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Measuring the nursing workload in intensive care with the Nursing Activities Score (NAS): study prospective in 15 hospitals in Belgium

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I. Introduction

Measuring the nursing workload in intensive care with the Nursing Activities Score (NAS): study prospective in 15 hospitals in Belgium

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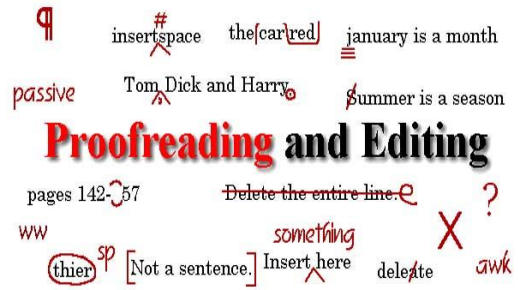
I. Introduction

Publishing timeline

- Submission to publication, 3—12 months



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I. Introduction

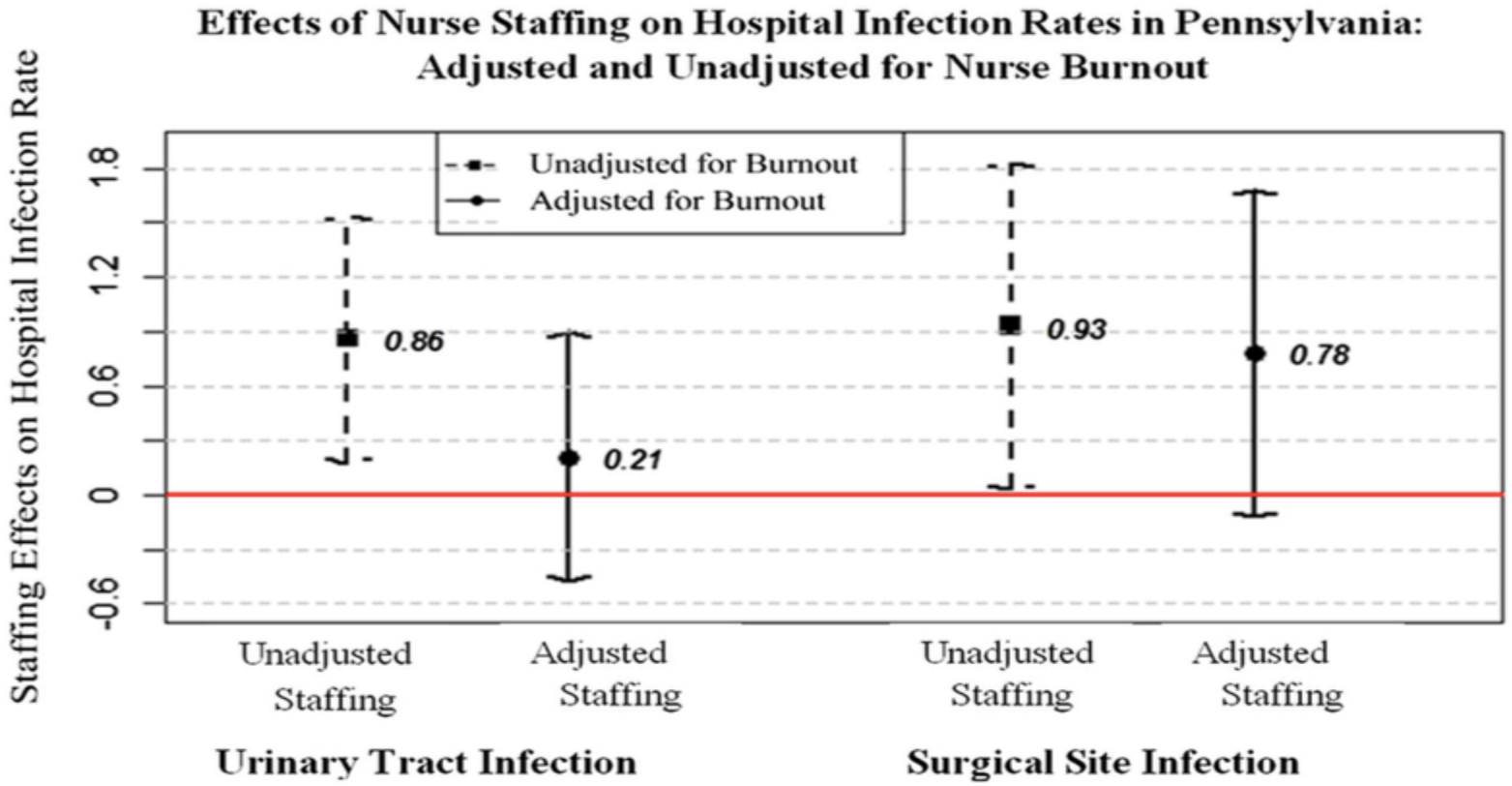


Fig 1.
Adjusted and unadjusted effects of burnout on nurse staffing and health care–associated urinary tract and surgical site infections.

Am J Infect Control. Cimiotti; 2012 November 28

I. Introduction

Other effects, N/P inadequate

- **↑ adverse events**

(schubert 2012 ; Goncalves, 2012 ; Graf, 2005; West et al., 2014, 2009)

- **↑ Nosocomial infections**

(Daud-Gallotti et al., 2012; Stone et al., 2007; Venier et al., 2014 ; CIMIOTTI ,2012 ; schubert 2012)

- **↓ satisfaction of relatives and families of the patient**

(schubert 2012 ; Gerasimou-Angelidi, 2014; Johnson,1998)

- **↑ decubitus ulcer**

(Cremasco et al., 2013 ; Lake, 2006 ; schubert 2012) ; des soins manquants (Ball, 2018)

- **↓ pain management**

(SHINDUL-ROTHSCHILD, 2017)

- **↑ LOS because of surgical complications**

(AMARAVADI, 2000 ; Dang, 2002 ; Pronovost, 1999)

- **↑ musculoskeletal and burnout injuries in nurses**

(Aiken et al., 2002; Frade Mera and García, 2009)

I. Introduction

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

Nurse Staffing and Inpatient Hospital Mortality

Jack Needleman, Ph.D., Peter Buerhaus, Ph.D., R.N., V. Shane Pankratz, Ph.D., Cynthia L. Leibson, Ph.D., Susanna R. Stevens, M.S., and Marcelline Harris, Ph.D., R.N.

Total of 171,041 patients with no shifts in an ICU		
Each shift with RN staffing level below target or high turnover during first 30 days after admission		
Shift with RN staffing level 8 hr or more below target	1.04 (1.03–1.06)	<0.001
Shift with high patient turnover	1.07 (1.02–1.13)	0.006
Each shift with RN staffing level below target or high turnover during first 5 days after admission		
Shift with RN staffing level 8 hr or more below target	1.12 (1.08–1.16)	<0.001
Shift with high patient turnover	1.15 (1.07–1.24)	0.001

I. Introduction

Patient Mortality Is Associated With Staff Resources and Workload in the ICU: A Multicenter Observational Study*

Antoine Neuraz, MD, MSc[1,2]; Claude Guérin, MD, PhD[2,3,4]; Cécile Payet, MSc[1,5]; Stéphanie Polazzi, MPH,[1,5]; Frédéric Aubrun, MD, PhD[2,5,6]; Frédéric Dailler, MD, PhD[7]; Jean-Jacques Lehot, MD, PhD[2,8]; Vincent Piriou, MD, PhD[5,9,10]; Jean Neidecker, MD, PhD[11]; Thomas Rimmelé, MD, PhD[2,12]; Anne-Marie Schott, MD, PhD[1,2,5]; Antoine Duclos, MD, PhD[1,2,5]

TABLE 2. Characteristics of Shifts Without Any Death or With At Least One Death

	Shifts Without Death ($n = 11,251$)	Shifts With ≥ 1 Death ($n = 415$)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)
Patients-to-nurse ratios (%)				
< 1:1	290 (2.6)	5 (1.2)	1	1
1:1–1.5:1	2,748 (24.4)	91 (21.9)	1.6 (0.8–2.9)	1.9 (0.7–4.6)
1.5:1–2:1	5,143 (45.7)	181 (43.7)	1.7 (0.9–3.1)	2.0 (0.8–5.0)
2:1–2.5:1	2,461 (21.9)	103 (24.8)	1.8 (0.9–3.2)	2.3 (0.9–5.8)
> 2.5:1	609 (5.4)	35 (8.4%)	2.2 (1.2–4.3)	3.5 (1.3–9.1)[a]
Patients-to-physician ratios (%)				
< 8	8,144 (72.4)	256 (61.7)	1	1
8:1–10:1	1,391 (12.4)	59 (14.2)	1.0 (0.8–1.3)	0.9 (0.7–1.3)
10:1–14:1	1,408 (12.5)	74 (17.8)	1.0 (0.8–1.3)	1.1 (0.8–1.5)
> 14:1	308 (2.7)	26 (6.3)	1.5 (1.0–2.1)	2.0 (1.3–3.2)[a]
Residents-to-physicians ratio (SD)	0.27 (0.26)	0.26 (0.25)	0.7 (0.4–1.1)	0.9 (0.5–1.5)
Mean patient turnover (SD)[b]	6.8 (9.2)	7.8 (11)	2.3 (1.1–4.7)	5.6 (2.0–15.0)[c]
Mean number of life-sustaining procedure (SD)[d]	1.3 (0.4)	1.4 (0.4)	4.4 (3.5–5.4)	5.9 (4.3–7.9)[c]
Mean proportion of men (SD)	0.6 (0.1)	0.6 (0.1)	1.6 (0.9–2.8)	1.8 (0.8–3.8)
Mean proportion of surgical cases (SD)	0.6 (0.3)	0.6 (0.3)	0.6 (0.4–1.0)	0.5 (0.2–1.1)
Mean Simplified Acute Physiology Score II[e] (SD)	50 (11)	52 (11)	1.5 (1.4–1.7)	1.5 (1.3–1.7)[c]
Mean number of comorbidities (SD)[f]	2.2 (0.6)	2.3 (0.6)	1.1 (0.9–1.3)	0.9 (0.8–1.1)

RR = relative risk.
[a]$p < 0.01$.
[b]Number of admissions plus discharges (excluding death) over the census during the shift, in percentage.
[c]$p < 0.001$.
[d]Mean number of life-sustaining medical procedure (LSPs; Annex 1) per patient-day.
[e]Risk ratios for Simplified Acute Physiology Score (SAPS) II are computed for 10-point increase.
[f]Conditions extracted from the Elixhauser list of comorbidities (22).
Risk ratios correspond to a bivariate Poisson mixed model with random effect on ICU. Adjusted risk ratios and p values correspond to a multivariate Poisson mixed model with random effect on ICU. The multivariate model includes the following variables: patient-to-nurse, patient-to-physician, and residents-to-physicians ratios, patient turnover, number of LSP, proportion of men, proportion of surgical cases, SAPSII and number of comorbidities.

