

**SIEPC 2013**

المؤتمر السعودي الدولي للتميز في رعاية المرضى 2013  
SAUDI INTERNATIONAL CONFERENCE FOR EXCELLENCE IN PATIENT CARE 2013



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**Dr. Abdullah Bin Abdul Aziz Al Rabeeah**

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# Development and validation of nursing resource weights from the Belgian Nursing Minimum Data Set in general hospitals

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# Team & acknowledgements

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- The study was supported and funded by the Belgian Ministry of Public Health, 2009-2012
  - [www.health.fgov.be](http://www.health.fgov.be)  
(keyword: Profi(e)l DI-VG)



# Outlines

- Belgian Nursing Minimum Data Set (Be-NMDS)?
- What are Nursing Related Groups (NRG)?
- Development of NRG
- Validation of NRG
- NRG resources weighting
- And now ... what's next?

# A Nursing Minimum Data Set ...

- “A *minimum* set of items of information with *uniform definitions and categories*, concerning the specific dimension of professional nursing, which meets the essential needs of *multiple data users* in the health care system (Werley et al., 1986)”
- Data Sets in the world : Australia, Belgium, Finland, Ireland, Portugal, Switzerland, USA, ...

# Belgian Nursing Minimum Data Set (Be-NMDS)

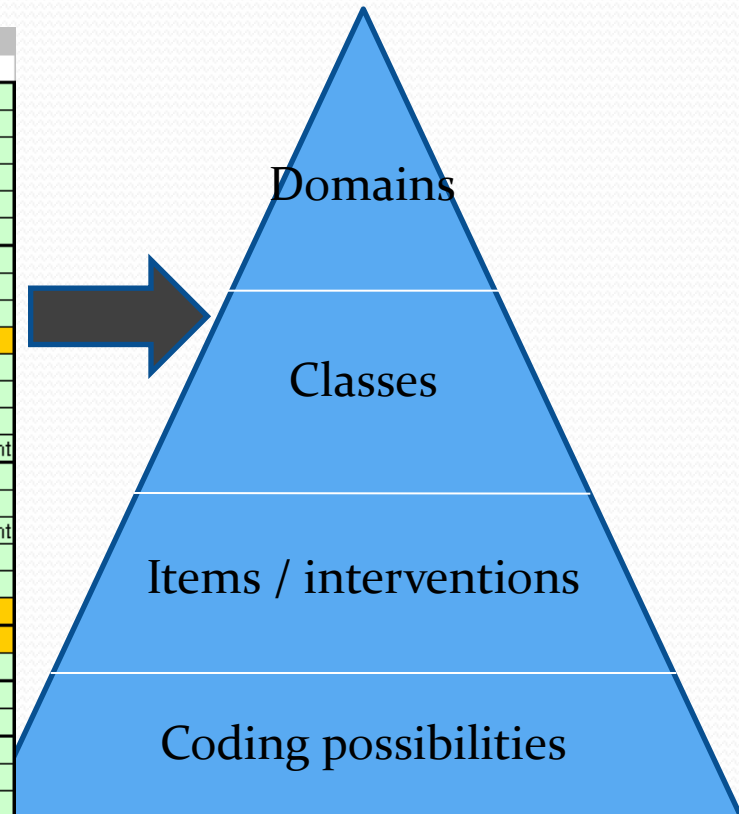
- Be-NMDS I (1988 - 2006)
  - Compulsory registration in all Belgian acute hospitals, based on 4 data samples (15d) / year
  - 19 million nursing records since 1988, one of the largest nursing database in the world, used at national level (MacNeela et al., 2006)
  - Content : 23 nursing interventions, patient demographics, nurse staffing data (FTE nurses / qualification level)
  - Integrated in hospital reimbursement system for medical / surgical units, paediatrics, ICU (6,5% of budget)

