

# **The Nursing Activities Score**

**from conception to clinical practice**

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# Severity of Illness Based Scoring Systems

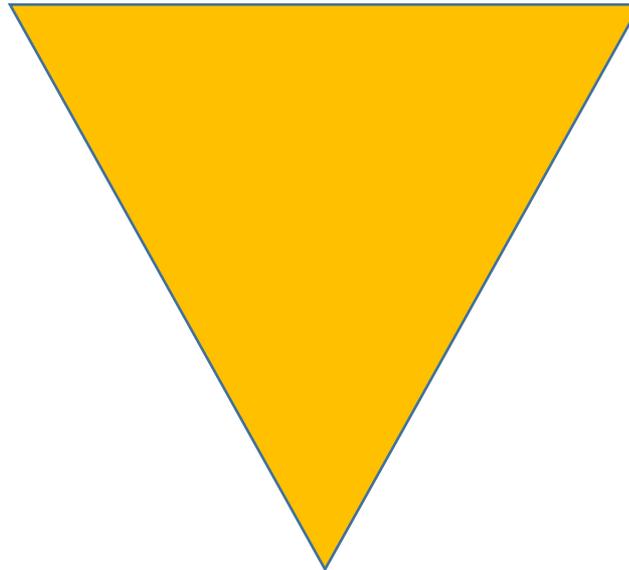
Introducing quantification in the medical reasoning in the ICU

	<b>VARIABLES</b>	<b>AIM</b>
<b>TISS</b> (1974)	Th. Interventions	Severity/Case-Mix Nursing Staffing
<b>APACHE</b> (1981)	Physiologic	Severity/Case-Mix Prediction Outcome

# TISS: Severity of Illness Based Scoring System

**Intervention**

**Severity Illness**



**N/P Staffing**

Levels of Care\*: level 3 –  $1 \geq 1$

level 2 – between 1:1 and 1:3

level 1 – between 1:2 and 1:4

\* Critical Care Consensus Conference Bethesda, USA, 1983

# TISS: Severity of Illness Based Scoring System

(examples of items and scores)

Designed by a panel of experts

## 4 Points

(19 items)

- Cardiac arrest and/or counter shock within 48hr
- Controlled ventilation with/without PEEP
- Balloon tamponade of varices
- Hemodialysis in unstable patients
- Peritoneal dialysis
- Induced hypothermia

## 3 Points

(28 items)

- Central iv hyperalimentation
- Pacemaker on standby
- Chest tubes
- Continuous positive airway pressure
- Concentrated K+ infusion via catheter
- Nasotracheal or orotracheal intubation

## 2 Points

(11 items)

- CVP (central venous pressure)
- 2 peripheral iv catheters
- Hemodialysis – stable patient
- Fresh tracheostomy (< 48 hrs.)
- Spontaneous respiration via endotracheal/tracheostomy tube
- GI feedings

## 1 Point

(18 items)