I. Introduction

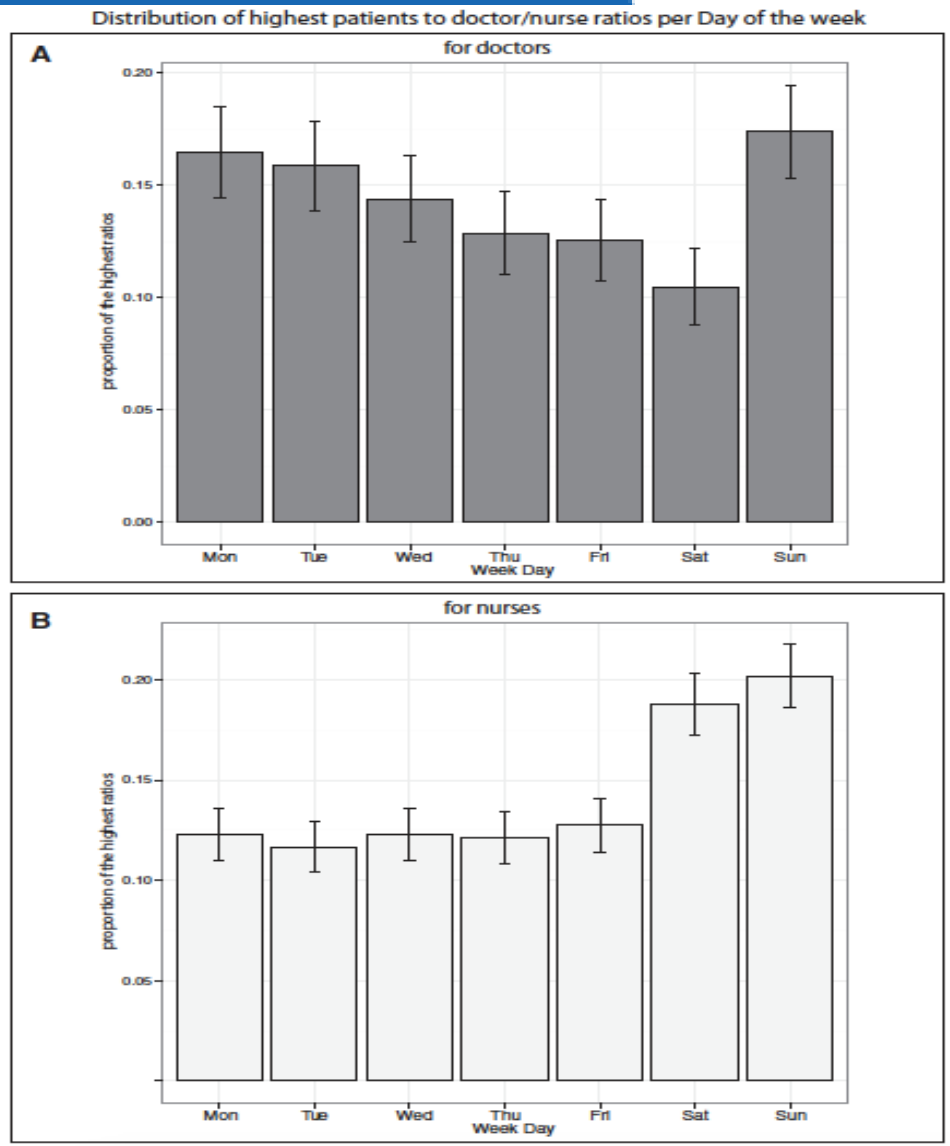


Figure 3. Distribution of highest ratios across days of the week. Highest ratios correspond to > 2.5 patients per nurse and > 14 patients per physician.

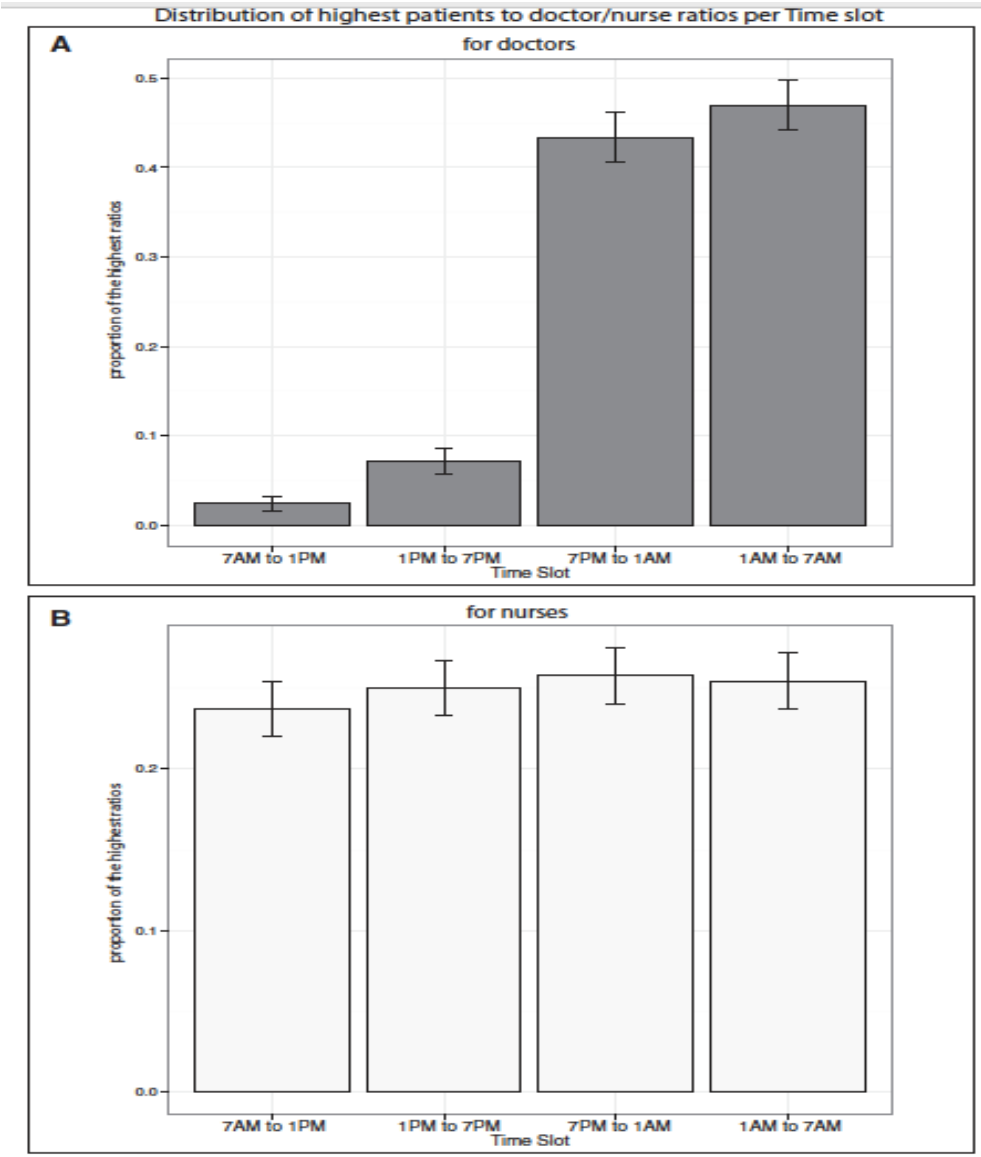


Figure 2. Distribution of highest ratios across shifts. Highest ratios correspond to > 2.5 patients per nurse and > 14 patients per physician.

I. Introduction

I. Introduction

Communiqué de presse AUVB-UGIB-AKVB - novembre 2017 – Enquête chez 2822 infirmiers :

- Malgré une charge de travail élevée et un manque de personnel, les infirmiers sont prêts à relever le défi
- 95 % des infirmiers trouvent la profession moyennement à extrêmement stimulant et 61% sont satisfaits de leurs conditions de travail
- **82.1%** pensent que leur lieu de travail est en sous-effectif, tandis que **82,9%** parlent d'une charge de travail élevée
- Une grande majorité des infirmiers (96,5%) veulent rester dans leur secteur et 75% ne voient certainement pas l'avenir d'une manière négative

I. Introduction

27 AVRIL 1998. – Arrêté royal fixant les normes auxquelles une fonction de soins intensifs doit répondre pour être agréée *(M.B. du 19/06/1998, p. 20073)*

Section 2
Le personnel infirmier.