# Belgian Nursing Minimum Data Set (Be-NMDS)

- Be-NMDS II (2008 - now)
  - 78 nursing interventions, based on Nursing Interventions Classification (NIC)
  - Same registration design as Be-NMDS I
  - Fully integrated and linked with the Hospital Discharge Data Set (HDDS) since 2008
  - Reimbursement scheme: under review

# From NIC to Be-NMDS II

Domaine	Classe
1. Physiological: basic, Care that supports physical functioning	A. Activity and exercise
	B. Elimination management
	C. Immobility management
	D. Nutrition support
	E. Physical comfort promotion
	F. Self-care facilitation
2. Physiological: Complex, Care that supports homeostatic regulation	G. Electrolyte and acid-base
	H. Drug management
	I. Neurologic management
	J. Perioperative care
	K. Respiratory management
	L. Skin/wound management
	M. Thermoregulation
	N. Tissue perfusion management
3. Behavior: Care that supports psychosocial functioning and facilitates lifestyle changes	O. Behavior therapy
	P. Cognitive therapy
	Q. Communication enhancement
	R. Coping assistance
	S. Patient education
	T. Psychological
4. Safety: Care that supports protection against harm	U. Crisis management
	V. Risk management
5. Family: Care that supports the family	W. Childbearing care
	X. Family
6. Health system: Care that supports effective use of the health care delivery system	Y. Health system mediation
	Z. Health system management
	Z. Information Management



Based on : Nursing Interventions Classification (NIC), 2<sup>nd</sup> Ed., classes J, T, U not considered for B-NMDS taxonomy :  
 Four main levels : 6 domains, 23 classes, 78 interventions, 91 coding possibilities, (131 scoring possibilities).

# Clinical validation of Be-NMDS II

- International Nursing Language
  - Based on NIC framework
  - Expert Panels (N=89)
    - Selection of relevant classes (23)
    - Selection of relevant interventions for Belgium (286)
    - Translation into Be-NMDS (v 1.6 – January 2011):
      - 78 items
      - classified in 6 domains and 23 classes

Source : Sermeus et al., International Journal of Medical Informatics (2005) 74, 946—951



## Selection of Be-NMDS II interventions

**Table 2. Selection of Relevant NIC Interventions for the Revised B-NMDS per Expert Panel**

NIC domain	MAX	CAR <sup>a</sup>	ICU <sup>a</sup>	PED <sup>a</sup>	GER <sup>a</sup>	CHR <sup>a</sup>	ONC <sup>a</sup>
Physiological, basic (1)							
Classes <sup>b</sup>	6 (A-F)	6	5 (A)				
Interventions	89	21	24				
Physiological, complex (2)							
Classes	8 (G-N)	6 (I, M)	8				
Interventions	143	73	61				
Behavioral (3)							
Classes	6 (O-T)	3 (O, P, Q)	2 (O, P, Q)				
Interventions	103	8	4				
Safety (4)							
Classes	2 (U, V)	2	2				
Interventions	46	10	7				
Family (5)							
Classes	2 (W, X)	0 (W, X)	0 (W, X)				
Interventions	63	0	0				
Health system (6)							
Classes	3 (Y-b)	1 (a, b)	1 (b)				
Interventions	38	1	3				
Overall							
Classes	27	18	18				
Interventions	433	113	99				

### Box 1. Questions Posed to Guide the Expert Panel Meetings

#### Definitions

What are the minimal requirements for this intervention?

Is this intervention evidence based?

#### Response categories

Does a score of 2 for a particular item imply more intensive care than a score of 1?

Is it necessary to measure this kind of detail?

#### Controls

What clinically relevant information should be documented in patient records for this intervention?

Is it appropriate to ask nurses to document this kind of information in patient records?

<sup>a</sup>Dropped classes between brackets.

<sup>b</sup>NIC classes: A, activity and exercise management; B, elimination management; C, immobility management; D, nutrition support; E, physical comfort promotion; F, self-care facilitation; G, electrolyte and acid base management; H, drug management; I, neurologic management; J, perioperative care; K, respiratory management; L, skin/wound management; M, thermoregulation; N, tissue perfusion management; O, behavior therapy; P, cognitive therapy; Q, communication enhancement; R, coping assistance; S, patient education; T, psychological comfort promotion; U, crisis management; V, risk management; W, childbearing care; X, life span care; Y, health system mediation; a, health system management; b, information management.