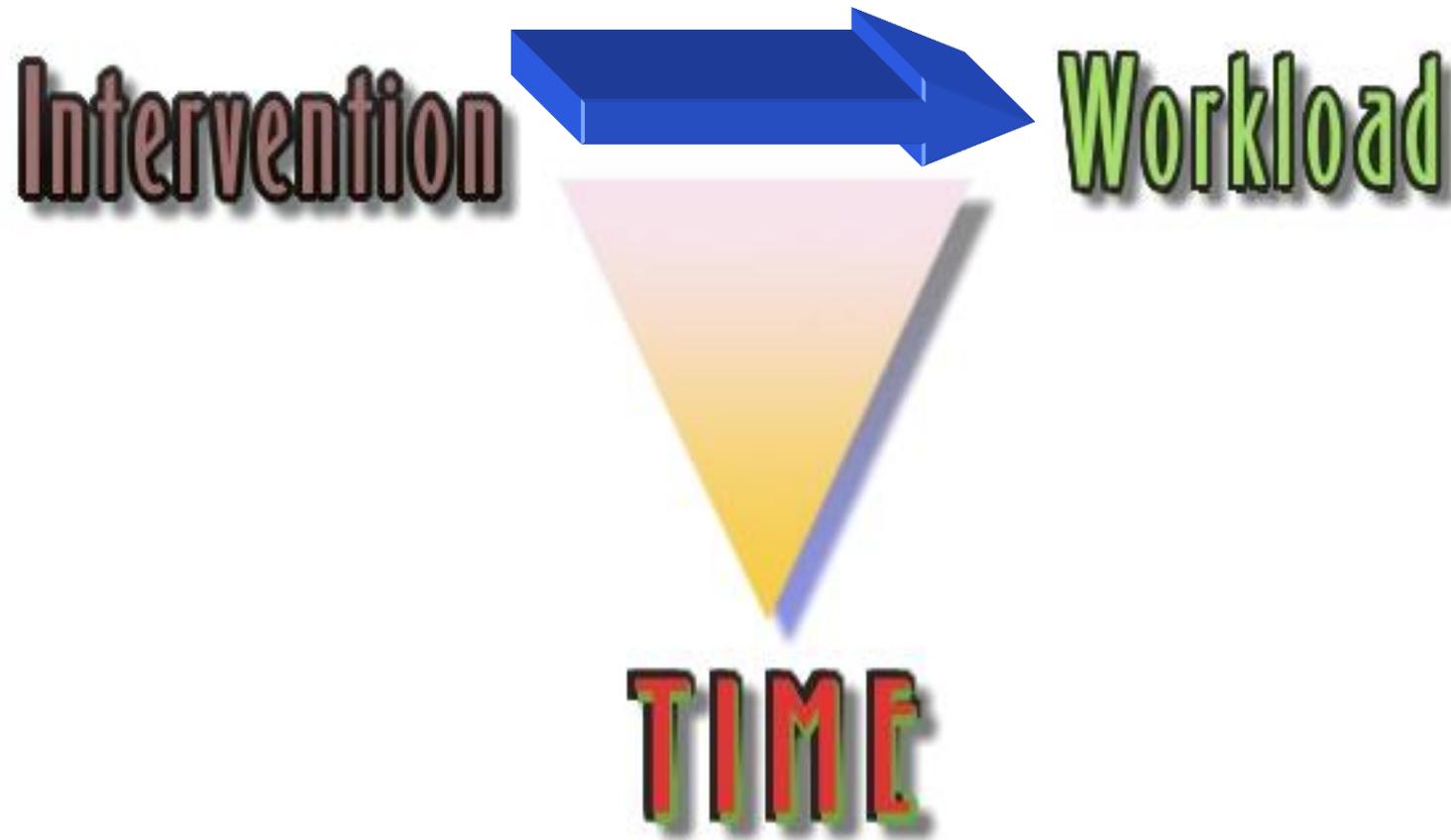
- ECG monitoring
- Hourly vital signs
- Chronic anticoagulation
- Routine dressing changes
- Standard orthopedic traction
- Decubitus ulcer

# **TISS: Severity of Illness Based Scoring System**

(Panel of experts)

## **Examples of mutually exclusive items (TISS-76)**

- **4 Points** - Controlled ventilation with muscle relaxants
- **3 Points** - Intermittent mandatory ventilation
- **2 Points** - Spontaneous ventilation via T-piece



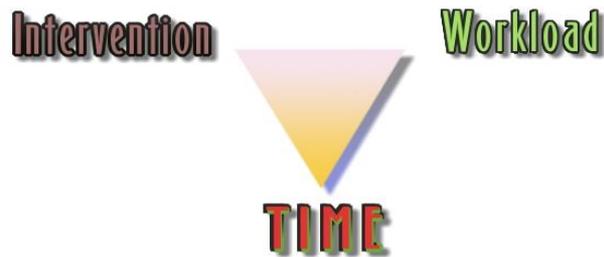
# Examples:

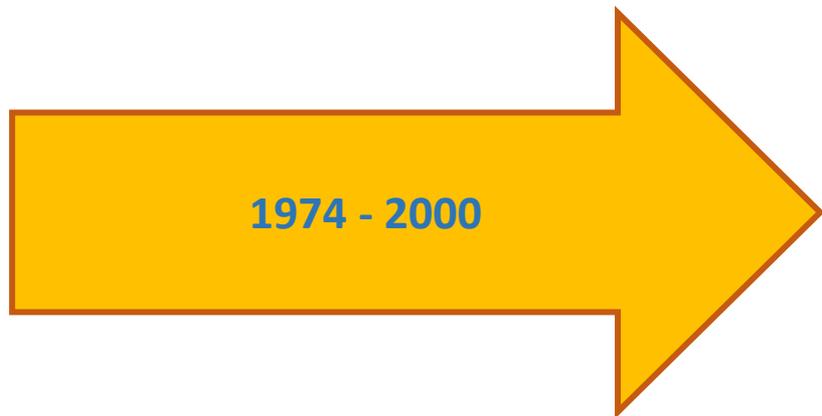
**Same intervention & time  $\neq$  Workload**

Lifting

**Same intervention & workload  $\neq$  Time**

Monitoring





**TISS** (1974)

TISS-76 (1983)

TISS-28 (1996)

NEMS (1997)

PRN (1980)

OMEGA (1986)

TOSS (1991)

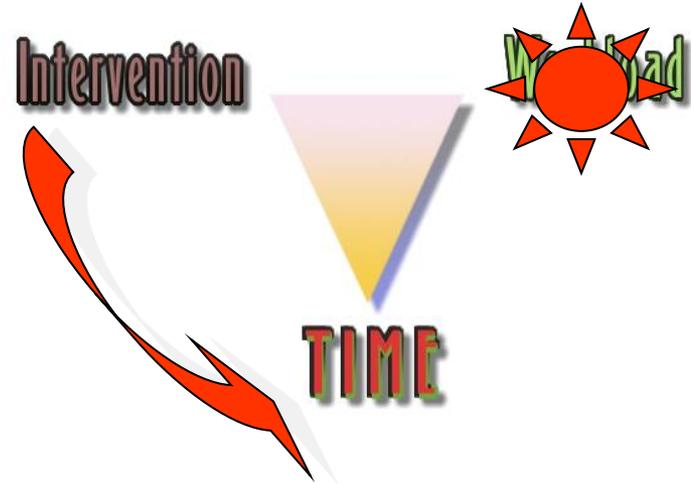
TISS – Therapeutic Intervention Scoring System  
NEMS – Nine Equivalent of nursing Manpower Score  
PRN – Project of Research in Nursing  
OMEGA System  
TOSS – Time-Oriented Score System

## **Relevant criticisms to TISS:**

- **Too long**
- **Out of date**
- **Items & scores not nursing oriented**
- **Time-consuming activities are not itemized**

# Quantitative Work Utilization

is the time spent with the  
performance of tasks or activities



# The nursing activities: a pilot study (48)

## 22 Dutch ICUs

- Led by a psychologist, a focus group developed a provisional list of activities and categories, which was submitted to the independent consideration of other nursing staff members.
- Parallel to the development of TISS-28, 1 week worksampling allocated the nursing time utilization among the different categories.

D.Reis Miranda et al. Therapeutic Intervention Scoring System, the TISS-28. Crit Care Med; 1996, 24:64-73

## Category I (43,3%)

**Nursing activities relating directly to the patient and part of TISS-28**

## Category II (12,9%)

**Activities relating directly to the patient and not included in TISS-28:**

Support – helping the patient to understand and accept clinical condition  
Communication with patient – e.g. improving psychic condition, capacity of communication, etc.

Safety – e.g. isolation, constraints, etc.

Comfort – ensuring comfort and rest

Hygiene – ensuring the physical hygiene of the patient

Activate – encouraging passive movements, changing position, mobilizing

Lifting – lifting, weighting, placing in the chair

Assisting – others in direct care activities, such as inserting catheter, washing, thorax Rx, echography

## Category III (21,4%)

**Activities that are not performed for, or in direct contact with the patients, but that are necessary for the continuity of the personal care of the patient**

Family – contact with and support of family

Other disciplines – contact with, such as technical services, physiotherapy, laboratory, for the patient or equipment of one patient

Coordination tasks – such as consultation with the team, reporting, work council, with physicians