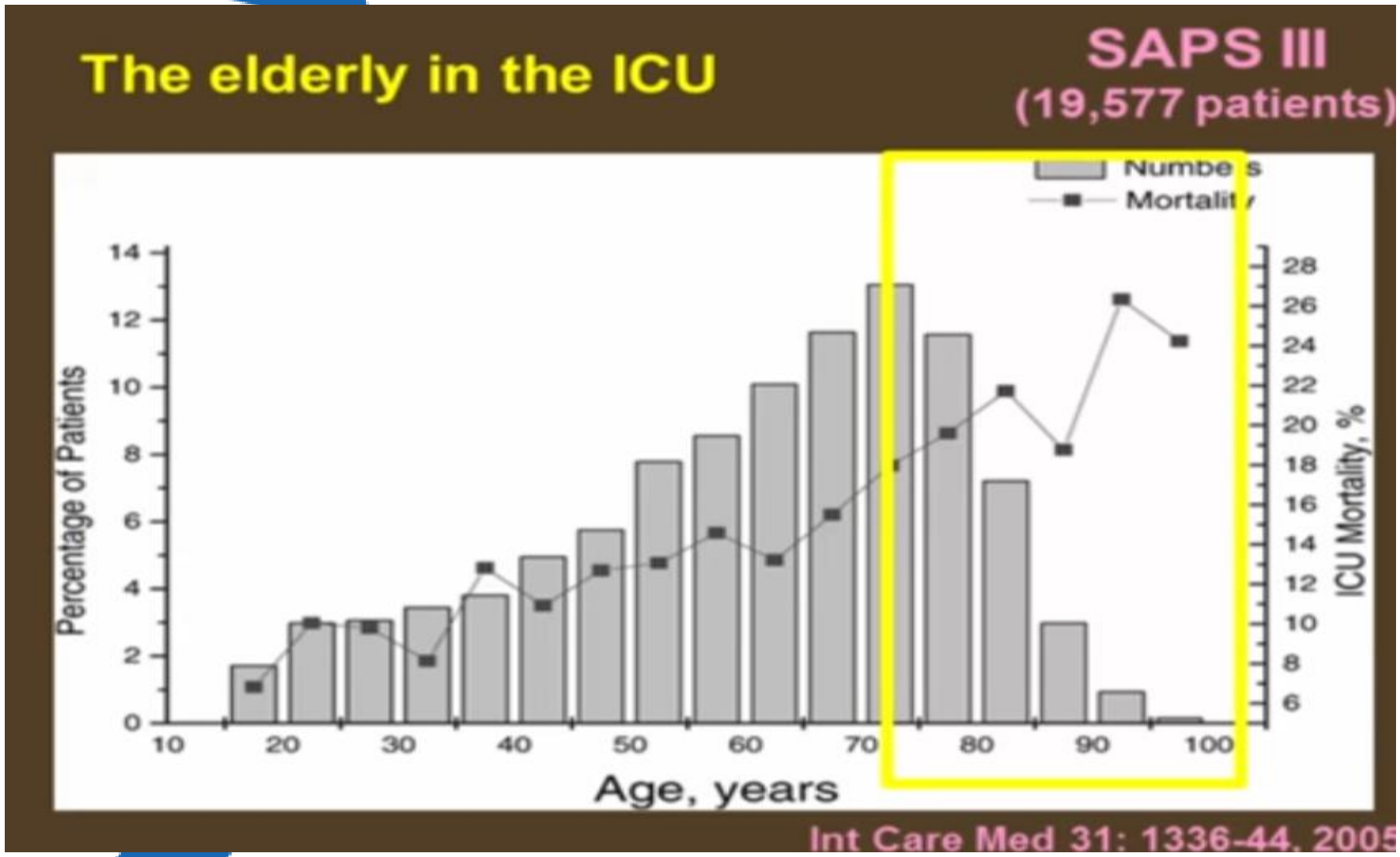
Art. 18. La fonction dispose d'une équipe infirmière spécifique propre, qui permet d'assurer une permanence 24 h sur 24 d'au moins 2 infirmiers, par tranche complète de six lits, dont un au moins est porteur du titre professionnel particulier d'infirmier gradué ou d'infirmière graduée en soins intensifs et d'urgence ou justifie d'au moins 5 ans d'expérience, à la date d'entrée en vigueur du présent arrêté, dans un des services visés à l'article 17, alinéa 2.

Par tranche complémentaire entamée de 6 lits, il convient d'adapter le nombre d'infirmiers visé à l'alinéa précédent proportionnellement au nombre de lits.

En outre, l'équipe infirmière doit être adaptée en fonction des activités de la fonction.

I. Introduction

I. Introduction



I. Introduction

D. R. Miranda and M. Jegers

Table 1

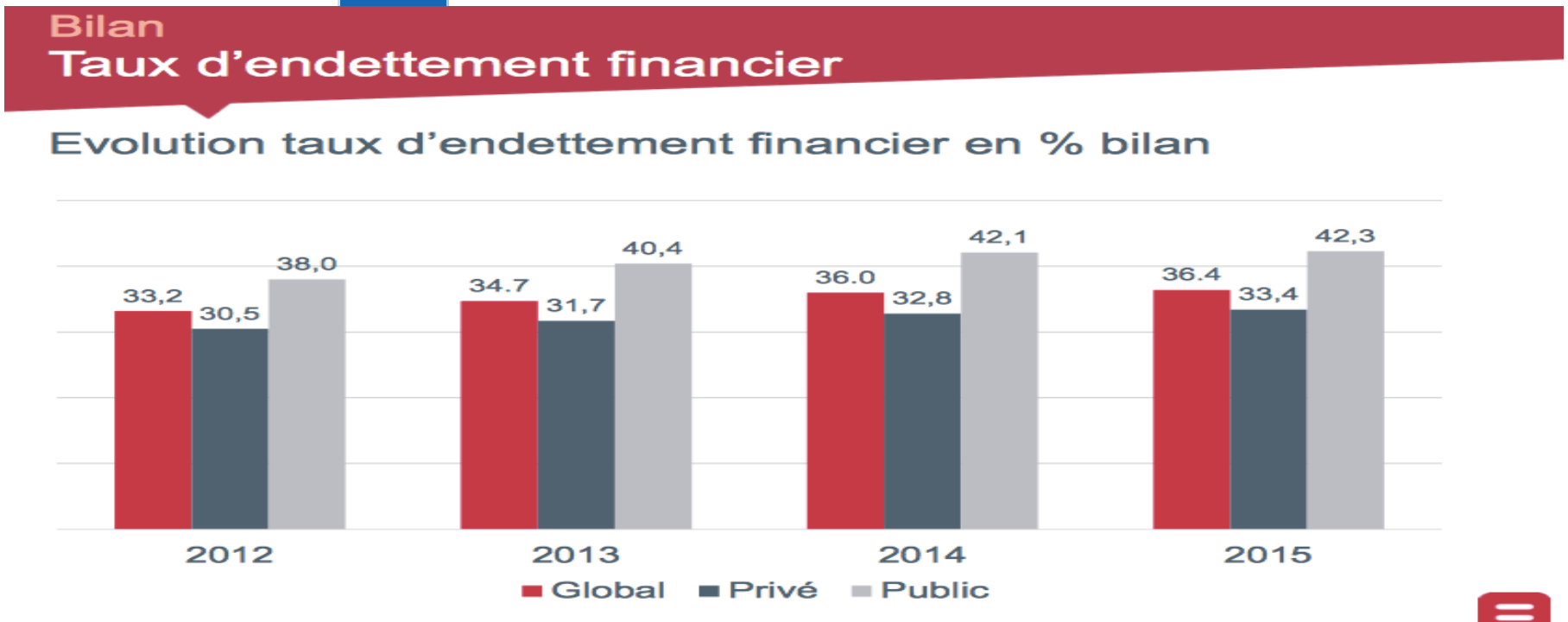
EURICUS III [third European intensive care unit (ICU) Study: BMH4-CT98-3461]. Breakdown of costs from a financial survey in 45 ICUs in 10 European countries.[7] In the survey of the cost administration of all ICUs, the total fixed costs (51, 5%) were similar to the total variable costs (48, 5%). Of these, the equivalent of 49% of the total costs of the ICU corresponded to cost data readily available (varying between 35% and 70%). This cost data is presented in the left column of both fixed- and variable costs. Of the fixed costs, more than the half (the nursing staff cost) is easily collected; of the variable costs, the amount of readily available costs was scattered and much smaller.

Fixed costs (51.5%)			Variable costs (48.5%)		
		Cost easily traced			Cost easily traced
Labour	46.0		Blood products	4.8	4.8
			Clinical services	14.5	
Nursing staff		27.8	Laboratory		6.9
Other staff	18.2		Radiology		3.3
			Rest	4.3	
			Non-clinical services	7.2	
Equipment	5.5		Pharmaceuticals	15.4	
			Anaesthetics		1.7
			Anti-microbial's		2.9
			Feeding		0.9
			Vasoactive drugs		0.7
			Rest	9.3	
			Disposables	6.6	
Total % cost traced		27.8	Total % cost traced		21.2

I. Introduction

Mesures d'économie dans les soins de santé

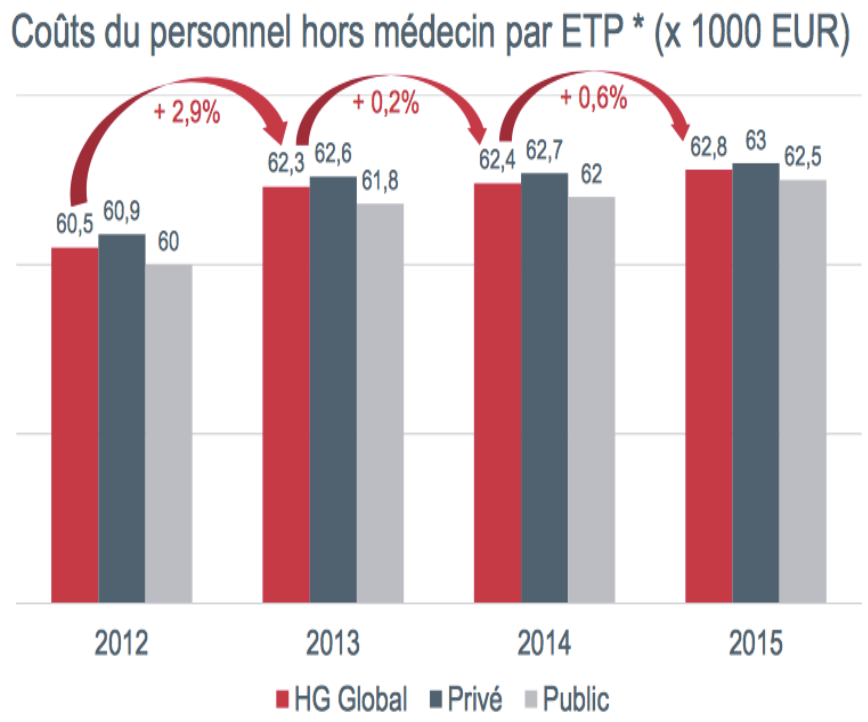
En 3 ans, ce gouvernement aura ainsi asséné quelques 500 millions d'euros d'économies aux hôpitaux (journal du médecin, 10/03/17) → 8000 emplois à temps plein