B-NMDS, Belgian nursing minimum data set; CAR, cardiology expert panel; CHR, chronic care expert panel; GER, geriatric expert panel; ICU, intensive care expert panel; MAX, maximum number of interventions or classes; NIC, Nursing Interventions Classification; ONC, oncology expert panel; PED, pediatric expert panel.

## Example of Be-NMDS II items (class B: elimination management)

**Table 4. Items of the Revised B-NMDS (Alpha Version) for “Elimination Management” (Based on NIC Class B)**

NMDS item (and sub-items)	Response categories
B100: care linked to elimination in children (under 5)	(a) Day AND night supervision of elimination in potty-trained children by a care provider (b) Nighttime supervision of elimination in children who are potty-trained during the day by a care provider outside the context of specific enuresis programs (c) Care for children who are not potty trained during the day or night, e.g., supervision and regular changing
B200: urinary and/or fecal elimination education	(a) Presence of urinary education/training (b) Presence of fecal education/training (c) Presence of urinary and fecal education/training Only one of sub-items B310–B350 can be scored
B3**: care associated with urinary elimination	
B310: normal urinary elimination	(a) Presence of normal urinary elimination
B320: urinary elimination support for continent patients	(a) Supporting assistance
B330: care associated with urinary incontinence	(a) Presence of care associated with urinary incontinence
B340: care associated with the presence of a urinary ostomy	(a) Care associated with the presence of a urinary ostomy
B350: care associated with the presence of a permanent vesical catheter	(a) Care associated with the presence of a permanent catheter
B400: inserting a vesical catheter	Frequency of insertion
Item B5 **: fecal elimination	Only one of sub-items B510–B540 can be scored
B510: normal fecal elimination	(a) Presence of normal fecal elimination management
B520: fecal elimination support for continent patients	(a) Fecal elimination support for continent patients
B530: care associated with fecal incontinence	(a) Presence of care
B540: care associated with the presence of a fecal ostomy	(a) Care associated with the presence of a fecal ostomy
B600: administration of an enema or manual removal of fecaliths in order to treat or prevent constipation	(a) Insertion of a rectal cannula and/or administration and an enema and/or removal of fecaliths

B-NMDS, Belgian nursing minimum data set; NIC, Nursing Interventions Classification.

Van de Heede et.al., International Journal of Nursing Terminologies and Classification, 20, 2009, 122-131

# Nursing care time-weights of Be-NMDS

- Delphi study, 895 candidates
- 678 participants (response rate = 76%), 2 rounds
- 3 systematic questions per nursing activity (N=154)
  - What is modal time (most frequent in daily practice) necessary to carry out the considered nurse activity?
  - What is minimal or maximum time necessary to carry out the considered nurse activity?
  - What are the possible elements to justify this temporal variation in the carrying of the considered nurse activity?
- Collecting an average of 247 “time responses” per nursing activity

## Appendix A

### Relative nursing resource weights per NMDSII item

Domain I: Care for elementary physiological functions

Class A Support of activities and physical movement

item	Care description	Specific care modality	Nursing care weight
A100	Structured physical exercises		12
Class B Care for elimination			
B100_1	Elimination child care	Toilet trained child day and night time	10
B100_2		Toilet trained child night time	8
B100_3		Non-toilet trained child day and night time	6
B210	Urinary elimination follow-up		2
B220	Support of urinary continent patient		6
B230	Care for the urinary incontinent patient		10
B240	Care for urinary stoma		7
B250	Care for urinary catheter		5
B300	Bladder catheterization	× frequency	4
B410	Fecal elimination follow-up		2
B420	Support of fecal continent patient	Validated by Delphi panel:	5
B430	Care for the fecal incontinent patient	- 678 participants	7
B440	Care for fecal stoma or pouch	- by e-mail	5
B500	Constipation prevention or treatment	- 2 rounds	4
B600	Elimination care education		6