Paperwork – such as reporting, registration and administrative tasks

Equipment – Taking care of, such as maintenance, cleaning, gauging

Domestic activities – cleaning waste according to instructions

Supply maintenance – refilling the supplies for a patient

Other – activities not planned/intended, such as looking for property of the patient (e.g., glasses) or equipment (e.g., balance)

## Category IV (3,3%)

**Activities not relating directly to a patient and not medical.**

**These activities ensure that everything fits together as should**

Meetings dealing with organizational issues

Making duty-rosters

General refilling of supplies for the whole team

Trainee supervision

Research activities

Following professional training in time of service

Contact with the general hospital services

## Category V (17,1%)

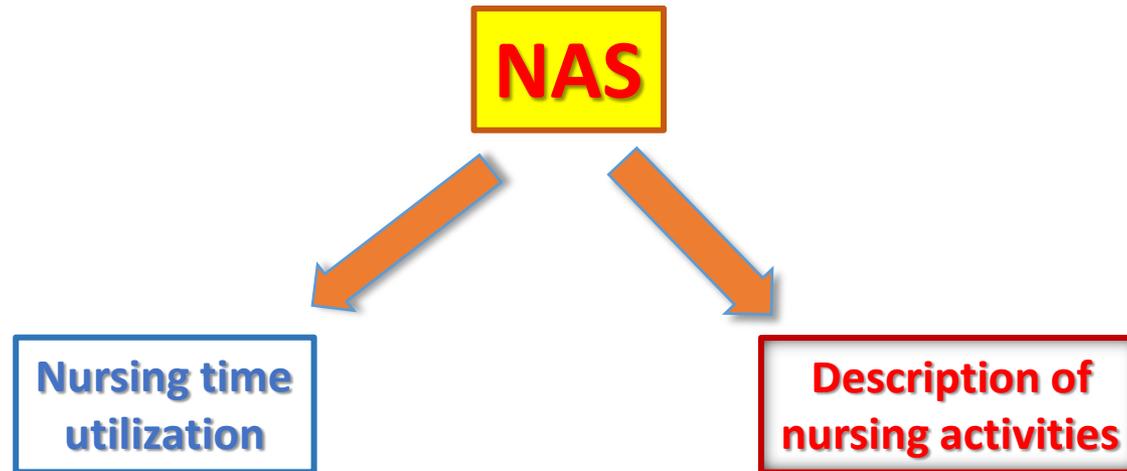
**For the nurse him/herself**

Taking a break, going to the toilet, waiting, chatting

## Category VI (1,9%)

**Everything which does not possibly fit in one of the above mentioned categories**

# Development of a new Scoring System along two research projects



## Basic Methods Used:

- The **Nursing Activities** Revisited
- Consumption of **TIME** instead of WORKLOAD
- **WORKSAMPLING** instead of Panel of Experts

# The inventory of nursing activities in the ICU

**Panel of experts**  
**Following a Delphi Methodology**

**Which are the patient-condition related nursing activities that are not addressed by the therapeutic indexes, and which might have a significant influence upon the use of nursing time in the ICU?**

**\*15 ICU-physicians and 10 ICU-Nurses**

# NAS

## First list of items defined by the panel

Variable	% Phy	% Nur	p
01. Hygiene	73.3	80.0	.464
02. Restlessness	80.0	100	.321
03. Isolation w/ bar.nursing	46.7	40.0	.211
04. Prone position	46.7	80.0	.241
05. Brain death	53.3	70.0	.574
06. Care/support relatives	13.3	70.0	.015
07. Team lifting	33.3	60.0	.283
08. Mobility	33.3	70.0	.110
09. Rehabilitation	14.3	33.3	.068
10. Oral alimentation	13.3	20.0	.783
11. Age	14.3	11.1	.576
12. Burns	83.3	66.7	.269
13. Continuous observation	40.0	100	.009
14. Admission/discharge proc.	20.0	50.0	.289
15. Chronic vs acute condition	9.1	22.2	.241

 : >50%  
 of all  
 respondents

## Final List of new items to include

- 1. Monitoring and titration**
- 2. Hygiene procedures**
- 3. Mobilization and positioning**
- 4. Support and care of relatives and patients**
- 5. Administrative and managerial tasks**

## The five nursing interventions were described\* so that:

Each item was first divided into patient conditions (e.g. incontinence, leaking wound), nursing interventions (e.g. hygiene, mobilization), and the corresponding nursing activities (e.g. changing linen, washing, dressing)

1. They can be unequivocally understood by different raters
2. They contain at least one quantified element
3. They could be subdivided into a hierarchy of mutually **exclusive levels of complexity** (expressing the estimated time consumed in the performance of the involved activities)

In each intervention, the **baseline** of this hierarchy reflected the activities considered routine practice for that intervention in any ICU. In a quantified manner, the other levels were “**more**” and “**much more**”.