I. Introduction

Compte de résultats

Personnel



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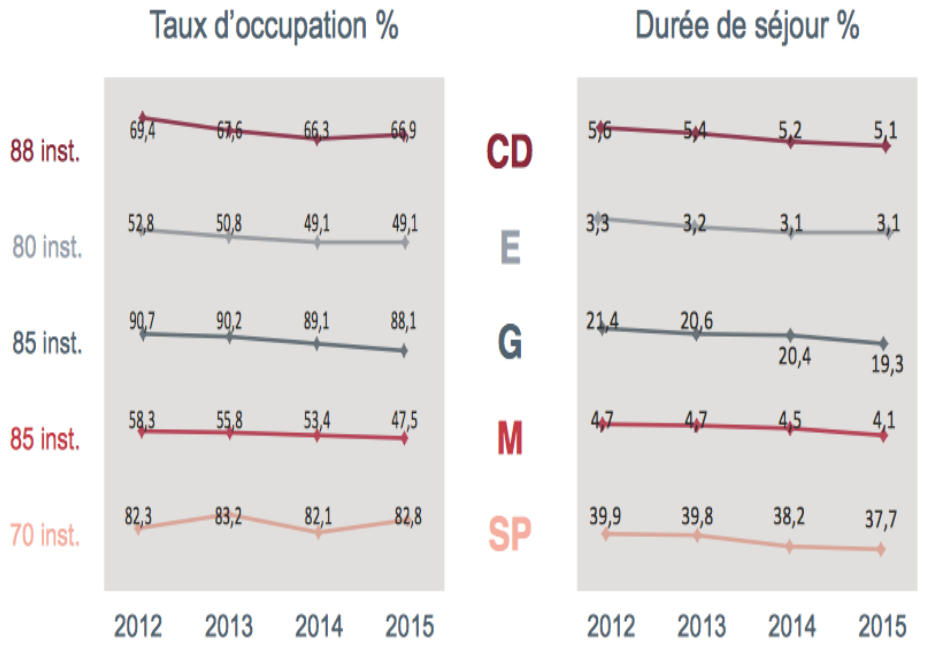
Activité des services

Taux d'occupation et durée de séjour



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I. Introduction

I. Introduction

[INFO] Non-marchand en colère à Bruxelles: entre 12 000 et 14 000 personnes battent le pavé

Non-marchand en colère à Bruxelles: plus de 10 000 personnes battent le pavé

Un cortège rouge, bleu et vert s'est élancé mardi vers 10h45 dans le boulevard Botanique à Bruxelles, marquant le début d'un nouvelle manifestation nationale...

RTBF.BE

Table 2 - Frequency of item and subitem performance of Nursing Activities Score. Campinas, 2008

Items and subitems	n	%
1. Monitoring and titration		
1a. Hourly vital signs, regular registration and calculation of fluid balance. (4.5 pts)	840	77.8
1b. Present at bedside and continuous observation or active for 2 hrs or more. (12.1 pts)	83	7.7
1c. Present at bedside and active for 4 hrs or more. (19.6 pts)	5	0.5
2. Laboratory, biochemical and microbiological investigations. (4.3 pts)	276	25.6
3. Medication, vasoactive drugs excluded. (5.6 pts)	916	84.8
4. Hygiene procedures		
4a. Performing hygiene procedures. (4.1 pts)	812	75.2
4b. The performance of hygiene procedures took more than 2 hrs. (16.5 pts)	90	8.3
4c. The performance of hygiene procedures took more than 4 hrs. (20.0 pts)	2	0.2
5. Care of drains - All (except gastric tube). (1.8 pts)	244	22.6
6. Mobilization and positioning		
6a. Performing procedure(s) up to three times per 24 hrs. (5.5 pts)	71	6.6
6b. Performing procedure(s) more frequently than 3 times per 24 hrs, or with two nurses, any frequency. (12.4 pts)	45	4.2
6c. Performing procedure with three or more nurses, any frequency. (17.0 pts)	3	0.3
7. Support and care of relatives and patient		
7a. Support and care of either relatives or patient requiring full dedication for about 1 hr in any shift. (4.0 pts)	881	81.6
7b. Support and care of either relatives or patient requiring full dedication for 3 hrs or more in any. (32.0 pts)	46	4.3
8. Administrative and managerial tasks		
8a. Performing routine tasks such as processing of clinical data, ordering examinations, professional exchange of information. (4.2 pts)	606	56.1
8b. Performing administrative and managerial tasks requiring full dedication for about 2 hrs in any shift. (23.2 pts)	328	30.4
8c. Performing administrative and managerial tasks requiring full dedication for about 4 hrs or more of the time in any shift. (30.0 pts)	5	0.5
9. Respiratory support: any form of mechanical ventilation/assisted ventilation ; supplementary oxygen by any method. (1.4 pts)	74	6.9
10. Care of artificial airways. (1.8 pts)	45	4.2
11. Treatment for improving lung function. (4.4 pts)	298	27.6
12. Vasoactive medication, disregard type and dose. (1.2 pts)	21	1.9
13. Intravenous replacement of large fluid losses. (2.5 pts)	0	0
14. Left atrium monitoring. (1.7 pts)	0	0
15. Cardiopulmonary resuscitation in the past period of 24 hrs. (7.1 pts)	3	0.3
16. Hemofiltration techniques. Dialysis techniques. (7.7 pts)	10	0.9
17. Quantitative urine output measurement. (7.0 pts)	422	39.1
18. Measurement of intracranial pressure. (1.6 pts)	0	0
19. Treatment of complicated metabolic acidosis/alkalosis. (1.3 pts)	6	0.6
20. Intravenous hyperalimentation. (2.8 pts)	49	4.5
21. Enteral feeding through gastric tube or other gastrointestinal route. (1.3 pts)	64	5.9
22. Specific intervention(s) in the intensive care unit. (2.8 pts)	41	3.8
23. Specific interventions outside the intensive care unit. (1.9 pts)	199	18.4

In items 1, 4, 6, 7 and 8, only one subitem can be scored

I. Introduction

Objectives

- Analyze the fluctuation of the workload in several intensive care units and its adequacy with the nursing workforce (patient/nurse ratio)
- Compare the theoretical strength of the NAS with the nurse permanence standards

Table of contents

Setting and patients

Prospective observational study
All patients in ICU and PICU

Instrument

Acronyme	Nom	Références
TISS - 76	Therapeutic intervention scoring system-76	Cullen et al, 1974
PRN	Project of research of nursing	EROS, 1981
OMEGA	Omega scoring system	CESRL, 1986
TOSS	Time oriented score system	GIRTI, 1991
SOPRA	System of patient related activity	ICNARC, 1999
TISS - 28	Therapeutic intervention scoring system-28 (TISS -28)	Miranda et al., 1996
NEMS	Nine equivalents of nursing manpower score	Miranda et al., 1997
NAS	Nursing Activities Score	Miranda et al., 2003

Instrument

Intensive & Critical Care Nursing xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Intensive & Critical Care Nursing

journal homepage: www.elsevier.com/iccn

Review article

Nursing workloads and activity in critical care: A review of the evidence

Jane Greaves [a,*], Deborah Goodall [e,†], Andrea Berry [b], Suman Shrestha [c], Annette Richardson [d], Pauline Pearson [a]

Table 4
Workload Scores That Focus Primarily on Nursing Interventions (Task Activity and Professional Judgement Methods).

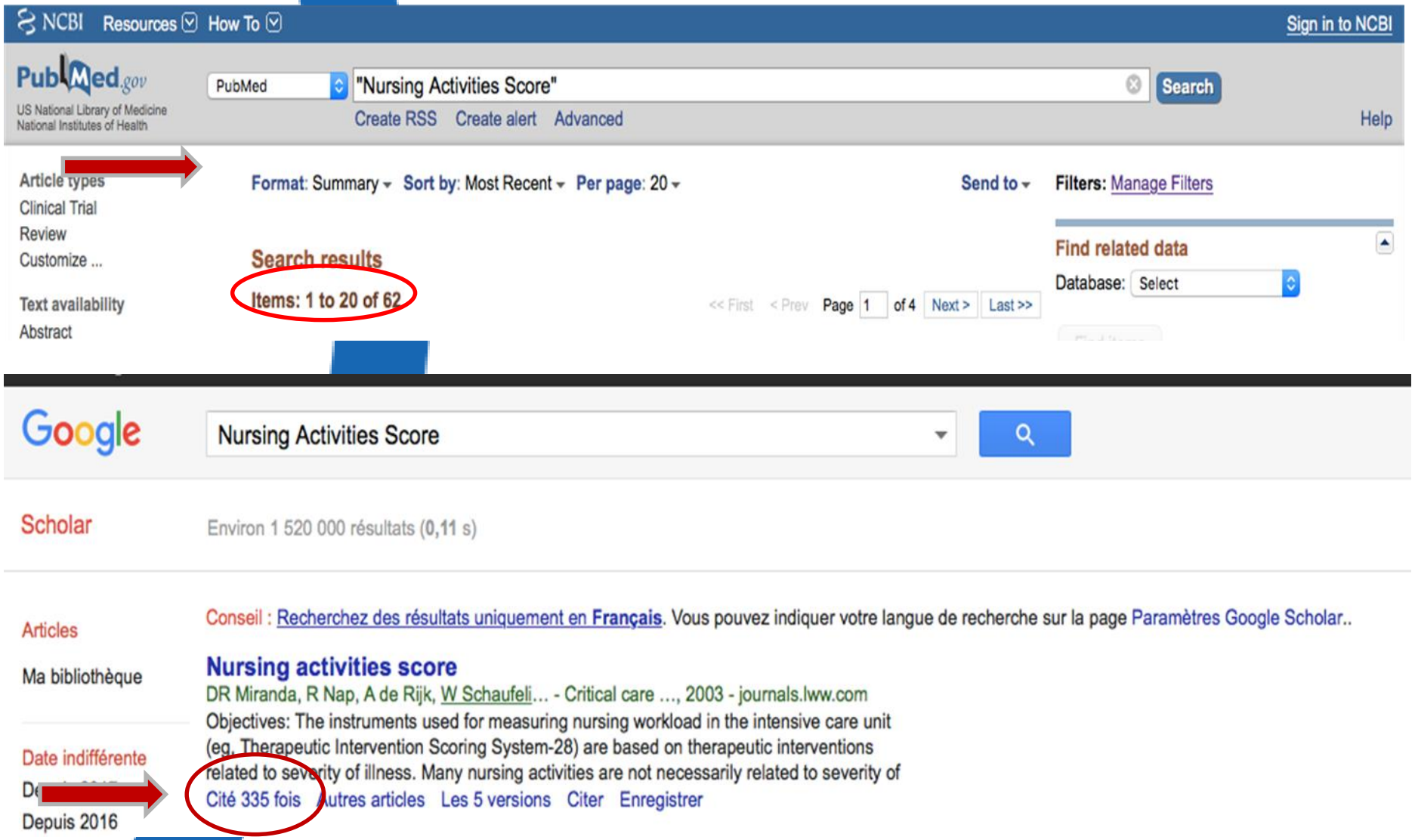
Nursing Activities Score (NAS) (Miranda et al., 2003)	A task activity-method. Uses data on activities undertaken by the nursing team. Work sampling was used to define the relative times spent on each activity and an expert group was used to find categories of nursing activity missing from TISS. Each activity is scored according to percentage of time used on this in a 24-h period. Scores run between 23 and 170: if the score is 100 a 1:1 nurse ratio is recommended (5, 8, 9, 10, 11, 12, 14, 15, 18, 23, 25, 26, 29, 31)
Dependence Nursing Scale (DNS) (Clini et al., 1999)	A task activity-method. This score is concerned with nursing activities and was developed by measuring the time spent on these (13, 17).
Nursing Interventions Classification NIC (Butcher et al., 2013)	A professional judgement method. The Nursing Interventions Classification (NIC) is a classification of nursing treatments in all healthcare settings. Developed by literature review, focus groups and expert consultation (not timings). The NIC includes 433 interventions in the recently published second edition.
NEMS Nine Equivalents of nursing Manpower Use (Reis-Miranda et al., 1998)	A professional judgement method derived from an acuity-quality framework. Derived from TISS-28 framework by regression analysis of contribution of each item to overall score. Categorises nursing activities in nine categories and allocates a weighting to each intervention (4, 12, 13, 14, 20, 21)
American Association of Critical Care Nurses (AACN) Synergy Model for Patient Care (ACCN, 2014)	A professional judgement method was used to develop weightings for a scoring system that incorporates judgements by the patient and relatives as well as objective data. Allocation guidelines also include the competence level of individual staff (2, 3).
SIPI (Sistema Informativo della Performance Infermieristica) (Moiset et al., 2003)	A professional judgement method. The SIPI is a grid-based survey tool derived from the care needs expressed by the patients and carers and refers to the conceptual model of nursing care of Marisa Cantarelli (Cantarelli, 2003), the same model adopted by ICA (16).
System of Patient Related Activities – SoPRA	A professional judgement method. SoPRA was developed by ICNARC the Intensive Care National Audit and Research Centre in the UK as a scoring system based upon Patient Related Activities.
Time Oriented Scoring System (TOSS)	A task-activity method. Each nursing activity has been timed in and the results averaged. Nursing acts were grouped in different categories. No publication in the search period (GIRTI, 1991)
Valoracion de Cargas de Trabajo y Tiempos de Enfermeria (VACTE) (*Evaluation of Workloads and Nursing Times*) (Brana Marcos et al., 2007)	A task-activity method. Timing of nursing activities were analysed for their contribution to an activity score. Brana Marcos compared VACTE with NEMS and APACHE II and found good correlation (Spanish – abstract in English). No other reports of this metric in English. Included here for completeness.