Please cite this article in press as: Sermeus, W., et al., Development and validation of nursing resource weights for the Belgian Nursing Minimum Dataset in general hospitals: A Delphi questionnaire survey approach. Int J Nurs Stud (2008), doi:10.1016/j.ijnurstu.2008.09.007

# Nursing Related Groups (NRG)

- Initiated at 3rd Nursing & Computers, June 1988, Dublin (Sermeus et al., 1988)
- Used in tasks of W. Fisher (Switzerland, 2002) & D. Hunstein (Germany, 2007)
- Patient classification system based on the grouping of the patient's nursing profile per episode of care according to its clinical and nurse resources homogeneity

Note: an episode of care (EC) is the length of patient's stay within one ward and lasts 24h or less. A patient can have one or more ECs during one patient day

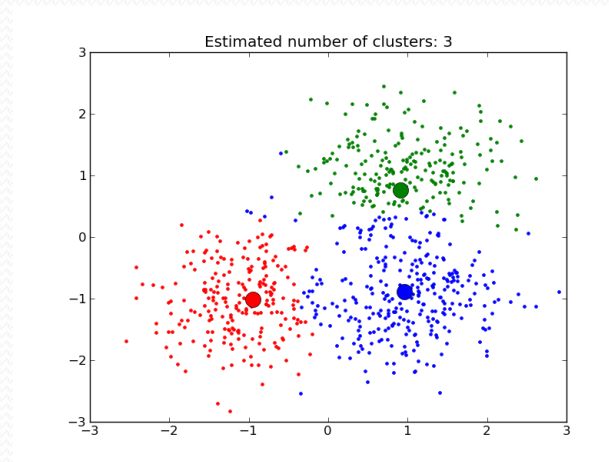
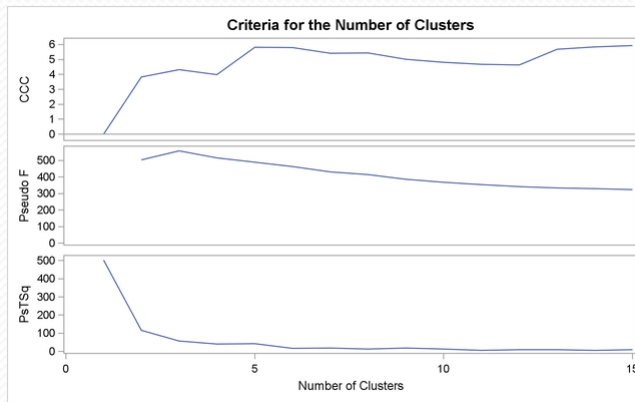
# Available data for NRGs construction

- Be-NMDS II:
  - Year 2009
  - 133 hospitals, 231 campus, > 2.600 care units
  - > 1.375.000 Episodes of Care (EC)

N Episodes of Care	1.378.326
N Hospitals	133
Avg EC / hospital	10.363
Median EC / hospital	8.481
25th centile EC / hospital	5.146
75th centile EC / hospital	13.524
Minimum EC / hospital	139
Maximum EC / hospital	50.236

