belgian Nursing Minimum Dataset (B-NMDS: MVG/RIM)[4] Data intended for the B-NMDS are recorded during the first 15 days of March, June, September and December, during which one recording takes place every 24 hours[a]. Besides nursing activities, the number of hours that nursing staff work during the recording days are registered. The number of nursing staff is expressed as Nursing Hours per Patient Day (NHPPD), which is the sum of the staffed hours of Registered Nurses (bachelor's degree prepared and diploma level nurses) divided by the number of inpatient days per nursing unit per observation day. Since 2008, the B-NMDS was updated and integrated in the Belgian Hospital Discharge dataset (MZG – RHM). Since 2017, the registration of workforce data is not anymore mandatory.
International comparability	**Patient-to-nurse ratio:** this indicator comes from a European survey called RN4CAST from which a patient-to-nurse ratio can be calculated. In fact, in 2009-2010 a survey was conducted among 33 659 nurses working on general medical-surgical nursing units in 488 general acute care hospitals in 12 European countries (Belgium, England, Finland, Germany, Greece, Ireland, Netherlands, Norway, Poland, Spain, Sweden, and Switzerland).[5] Nurse staffing was calculated for each hospital from the nurse surveys, as a ratio of patients to nurses on the nursing units on each nurse's last shift, averaged across all nurses providing direct inpatient care in the sampled nursing units. Lower ratios indicated more favourable staffing. Primary data for nurse staffing allows the minimisation of differences in administrative reporting methods across countries and restrict staffing measures to nurses providing direct inpatient care. A "nurse" was defined as a fully qualified professional nurse by the standards of each country. The patient-to-nurse ratio as measured by the B-NMDS cannot be compared in a reliable measure with these patient to nurse ratios.

[a] Unless the patient shifts towards another nursing unit. In that case a new 'care period' is started (i.e. the care period is the unit of registration)

	Nursing Hours per Patient Day in Acute Hospitals (NHPPD): although it is an international used indicator, no systematically collected dataset exists.
Dimension	Quality of care
Related performance indicators	Patient to nurse ratio; Number of practising nurses per 10 000 population; Nursing graduates; Nursing student following a bachelor track

6.9.2. Results

Nursing Hours per Patient Day in Acute Hospitals (NHPPD)

NHPPD increased between 2011 and 2015 from 4.3 to 6.3 for surgical units and from 4.8 to 5.5 for internal medicine (see Table 3 and Figure 1).

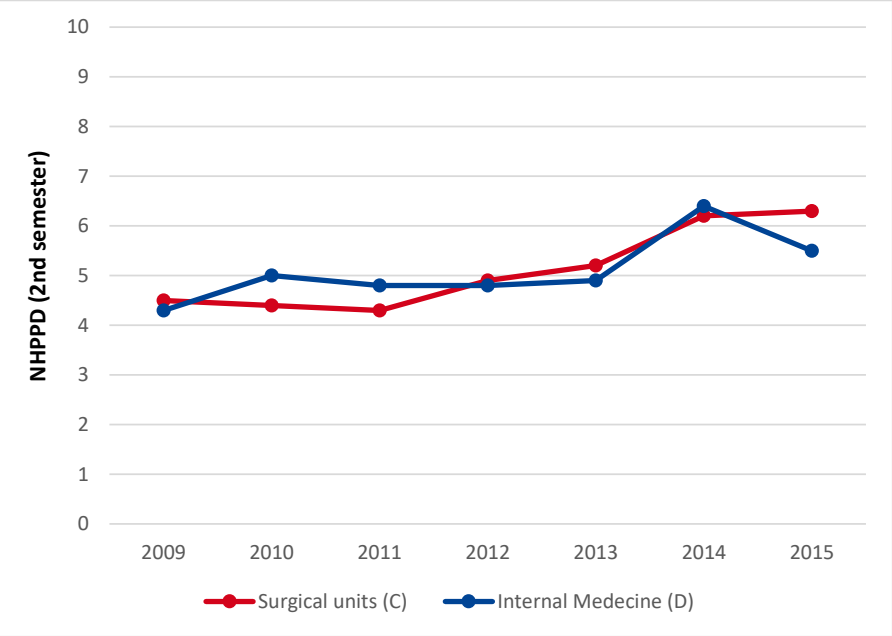
From Table 3 it is clear that there is substantial variability in NHPPD across hospitals. Part of the variability can potentially be explained by differences in nursing intensity. In fact, hospitals receive (based on, a.o. the B-NMDS) extra budget for nursing staff if their nursing intensity is higher compared to other hospitals.[6] Yet, it is has been shown that after correcting for these differences a substantial variation in staffing ratios remain[7], which is associated to variation in quality of patient care.[8]

Table 3 – NHPPD* in Belgian hospitals (2011-2015)