Instrument

Country	No. of ICUs	ICU Type			No. of Patients	No. of TISS Forms
		Medical	Surgical	General		
Australia	9			9	220	577
Austria	5		1	4	73	294
Belgium	10	2	3	5	249	780
Brazil	7	3		4	115	325
Denmark	5			5	94	230
Estonia	5	1	2	2	87	301
Germany	11	3	6	2	310	764
Italy	6			6	88	302
The Netherlands	3		2	1	78	201
Norway	4		1	3	65	186
Portugal	7			7	80	305
Spain	15		1	14	403	1360
United Kingdom	6			6	88	313
United States	1	1			14	24
France	5	2	3		108	452
Total	99	12	19	68	2072	6414

TISS, Therapeutic Intervention Scoring System.

Instrument


NCBI Resources How To
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"Nursing Activities Score"
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Environ 1 520 000 résultats (0,11 s)
Articles
Ma bibliothèque
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Conseil : Recherchez des résultats uniquement en Français. Vous pouvez indiquer votre langue de recherche sur la page Paramètres Google Scholar..
Nursing activities score
DR Miranda, R Nap, A de Rijk, W Schaufeli... - Critical care ..., 2003 - journals.lww.com
Objectives: The instruments used for measuring nursing workload in the intensive care unit (eg, Therapeutic Intervention Scoring System-28) are based on therapeutic interventions related to severity of illness. Many nursing activities are not necessarily related to severity of
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WORK SAMPLING

- **is the process of taking instantaneous samples of workers' activities (Multi Moment Recording: 'what am I doing at this moment?')**

- **is a statistical procedure rooted in the laws of probability giving *estimates* of the time devoted to activities**

Estimations are reliable if:

- the activities are mutually exclusive
- the sampling of times for recording are random
- the number of records is sufficient to estimate

Specific formulas can be used to check the accuracy of the estimates and to calculate the needed sample size

NURSING ACTIVITIES SCORE

Range: 0 - 177%

1. Monitoring and titration	
• 1a - baseline	4.5
• 1b - cont. obs or active ≥2hrs	12.1
• 1c - idem ≥4hrs	19.6
2. Laboratory	4.3
3. Medication	5.6
4. Hygiene procedures	
• 4a - baseline	4.1
• 4b - procedures ≥2hours	16.5
• 4c - idem ≥4hours	20.0
5. Care of drains	1.8
6. Mobilisation and positioning	
• 6a - up to 3 times/day	5.5
• 6b - >3 times, or 2 nurses	12.4
• 6c - ≥3 nurses any time	17.0
7. Support and care of relatives	
• 7a - full dedication 1 hour	4.0
• 7b - idem ≥3hours	32.0
8. Administrative and managerial tasks	
• 8a - baseline	4.2
• 8b - full dedication for 2hours	23.2
• 8c - idem ≥4hours	30.0
9. Respiratory support	1.4
10. Care of artificial airways	1.8
11. Improving lung function	4.4
12. Vasoactive medication	1.2
13. IV replacement of large volume	2.5
14. Left atrium monitoring	1.7
15. CPR	7.1
16. Hemofiltration techniques	7.7
17. Quantitative urine output	7.0
18. Measurement of ICP	1.6
19. Complex metabolic conditions	1.3
20. IV hyper alimentation	2.8
21. Enteral feeding	1.3
22. Specific interventions in the ICU	2.8
23. Idem outside the ICU	1.9

30

Instrument

	TISS-28	NAS
Nursing activities in the score	43.3	80.4
Patient activities not in the score	12.9	
Not in direct contact with patient	21.4	
Organizational	3.3	6.3
Personal care	17.1	11.2
Other	1.9	2.1

Instrument

Table 1 - Number of patients, age, LOS, SAPSII, NAS score and death in the different countries.

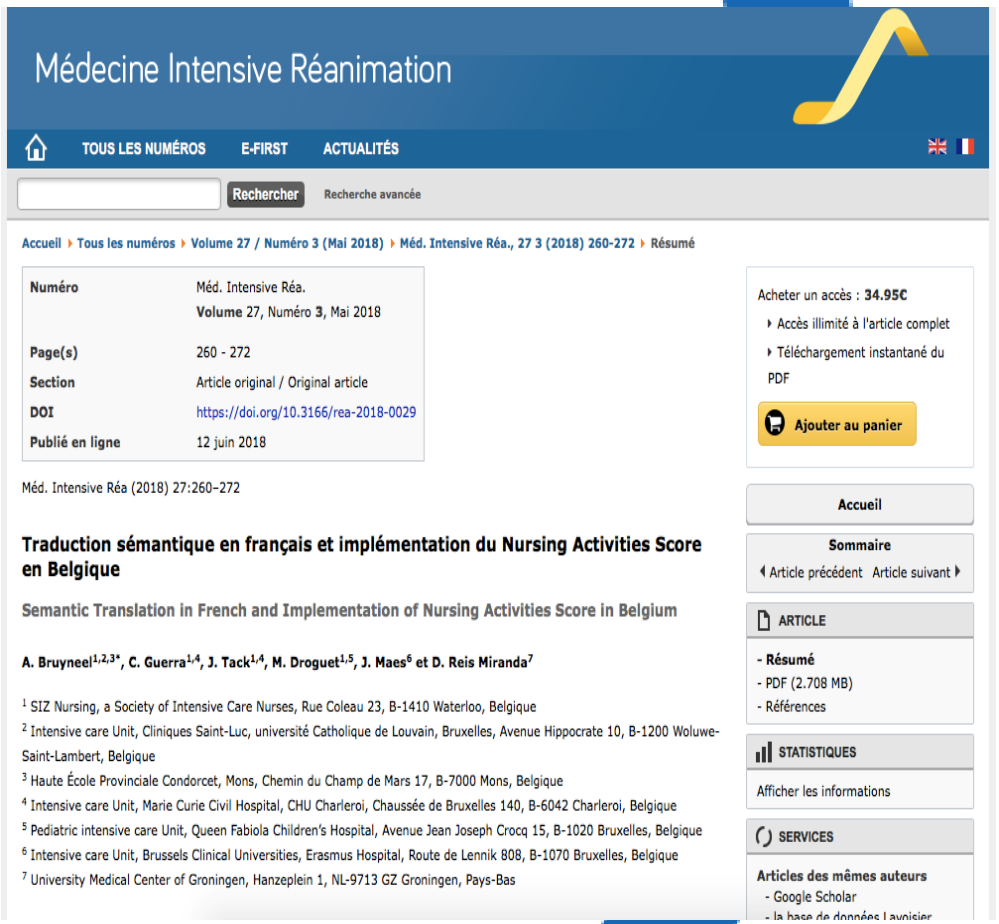
ICU	Patients n (%)	Age mean (SD)	LOS mean (SD)	SAPSII mean (SD)	NAS mean (SD)	Death n (%)
EGY	39 (5.1)	40.7 (19.1)	6.5 (1.0)	37.3 (20.8)	57.1 (10.0)	13 (33.3)
GRE	66 (8.7)	65.0 (11.6)	2.0 (0.3)	28.9 (13.9)	64.6 (4.7)	16 (24.2)
NET	109 (14.4)	65.0 (13.3)	6.7 (8.3)	32.7 (15.8)	51.0 (11.5)	9 (8.3)
POL	23 (3.0)	61.8 (13.9)	8.3 (15.9)	65.0 (12.9)	83.0 (14.7)	2 (9.5)
SPA	54 (7.1)	65.9 (13.2)	5.9 (6.1)	37.8 (15.0)	44.5 (13.0)	5 (10.2)
BRA	182 (24.0)	67.6 (17.5)	3.3 (5.8)	30.9 (21.9)	54.0 (6.1)	10 (5.5)
NOR	285 (37.6)	62.9 (16.9)	3.9 (3.9)	33.8 (11.9)	101.8 (31.3)	7 (2.5)
Total	758 (100,00)	63.5 (16.9)	4.4 (6.2)	33.94 (17.3)	72.8 (31.1)	62 (8.2)

SD=Standard Deviation.