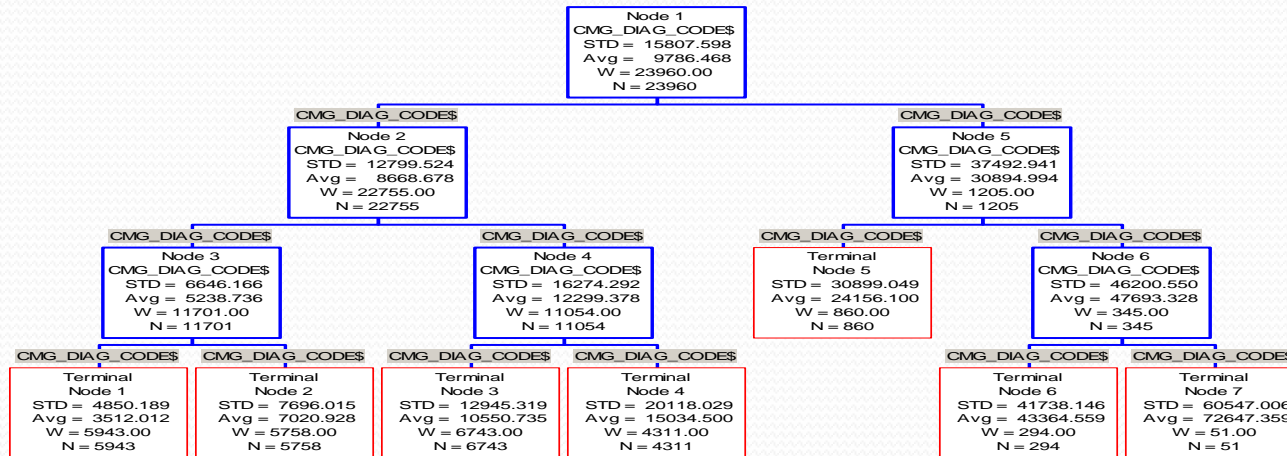
# Methods

- Step 1/2:
  - Development of **Major Nursing Categories (MNCs)**
    - Based on clustering technique – FASTCLUS (Andenberg, 1973 ; Hartigan, 1975)
    - Focused on clinical homogeneity of the nursing profile (91) + length of the episode of care (1): 92 variables in total
  - 8 MNCs built



# Methods

- Step 2/2:
  - Development of **Nursing Related Groups (NRGs)**
    - Based on Decision Tree methodology - CART, Classification And Regression Tree (Hastie et al., 2011)
    - Target-variable: time per intervention
  - 92 NRGs built