\*By a panel of 2 physicians, 2 nurses and 2 methodologists

New item to include  
**1- MONITORING AND TITRATION**

- a. Hourly vital signs, regular registration and calculation of fluid balance
- b. Present at bedside and continuous observation for reasons of safety, severity or therapy, *usually involving moderate amount of time (about 2 hours)\**
- c. Present at bedside and active for reasons of safety, severity or therapy, *usually involving extensive amount of time (about 4 hours or more)\**

\* Please check one

- |  |  |
|--|--|
| 1. weaning procedures  | 5. restlessness                              |
| 2. donation procedures   | 6. mental disorientation                     |
| 3. assisting specific procedures, such as:<br>anticoagulation therapy, plasma exchange<br>active thermal control | 7. seizures                                  |
| 4. clinical examination or intervention  | 8. epidural and patient controlled analgesia |
|  | 9. prone position                            |
|  | 10. other                                    |

New item to include  
**5- HYGIENE PROCEDURES**

- a. **Performing routine hygiene procedures in the unit such as: dressing of wounds, changing linen, washing patient, special room cleaning procedures e.g. following certain infections which require ‘wall washing’**
- b. **Performing hygiene procedures\* *usually involving moderate amount of time***
- c. **Performing hygiene procedures\* *usually involving extensive amount of time***

\* Please check one

- |  |                                       |
|--|---------------------------------------|
| 1. burns dressings                           | 7. incontinence                       |
| 2. other extensive skin lesions              | 8. barrier nursing (staff hygiene)    |
| 3. bleeding and coagulation disorders        | 9. cross-infection related procedures |
| 4. leaking wounds                            | 10. washing hair                      |
| 5. complex surgical dressing with irrigation | 11. enema                             |
| 6. vomiting                                  | 12. other                             |

**New item to include**  
**7- MOBILISATION AND POSITIONING**

**such as turning the patient, mobilisation of the patient, moving from bed to chair, team lifting (e.g. immobile patient, traction, prone position)**

- a. Performing procedure alone**
- b. Performing procedure with 2 nurses**
- c. Performing procedure with 3 or more nurses**

## New item to include

**8- SUPPORT AND CARE OF RELATIVES AND PATIENTS**

**including procedures such as telephone calls, interviews, counselling**

**Routine communication allowing staff to continue with other nursing activities such as: communication with patients during hygiene procedures, communication with relatives whilst present at bedside and observing patient**

- a. **Support and care of either relatives or patient requiring full dedication and usually involving *moderate amount of time (about one hour)*\***
- b. **Support and care of either relatives or patient requiring full dedication usually involving *extensive amount of time (3 hours or more)*\***

\* Please check one

1. to explain clinical condition
2. patient with impaired communication
3. psychology support
4. dealing with pain and distress
5. death
6. difficult family circumstances
7. other demanding circumstances (e.g. large number of relatives, language problems, hostile relatives)
8. other