Nursing Activities Score

- ✓Synthetic and ICU specific management tool
- ✓Posted in 2003 (Miranda) - 99 USI - 15 countries
- ✓Worksampling method
- ✓23 nursing activities
- ✓Represents 81% of nursing activities
- ✓Measures nursing time consumed to provide patient care
- ✓Weighting in% (100% = 1 nurse)
- ✓Independent of the severity of the disease
- ✓Many international publications

Training of the nursing staff



Médecine Intensive Réanimation

TOUS LES NUMÉROS E-FIRST ACTUALITÉS

Rechercher Recherche avancée

Accueil › Tous les numéros › Volume 27 / Numéro 3 (Mai 2018) › Méd. Intensive Réa., 27 3 (2018) 260-272 › Résumé

Numéro	Méd. Intensive Réa. **Volume** 27, Numéro **3**, Mai 2018
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Méd. Intensive Réa (2018) 27:260–272

Traduction sémantique en français et implémentation du Nursing Activities Score en Belgique

Semantic Translation in French and Implementation of Nursing Activities Score in Belgium

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STATISTIQUES
Afficher les informations

SERVICES
Articles des mêmes auteurs
- Google Scholar
- la base de données Lavoisier

- Computer tool (Epimed Monitor)
- Encoding each end of shift by the nurses at the bedside of the patient
- Training by the research team of approximately 1 hour between March 2017 and November 2017
- Referring nurses by hospitals and researchers available 24/7

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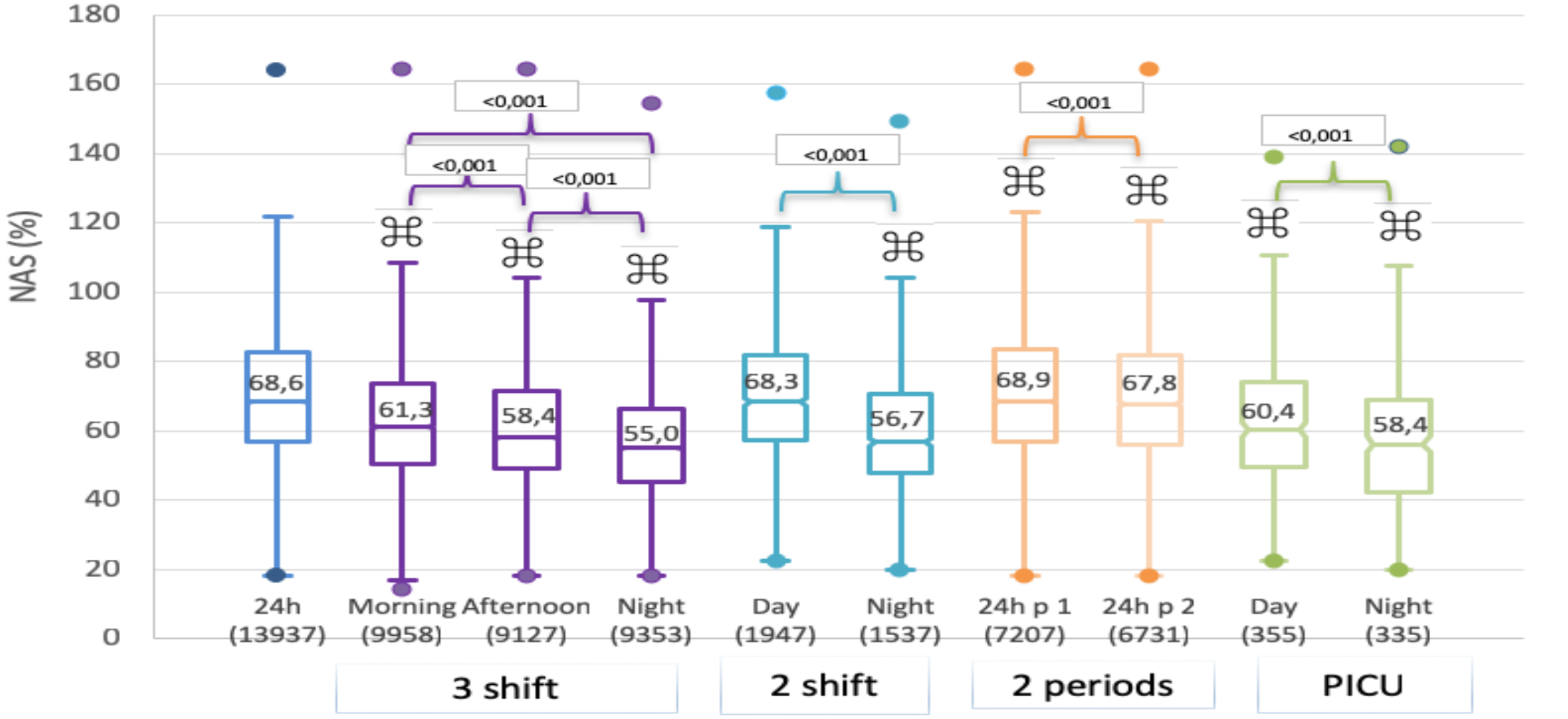
Table 1: Sociodemographic description of the sample

	Periode 1 (n = 1795)	Periode 2 (n= 1582)	All periods (n=3377)
Sex (% ♂/♀)	60/40	60/40	60/40
Age (years), mean ± SD	62,0 ± 19,6	60,4 ± 21,2	61,3 ± 20,4
Pediatric cases (>15 years), n (%)	62 (4)	84 (5)	146 (4)
Lenght of stay (days), Median (IQR) a	2 (1-6)	2 (1-5)	2 (1-5)
Occupancy rate, mean ± SD	77,8 ± 16,4	70,8 ± 19,0	73,8 ± 18,2
Orign, %			
Emergency surgery	11,1	11,3	11,2
Scheduled surgery	24,5	25,5	24,4
Medical	64,5	63,4	64,4
Destination (%)			
Deceased	9,1	8,2	8,6
Ward	82,7	83,4	83,1
Other hospital	4,1	2,7	3,6
Home	3,5	3,2	3,3
Other	0,6	2,5	1,4
Description of hospitals			
Number of hospitals, n	15	15	15
Number of ICU, n	24	24	24
Number of bed, n	306	306	306
Number of bed medical and surgical, n (%)	306 (100)	306 (100)	306 (100)
Number of bed PICU, n (%)	24 (7,8)	24 (7,8)	24 (7,8)
Number of bed with neuro surgery, n (%)	126 (42,2)	126 (42,2)	126 (42,2)
Number of bed with cardiac surgery, n (%)	152 (49,7)	152 (49,7)	152 (49,7)
Ratio bed ICU/nurse, mean ± SD			
Morning	2,50 ± 0,8	2,70 ± 0,6	2,55 ± 0,68
Afternoon	2,70 ± 0,9	2,98 ± 0,8	2,87 ± 0,9
Night	3,10 ± 1,0	2,94 ± 0,8	3,02 ± 0,9

Results

Figure 1: Box plots representing the mean NAS divided by shift



Legend: P1 = periode 1, P2 = periode 2 ; PICU = NAS afternoon and morning are gathered in day ; ⌘: comparison NAS 24h with pvalue < 0,001

Simulation effectif USI

USI	Matin		Après-midi		Nuit	
	100%	80%	100%	80%	100%	80%
6 lits	3,9	3,1	3,7	3	3,4	2,8
8 lits	5,2	4,2	4,9	3,9	4,6	3,7
10 lits	6,5	5,2	6,2	4,9	5,7	4,6
12 lits	7,8	6,2	7,4	5,9	6,9	5,5
14 lits	9,1	7,3	8,6	6,9	8	6,4

Table 2: Description items of NAS by shift

Items	3 shift, frequency (%)			pvalue	2 shift, frequency (%)		pvalue
	Morning (n=9856)	Afternoon (n=9126)	Night (n=9352)		Day (n=1945)	Night, (n=1536)	
1. Monitoring and titration	**9805 (99)**	**9070 (98)**	**8426 (90)**		**1935 (99)**	**1520 (99)**	
1a. Hourly vital signs, regular registration and calculation of fluid balance	6689 (68)	6125 (67)	5884 (63)	0,001	1268 (65)	1087 (71)	0,001
1b. Present at bedside and continuous observation or active for 2 hrs or more in any shift	2911 (30)	2757 (30)	2375 (25)		575 (30)	374 (24)	
1c. Present at bedside and active for 4 hrs or more in any shift for reasons of safety	205 (2)	188 (2)	167 (2)		92 (5)	59 (4)	
2. Laboratory, biochemical and microbiological investigations	7706 (78)	7166 (78)	7818 (84)	<0,001	1631 (85)	1526 (86)	0,229
3. Medication, vasoactive drugs excluded	9267 (94)	8474 (93)	7873 (84)	<0,001	1875 (96)	1454 (95)	0,013
4. Hygiene procedures	**9727 (99)**	**8748 (96)**	**7634 (81)**		**1885 (97)**	**1455 (95)**	
4a. Performing hygiene procedures such as dressing of	7108 (72)	6734 (74)	5804 (62)	<0,001	1174 (60)	1038 (68)	<0,001
4b. The performance of hygiene procedures took ≥2 hrs in any shift	2347 (24)	1842 (20)	1701 (28)		670 (34)	401 (26)	
4c. The performance of hygiene procedures took ≥4 hrs in any shift	272 (3)	172 (2)	129 (1)		41 (2)	16 (1)	
5. Care of drains, all (except gastric tube) 1.8	7399 (75)	6785 (74)	6333 (68)	<0,001	1181 (61)	949 (62)	0,533
6. Mobilization and positioning, including procedures	**9725 (99)**	**8971 (98)**	**8008 (86)**		**1908 (98)**	**1502 (98)**	
6a. Performing procedure(s) up to three times per 24 hrs	2695 (27)	2506 (27)	2541 (27)		398 (20)	343 (22)	
6b. Performing procedure(s) more frequently than 3 times per 24 hrs, or with two nurses, any frequency	6679 (68)	6208 (68)	5312 (57)	<0,001	1391 (72)	1122 (73)	<0,001
6c. Performing procedure with three or more nurses, any frequency	351 (4)	257 (3)	155 (2)		119 (6)	37 (2)	
7. Support and care of relatives and patient	**9103 (92)**	**8563 (94)**	**6560 (70)**		**1879 (97)**	**1370 (89)**	
7a. Support and care of either relatives or patient requiring full dedication for about 1 hr in any shift	8523 (86)	7853 (86)	6258 (67)	<0,001	1711 (88)	1284 (84)	<0,001
7b. Support and care of either relatives or patient requiring full dedication for 3 hrs or more in any shift	580 (6)	710 (8)	302 (3		168 (9)	86 (6)	
8. Administrative and managerial tasks	**9743 (99)**	**9011 (99)**	**8311 (89)**		**1919 (99)**	**1492 (97)**	
8a. Performing in routine	6733 (68)	6821 (75)	7063 (76)		811 (42)	1149 (75)	
8b. Performing administrative and managerial tasks requiring full dedication for about 2 hrs in any shift	2916 (30)	2113 (23)	1209 (13)	<0,001	1081 (56)	337 (22)	<0,001
8c. Performing administrative and managerial tasks requiring full dedication for about 4 hrs or more of the time in any shift	94 (2)	67 (1)	39 (0)		27 (1)	6 (0)	