# Development of MNCs en NRGs

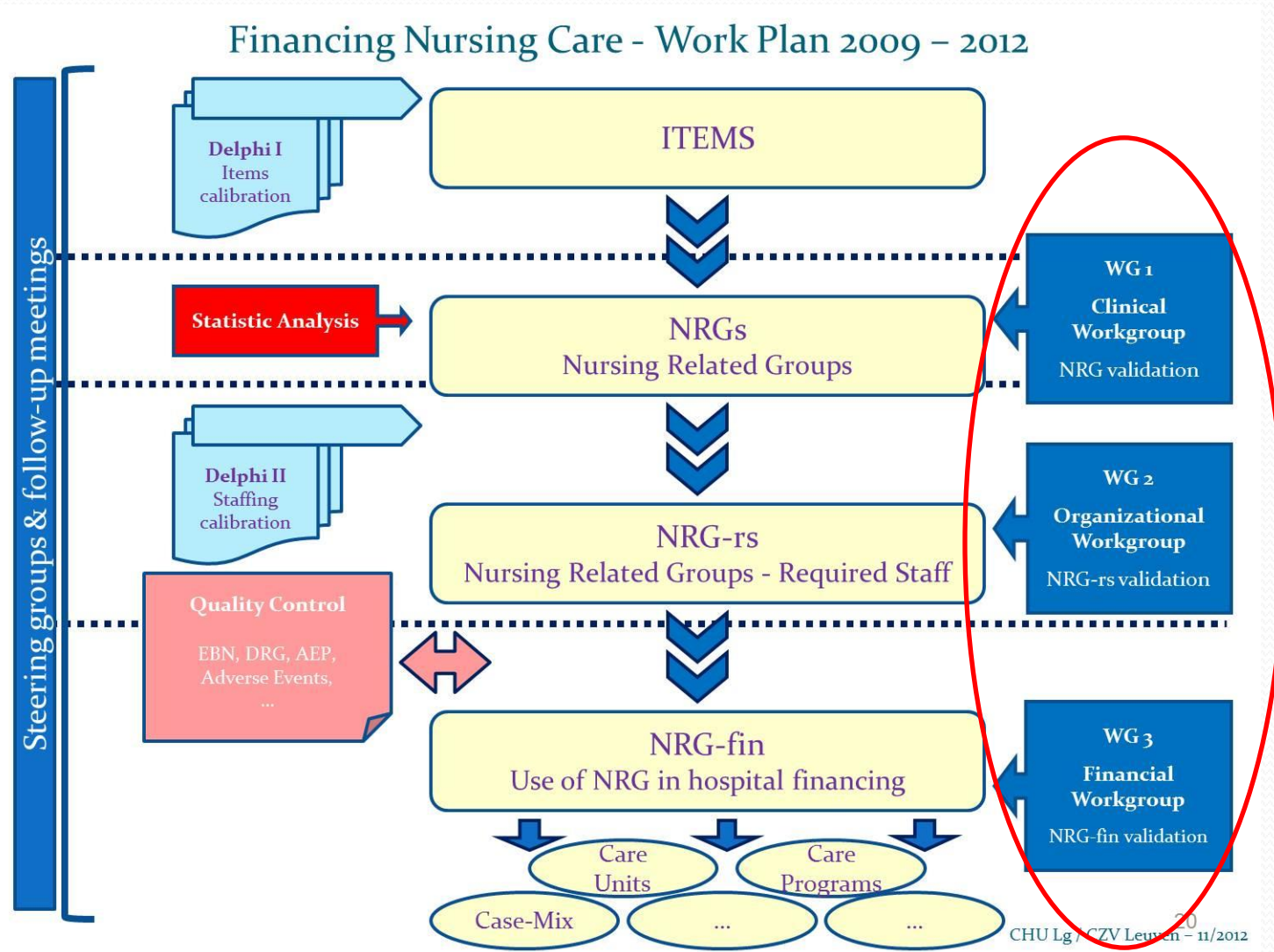
MNC	NRGs	N ECs classified
01.0	01.1, 01.2, 01.3, 01.4, 01.5, 01.6, 01.7, 01.8, 01.9, 01.10, 01.11, 01.12	179 290
02.0	02.1, 02.2, 02.3, 02.4, 02.5, 02.6, 02.7, 02.8, 02.9, 02.10	54 033
03.0	03.1, 03.2, 03.3, 03.4, 03.5, 03.6, 03.7, 03.8, 03.9, 03.10, 03.11, 03.12, 03.13	303 375
04.0	04.1, 04.2, 04.3, 04.4, 04.5, 04.6, 04.7, 04.8, 04.9, 04.10, 04.11, 04.12, 04.13	69 151
05.0	05.1, 05.2, 05.3, 05.4, 05.5, 05.6, 05.7, 05.8, 05.9, 05.10, 05.11, 05.12	156 749
06.0	06.1, 06.2, 06.3, 06.4, 06.5, 06.6, 06.7, 06.8, 06.9, 06.10, 06.11	585 298
07.0	07.1, 07.2, 07.3, 07.4, 07.5, 07.6, 07.7, 07.8, 07.9, 07.10, 07.11, 07.12	28 040
08.0	08.1, 08.2, 08.3, 08.4, 08.5, 08.6, 08.7, 08.8, 08.9	2 390

# Description of MNCs

MNC	Description
01	Pre / post operative care, post-delivery (12 NRGs)
02	Observation, follow-up and education, especillay at end of stay (10 NRGs)
03	Chronic care with high levels of dependency (13 NRGs)
04	Acute care and monitoring – highly technical (13 NRGs)
05	Independent care, transfers (12 NRGs)
06	Rehab nursing care (11 NRGs)
07	Intensive care (12 NRGs)
08	Rest group (9 NRGs)