New item to include

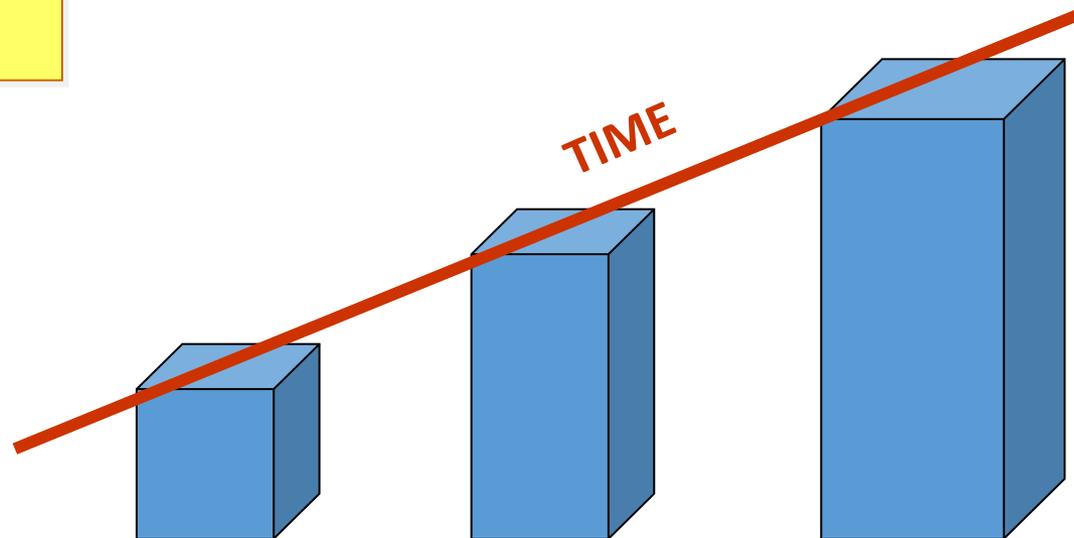
9- ADMINISTRATIVE AND MANAGERIAL TASKS

- a. Performing *routine tasks* such as: processing of clinical data, ordering examinations, professional exchange of information (e.g. ward rounds), assisting others in direct care activities (e.g. inserting a catheter, washing, diagnostic examinations)
- b. Performing administrative and managerial tasks requiring full dedication usually involving *moderate amount of time (about 2 hours)*\*
- c. Performing administrative and managerial tasks requiring full dedication usually involving *extensive amount of time (4 hours or more)*\*

\* Please check one

- |  |  |
|--|--|
| 1. nursing assessment, planning or evaluation                                      | 8. preparing and drawing up infusions ready for administration                       |
| 2. research activities   | 9. co-ordination with other disciplines  |
| 3. protocols in use  | 10. looking for property of the patient (e.g., glasses) or equipment (e.g., balance) |
| 4. admission & discharge procedures  | 11. taking care of equipment (e.g., maintenance, gauging)                            |
| 5. setting up for transportation such as mechanical ventilation or haemofiltration | 12. other  |
| 6. setting up for transportation   |  |
| 7. death and organ donation procedures   |  |

**Requirements:**  
**Unequivocally understood**  
**≥ 1 quantified element**  
**Mutually exclusive levels**



**Routine**

**More**  
 ≥ 2hrs

**Much more**  
 ≥ 4hrs

Monitoring	4.5	12.1	19.6
Hygiene	4.1	16.5	20.0
Mobilization*	5.5	12.4	17.0
Support		4.0	32.0
Adm. & Manag. Tasks	4.2	23.2	30.0