Results

Ventilatory support							
9. Respiratory support	7476 (76)	7011 (77)	6566 (70)	<0,001	1465 (75)	1219 (79)	0,005
10. Care of artificial airways: endotracheal tube or tracheostomy cannula	3733 (38)	3483 (38)	3189 (34)	<0,001	602 (31)	536 (35)	0,014
11. Treatment for improving lung function	6160 (63)	5605 (61)	4999 (53)	<0,001	867 (45)	715 (47)	0,246
Cardiovascular support							
12. Vasoactive medication, disregard type and dose	2442 (25)	2281 (25)	2138 (23)	0,001	356 (18)	306 (20)	0,277
13. Intravenous replacement of large fluid losses.	470 (5)	532 (6)	442 (5)	0,001	122 (6)	102 (7)	0,66
14. Left atrium monitoring: pulmonary artery catheter with or without cardiac output measurement	902 (9)	839 (9)	740 (8)	0,002	68 (3)	56 (4)	0,813
15. Cardiopulmonary resuscitation after arrest, in the past period of 24 hrs	0	0	0	-	0	0	-
Renal support							
16. Hemofiltration techniques, dialysis techniques	745 (8)	664 (7)	523 (6)	0,001	86 (4)	73 (5)	0,642
17. Quantitative urine output measurement (e.g., by indwelling urinary catheter)	8577 (87)	7843 (86)	7200 (77)	<0,001	1796 (92)	1454 (98)	0,006
Neurologic support							
18. Measurement of intracranial pressure	189 (2)	190 (2)	174 (2)	0,529	38 (2)	32 (2)	0,787
Metabolic support							
19. Treatment of complicated metabolic acidosis/alkalosis	851 (9)	879 (10)	659 (7)	<0,001	87 (4)	67 (4)	0,874
20. Intravenous hyperalimentation	545 (6)	517 (6)	439 (5)	0,006	83 (4)	62 (4)	0,735
21. Enteral feeding through gastric tube or other gastrointestinal route (e.g., jejunostomy)	3348 (34)	2975 (33)	2678 (29)	<0,001	586 (30)	530 (35)	0,006
Specific interventions							
22. Specific intervention(s) in the intensive care unit	1576 (16)	1127 (12)	504 (5)	<0,001	432 (22)	114 (7)	<0,001
23. Specific interventions outside the intensive care unit: surgery or diagnostic procedures	1037 (11)	691 (8)	112 (1)	<0,001	198 (10)	25 (2)	<0,001

Table 3: Mean NAS by activity adapted to weighting and by shift (expressed as a percentage)

Activity	3 Shift				2 shift		
	Morning (n = 9856)	Afternoon (n=9126)	Night (n=9352)	*pvalue*	Day (n=1945)	Night (n=1536)	pvalue
1. Monitoring and titration	7,0 ± 3,9	7,1 ± 4,0	6,3 ± 4,2	*0,026*	7,4 ± 4,4	6,9 ± 4,2	*<0,001*
2. Laboratory, biochemical investigations	3,4 ± 1,8	3,3 ± 1,8	3,6 ± 1,6	*0,085*	3,7 ± 1,5	3,7 ± 1,5	*<0,001*
3. Medication, vasoactive drugs excluded	5,3 ± 1,3	5,2 ± 1,4	4,7 ± 2,0	*<0,001*	5,4 ± 1,0	5,3 ± 1,3	*<0,001*
4. Hygiene procedures	7,4 ± 5,7	6,7 ± 5,4	5,8 ± 5,6	*0,003*	8,6 ± 6,2	7,3 ± 5,8	*<0,001*
5. Care of drains, all (except gastric tube)	1,4 ± 0,8	1,3 ± 0,8	1,2 ± 0,8	*0,837*	1,1 ± 0,9	1,1 ± 0,9	*<0,001*
6. Mobilization and positioning, including procedures	10,5 ± 3,5	10,4 ± 3,5	8,8 ± 4,8	*0,429*	11,0 ± 3,5	10,7 ± 3,4	*<0,001*
7. Support and care of relatives and patient	5,3 ± 6,7	5,9 ± 7,6	3,7 ± 5,5	*<0,001*	6,3 ± 7,9	5,1 ± 6,7	*<0,001*
8. Administrative and managerial tasks	10,0 ± 8,9	8,7 ± 8,3	6,3 ± 6,9	*<0,001*	15,1 ± 9,6	8,3 ± 8,1	*<0,001*
9. Respiratory support	1,1 ± 0,6	1,1 ± 0,6	1,0 ± 0,6	*0,009*	1,1 ± 0,6	1,1 ± 0,6	*<0,001*
10. Care of artificial airways	0,7 ± 0,9	0,7 ± 0,9	0,6 ± 0,9	*0,204*	0,6 ± 0,8	0,6 ± 0,9	0,03
11. Treatment for improving lung function	2,8 ± 2,1	2,7 ± 2,1	2,4 ± 2,2	*0,881*	2,0 ± 2,2	2,0 ± 2,2	0,008
12. Vasoactive medication	0,3 ± 0,5	0,3 ± 0,5	0,3 ± 0,5	*0,179*	0,2 ± 0,5	0,2 ± 0,5	0,001
13. Intravenous replacement of large fluid losses	0,1 ± 0,5	0,1 ± 0,6	0,1 ± 0,5	*0,27*	0,2 ± 0,6	0,2 ± 0,6	*<0,001*
14. Left atrium monitoring: pulmonary artery catheter	0,2 ± 0,5	0,2 ± 0,5	0,1 ± 0,5	*0,401*	0,1 ± 0,3	0,1 ± 0,3	*<0,001*
15. Cardiopulmonary resuscitation after arrest	-	-	-	-	-	-	-
16. Hemofiltration techniques, dialysis techniques	0,6 ± 2,0	0,6 ± 2,0	0,4 ± 1,8	*0,153*	0,3 ± 1,6	0,4 ± 1,6	*<0,001*
17. Quantitative urine output measurement	6,1 ± 2,4	6,0 ± 2,4	5,4 ± 2,9	*<0,001*	6,5 ± 1,9	6,6 ± 1,6	*<0,001*
18. Measurement of intracranial pressure	0,0 ± 0,2	0,0 ± 0,2	0,0 ± 0,2	*0,191*	0,0 ± 0,2	0,0 ± 0,2	*<0,001*
19. Treatment of complicated metabolic acidosis/alkalosis	0,1 ± 0,4	0,1 ± 0,4	0,1 ± 0,3	*0,622*	0,1 ± 0,3	0,1 ± 0,3	*<0,001*
20. Intravenous hyperalimentation	0,2 ± 0,6	0,2 ± 0,6	0,1 ± 0,6	*0,272*	0,1 ± 0,6	0,1 ± 0,6	*<0,001*
21. Enteral feeding through gastric tube	0,4 ± 0,6	0,4 ± 0,6	0,4 ± 0,6	*0,141*	0,4 ± 0,6	0,4 ± 0,6	*<0,001*
22. Specific intervention(s) in the intensive care unit	0,4 ± 1,0	0,3 ± 0,9	0,2 ± 0,6	*<0,001*	0,6 ± 1,2	0,2 ± 0,7	*<0,001*
23. Specific interventions outside the intensive care unit	0,2 ± 0,6	0,1 ± 0,5	0,0 ± 0,2	*<0,001*	0,2 ± 0,6	0,0 ± 0,2	*<0,001*

Table 4: Univariate analysis, according to the nursing workload

		Outliers Mediane	*p value*	*Outliers P75+1,5EIQ*	*p value*
Outliers by Hopital, %	Med [P25-P75]	44,0 [35,4-55,0]	<0,001 a	2,1 [1,1-2,6]	<0,001 a
Sexe outliers, %	F	47,8	0,005 a	2,0	0,027 a
	M	50,2		2,6	
Période outliers, %	1	50,4	0,007 a	2,3	0,733 a
	2	48,1		2,4	
Shift outliers, %	2	54,0	<0,001 a	2,4	0,876 a
	3	48,5		2,3	
ICU discharge outliers, %	Alive	46,2	<0,001 a	1,5	<0,001 a
	Dead	72,7		9,4	
Lenght of stay outliers and inliers	Outliers, %	42,3	<0,001 b	2,1	0,005 b
	Outliers Med [P25-P75], Day	7 [3-17]		8 [3-15]	
	Intliers Med [P25-P75], Day	5 [2-11]		6 [2-14]	
Age	Outliers, %	49,3	0,389 b	2,4	<0,001 b
	Med outliers [P25-P75], Years	65 [55-75]		62 [52-72]	
	Med intliers [P25-P75], Yeras	66 [54-75]		66 [54-75]	

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Discussion

Table 1 - Number of patients, age, LOS, SAPSII, NAS score and death in the different countries.