# NRGs validation



# NRGs weighting based on nursing staff allocation and qualification mix

- Focus on resource weight by patient groups using a Delphi study:
  - 92 NRGs, 17 questions (Q & q) per NRG
  - 205 participants, 2 rounds
  - each NRG was analyzed on average 50 times
- Collected variables per NRG: required staffing (NPPD), competencies (10) and skill-levels (5)
  - quantitative results on two levels (opt/max): number of patients per day for each NRG
  - qualitative results: median level for each 10 competencies

## Allocation of 10 competencies per nursing intervention / per NRG

PROFESSIONAL, ETHICAL, LEGAL PRACTICE	
Accountability	5
Ethical Practice	8
Legal Practice	3
CARE PROVISION AND MANAGEMENT	
Principles of Care Provision	13
a. Promotion of Health	3
b. Assessment	3
c. Planning	7
d. Implementation	4
e. Evaluation	3
f. Therapeutic Communication and Interpersonal Relationships	7
Leadership and Management	9
g. Safe Environment	6
h. Delegation and Supervision	4
i. Inter-Professional Health Care	6
PROFESSIONAL, PERSONAL & QUALITY DEVELOPMENT	
Enhancement of the Profession	8
Quality Improvement	2
Continuing Education	3

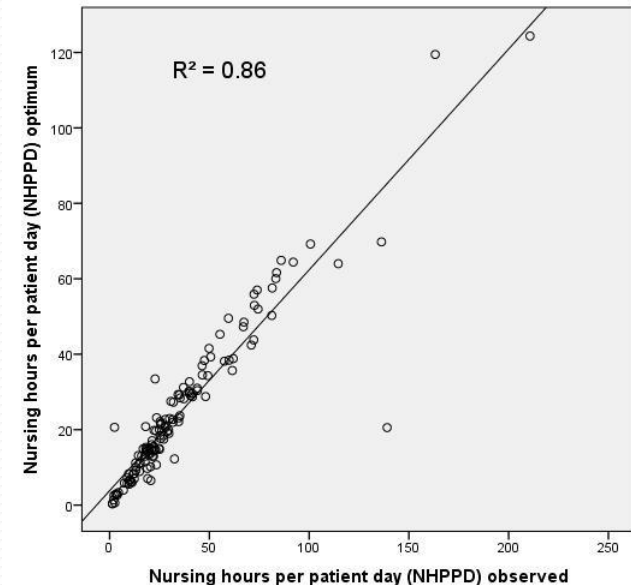
Delphi study competencies by item: 113 participants

ID	Comptencies
I	Information and Education
II	Knowledge and Best Practice (EBN)
III	Clinical reasoning and problem solving
IV	Selfcare support
V	Assessment
VI	Care Planning
VII	Implementation
VIII	Follow up
IX	Communication en relationships
X	Technical skills

# Validation of NRG resources weights

- Criterion validity
  - Differences between NRGs
  - Wilcoxon signed-rank: observed nurse staffing in hospitals vs opt./max. nurse staffing from Delphi
  - Correlation with NRG resource weight and NRG-sum of nursing care time-weights per intervention:  $r=0.9$