		2011 (2nd semester)						2015 (2nd semester)					
		P10	P25	P50	P75	P90	Mean	P10	P25	P50	P75	P90	Mean
NHPPD aggregate measure**	Surgery (C)	2.9	3.3	3.7	4.3	5.4	4.3	3.2	3.6	4.1	4.9	6.5	6.3
	Internal Medicine (D)	2.7	3.0	3.6	4.3	6.0	4.8	3.0	3.4	4.0	4.8	7.8	5.5
NHPPD* per educational level Surgical units**	Master	0.3	0.3	0.4	0.5	0.7	0.5	0.3	0.4	0.4	0.5	0.6	0.6
	Bachelor	0.9	1.2	1.6	2.3	3.0	2.1	1.2	1.6	2.1	2.7	3.7	4.0
	Diploma	0.6	0.9	1.4	1.9	2.4	1.5	0.7	1.0	1.4	1.9	2.7	1.7
NHPPD* per educational level Internal medicine**	Master	0.3	0.3	0.4	0.5	0.7	0.5	0.3	0.3	0.4	0.5	0.9	0.6
	Bachelor	0.9	1.1	1.6	2.3	3.4	2.2	1.1	1.5	2.0	2.8	5.2	3.3
	Diploma	0.6	0.9	1.2	1.7	2.2	1.8	0.6	0.9	1.3	1.8	2.5	1.7

Source: SPF-FOD Federal Public Service Health, Food Chain Safety and Environment (RHM)
*Note: *NHPPD= Nursing Hours per Patient Day; ** includes hours of nursing staff (Master, Bachelor, diploma), care assistants, supporting staff and students; ***the distribution statistics only concern the nursing unit with the respective educational level present on the nursing unit.*

Figure 1 – NHPPD in general surgery nursing units (C) and general internal medicine units (D) (2009-2015, 2nd semester)



Source: SPF-FOD Federal Public Service Health, Food Chain Safety and Environment (RHM)

International comparison

The average patient-to-nurse ratio in Belgium (10.7) is high compared to other EU countries (average for 12 countries: 9). The average number of patients assigned to 1 nurse is only higher in Germany (13.0) and Spain (12.6) and is nearly twice as high as in Norway (5.4). If besides registered nurses also lesser trained staff is counted the number of patients per staff member is 7.9 which is only higher in Germany.

Table 4 – Patient-to-Nurse ratios in European Hospitals: international comparison (2009-2010)

	Nurse staffing ratio	
Country	Patients to professional registered nurses	Patients to total nursing staff (registered nurses + lesser trained care personnel)
Belgium	10.7 (2.2)	7.9 (1.7)

England	8.6 (1.5)	4.8 (0.6)
Finland	8.3 (2.2)	5.3 (0.8)
Germany	13 (2.3)	10.5 (1.6)
Greece	10.2 (2.8)	6.2 (2.1)
Ireland	6.9 (1.0)	5.0 (0.8)
Netherlands	7 (0.8)	5.0 (0.7)
Norway	5.4 (1.0)	3.3 (0.5)
Poland	10.5 (1.9)	7.1 (1.4)
Spain	12.6 (1.9)	6.8 (1.0)
Sweden	7.7 (1.1)	4.2 (0.6)
Switzerland	7.9 (1.5)	5.0 (1.0)

Source: RN4CAST[2]

Key points

- **The number of nursing staff allocated to patient care is associated with quality of patient care. It is shown that staffing rates in Belgian hospitals are varying considerably.**
- **NHPPD increased between 2011 and 2015 from 4.3 to 6.3 for surgical units and from 4.8 to 5.5 for internal medicine**
- **In 2010, one nurse was, on average, responsable for 10.7 patients, this was amongst the highest in Europe.**

References

[1] 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. doi: 10.001/jama.290.12..

[2] 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.

[3] Kane RL, Shamliyan TA, Mueller C, Duval S, Wilt TJ. The association of registered nurse staffing levels and patient outcomes: systematic review and meta-analysis. Med Care. 2007;45(12):1195-204. doi: 10.097/MLR.0b013e3181468ca3.

[4] FOD-SPF Santé publique Sécurité de la Chaine alimentaire et Environnement. Feed-back national sur les données du personnel du RHM Brussels: FOD-SPF Santé publique, Sécurité de la Chaine alimentaire et Environnement; 2015.

[5] Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Sermeus W. Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. Int J Nurs Stud. 2013;50(2):143-53.

[6] Van de Voorde C. VdHK, Obyn C., Quentin W., Geissler A., Wittenbecher F., Busse R., Magnussen J., Camaly O., Devriese S., Gerkens S., Misplon S., Neyt M., Mertens R. Conceptual framework for the reform of the Belgian hospital payment system. . Health Services Research (HSR) Brussels: Belgian Health Care Knowledge Centre (KCE); 2014.

[7] Van den Heede K, Diya L, Lesaffre E, Vleugels A, Sermeus W. Benchmarking nurse staffing levels: the development of a nationwide feedback tool. J Adv Nurs. 2008;63(6):607-18. doi: 10.1111/j.365-2648.008.04724.x.

[8] Van den Heede K, Lesaffre E, Diya L, Vleugels A, Clarke SP, Aiken LH, *et al.* The relationship between inpatient cardiac surgery mortality and nurse numbers and educational level: analysis of administrative data. Int J Nurs Stud. 2009;46(6):796-803. doi: 10.1016/j.ijnurstu.2008.12.018. Epub 9 Feb 7.