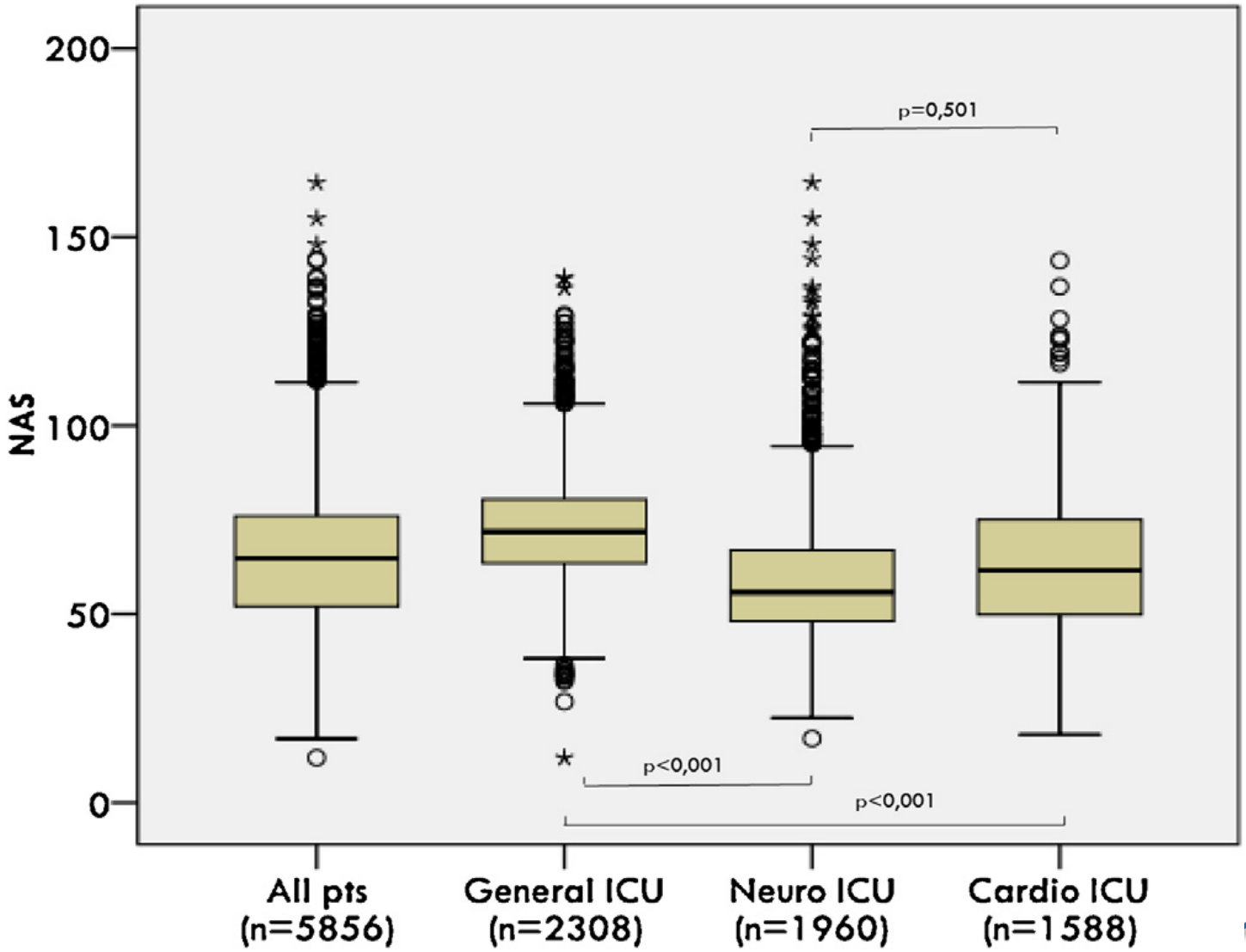
ICU	Patients n (%)	Age mean (SD)	LOS mean (SD)	SAPSII mean (SD)	NAS mean (SD)	Death n (%)
EGY	39 (5.1)	40.7 (19.1)	6.5 (1.0)	37.3 (20.8)	57.1 (10.0)	13 (33.3)
GRE	66 (8.7)	65.0 (11.6)	2.0 (0.3)	[illegible]	64.6 (4.7)	16 (24.2)
NET	109 (14.4)	65.0 (13.3)	6.7 (8.3)	32.7 (15.8)	51.0 (11.5)	9 (8.3)
POL	23 (3.0)	61.8 (13.9)	8.3 (15.9)	65.0 (12.9)	83.0 (14.7)	2 (9.5)
SPA	54 (7.1)	65.9 (13.2)	5.9 (6.1)	37.8 (15.0)	44.5 (13.0)	5 (10.2)
BRA	182 (24.0)	67.6 (17.5)	3.3 (5.8)	30.9 (21.9)	54.0 (6.1)	10 (5.5)
NOR	285 (37.6)	62.9 (16.9)	3.9 (3.9)	33.8 (11.9)	101.8 (31.3)	7 (2.5)
Total	758 (100,00)	63.5 (16.9)	4.4 (6.2)	33.94 (17.3)	72.8 (31.1)	62 (8.2)

SD=Standard Deviation.

Discussion

The mean NAS for patients admitted to the GICU was72.55 (SD ± 16:28), in the NeuroICU 59.33 (SD ± 16:54) in theCICU 63.51 (SD ± 14.69)

Nursing Activities Score (NAS): 5 Years of experience in the intensive care units of an Italian University hospital☆,☆☆



Discussion

Intensive Care Med (2012) 38:1438–1444
DOI 10.1007/s00134-012-2648-3

ORIGINAL

Dieter P. Debergh
Dries Myny
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Measuring the nursing workload per shift in the ICU

SICU-PICU- MICU
at Ghent University Hospital
4 week period in 2004

The mean NAS/shift was 47.0, 46.3 and 41.6 %, respectively, for the morning, evening and night shift

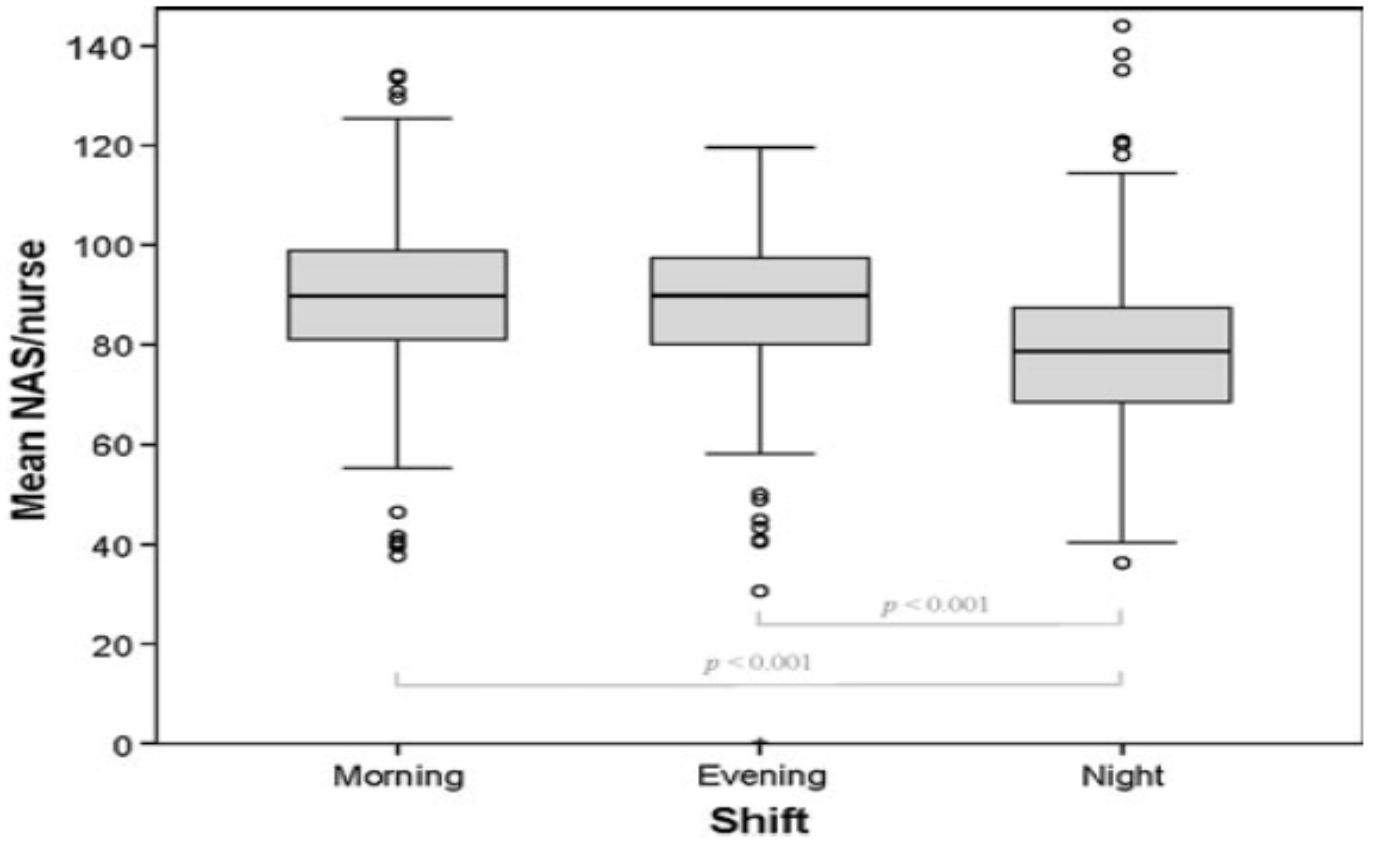

Fig. 1 Box plots representing the mean NAS per nurse per shift. *NAS* Nursing activities score

Limits

- No University Hospital
- Only French people in Belgium
- Only twice a month
- Encoding in bedside
- No the severity of illness score

BUT

- 15 hospitals and almost 30.000 NAS encodes

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Conclusion

- This study described the daily use of the NAS for the determination of nursing workload and defines the staff required
- The NAS could therefore be a guide for harmonizing nursing resources with workload on a shift by shift basis
- Outdated legal standards !

MERCI DE VOTRE ATTENTION