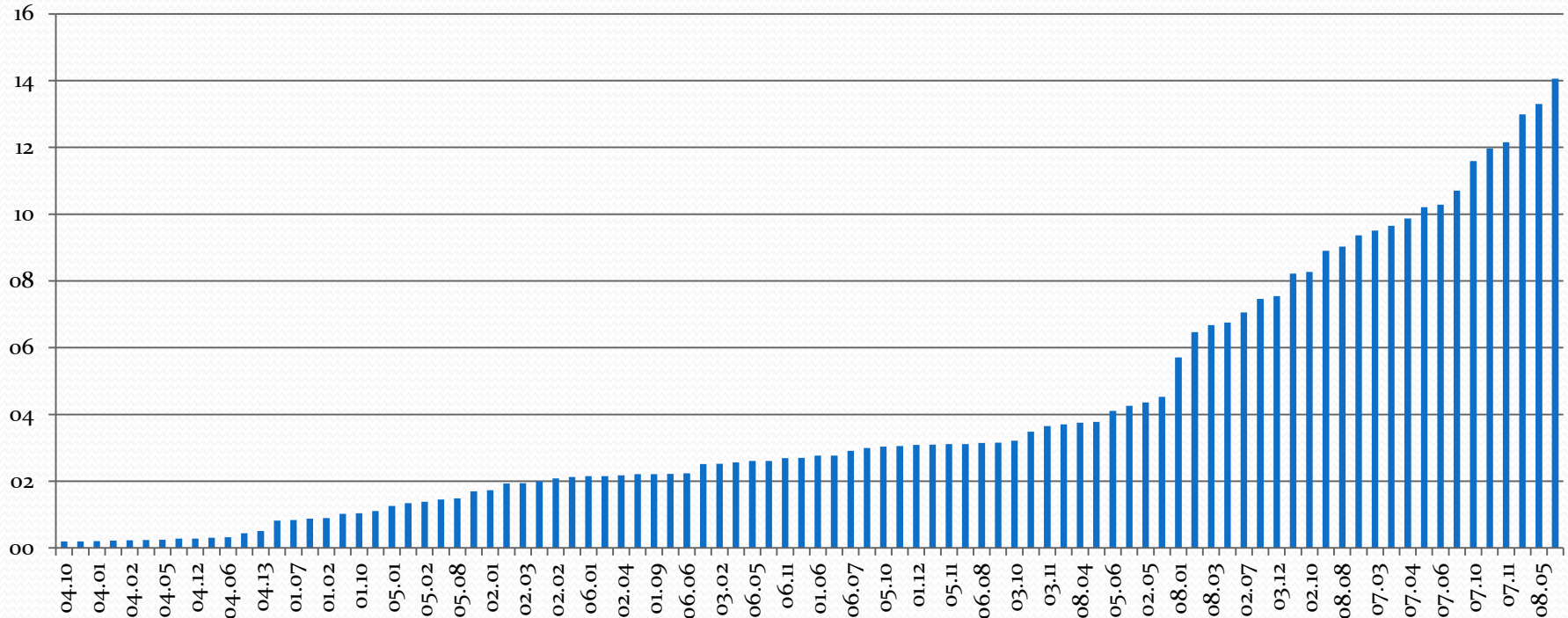
Paires	N NRG	Mean	$\Delta$ Means	SD	PWilcoxon
NPPD_M_obs	79	6,67			
NPPD_max	79	8,78	-2,1	3,72	P < 0,000
NPPD_M_obs	79	6,67			
NPPD_opt	79	6,86	-0,18	3,52	P < 0,01



# What's next ?

- Integration in hospital reimbursement system ?

**Nursing hours per patient day per NRG**  
**High sensitivity: 0.19 (NRG 04.10) to 14.06 (NRG 07.09)**





# Be-NMDS II products

- Nursing time-weights by care profiles
- Nursing cost-weights by NRG (Q & q resources)
- Using for nurses allocation in care units based on patient needs
- Using for nursing financing: implementation & schemes under review
- Linking with DRGs ?
  - Evidence that nursing care / nursing costs cannot be predicted from DRGs (best models explain a 20-25% variability)
  - Cost are explained by the combination of DRGs + NRGs (major increase in explanatory power – Welton & Halloran, JONA, 2005)
  - Complementary, not opposed

# Arguments

## • PROS

- More sensitive than Be NMDS I
- Based on Delphi data (staff & competencies)
- Validated on large data sets
- Validated by large groups of experts

## • CONS

- Complex
- Financial impact unknown, simulations needed
- Link with DRGs not fully established
- Delphi study too subjective, more validation needed
- NRGs not transparent but ...

# Conclusions

- From nursing interventions to care profiles ...
- ... from care profiles to MNCs & NRGs
- Based on quantitative and qualitative research
- Validated by nursing sector
- Many discussions pros & cons: more healthcare financing policy than scientific and/or management arguments ...

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# Thank you to all for your attention !

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