\*Based on frequency and number of nurses

# Final List of Nursing Activities in the ICU (53)

## Relating Directly to Patient

Items in TISS-28

Support - helping/explaining to patient

Communication

Safety

Comfort

Hygiene

Activate - changing position, mobilising

Lifting

Assisting others - with direct care activities

## Personal Care

Break/toilet/waiting/chatting

## Other

Activities not fitting in the above

## Not in Direct Contact Patients

Family

Other disciplines - e.g. technical services, lab

Coordinating Tasks - e.g. consultation, reporting

Paperwork

Equipment - Maintenance, cleaning

Domestic activities

Supply maintenance

Other activities- looking for property/equipment

## Not Patients, not Medical

Meetings for Organisational issues

Making duty-rosters

General refilling of supplies

Trainee supervision

Research activities

Following professional training

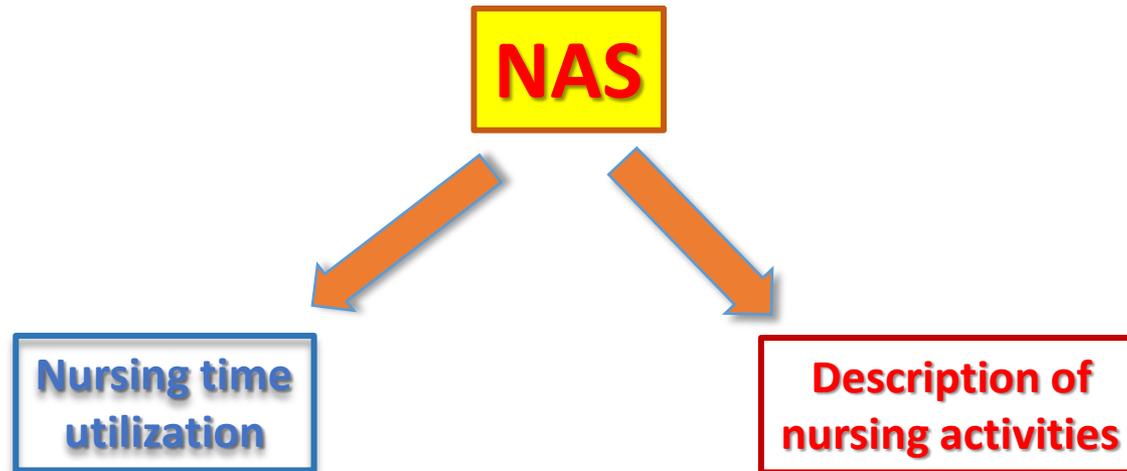
Contact with general hospital services

NAS differs from the TISS-like therapeutic indexes

**NAS** refers to the nursing activities in the ICU after these were inventoried and described by Delphi- and Focus Group's techniques

**TISS** refers to particular therapeutic interventions selected at patient level and related to severity of illness

# Development of a new Scoring System along two research projects

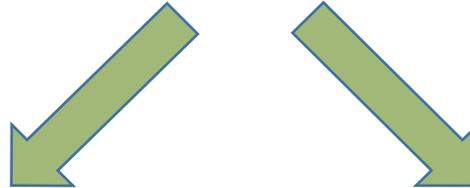


## Basic Methods Used:

- The **Nursing Activities** Revisited
- Consumption of **TIME** instead of WORKLOAD
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# Time and Motion

## Analytic methods of time utilization



### Work-sampling

Collects data at intervals of time

- Precision depends of number of participants and of entries
- Preferably multicenter
- Lower cost
- Job consists of various tasks possible to classify into a distinct number of activity-categories

### Clocking

Uses observer (1:1) with stopwatch

- Precision independent of number of participants and of entries
- Usually in one center
- High cost
- Both work utilization and task duration
- The number of categories is related to the nr. of task elements identified
- Fulfils a set of requirements, such as:  
selection of task/job to be timed; standardized method of working; select operator for study; break the task into elements; determine number of cycles to be measured; measure the time of each element with a stopwatch, etc.

Work-sampling: what is the average time spent

Clocking: what is the time spent

# 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

# WORK SAMPLING

10 MMR/shift (1 record = 10% nursing time)

## Important considerations:

- All possible intensive care nursing activities have been identified and listed
- Enabling to check & match, the activity is registered in the work sampling form (nurse level) and in the NAS-activities form (patient level)
- The weights to the activities are proportionately attributed so that all weights together sum up to the total of 24 hours work
- For each task, the proportion is calculated by dividing the Nr. MMRs for the task by the possible Nr. of records in which the task could have been performed

**Because of the methodology used, the set of activities identified and the proportional weights attributed to each activity are one interdependent whole. Simply changing the activities or the weights, will invalidate the score.**

# **NAS - Field Research**

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- **1 week data collection**
- **99 ICUs of 15 countries**
- **2,041 patients**
- **6,451 nursing days**
- **127,951 MMRs**
  - 31.5% day shift
  - 35.6% late shift
  - 32.7% night shift

# NURSING ACTIVITIES SCORE

Range: 0 - 177%

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

# Proportional Weight of Categories

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

NAS

# Impact of variables in the scores (discriminant analysis)

R= 0.56; p= 0.001

The increase of TISS-28 was most dependent of:

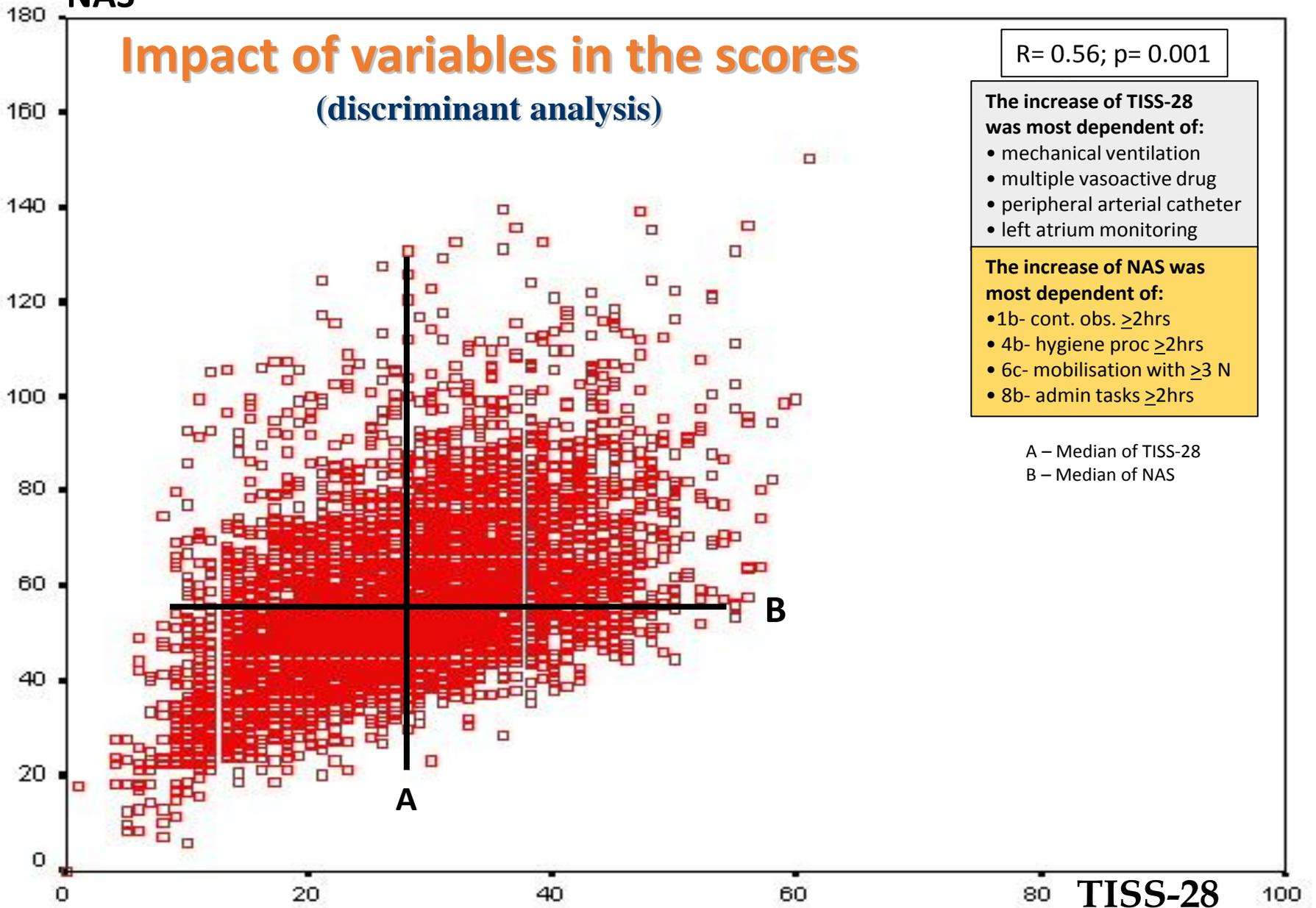
- mechanical ventilation
- multiple vasoactive drug
- peripheral arterial catheter
- left atrium monitoring

The increase of NAS was most dependent of:

- 1b- cont. obs.  $\geq 2$ hrs
- 4b- hygiene proc  $\geq 2$ hrs
- 6c- mobilisation with  $\geq 3$  N
- 8b- admin tasks  $\geq 2$ hrs

A – Median of TISS-28

B – Median of NAS



# **NAS is a General Scoring System**

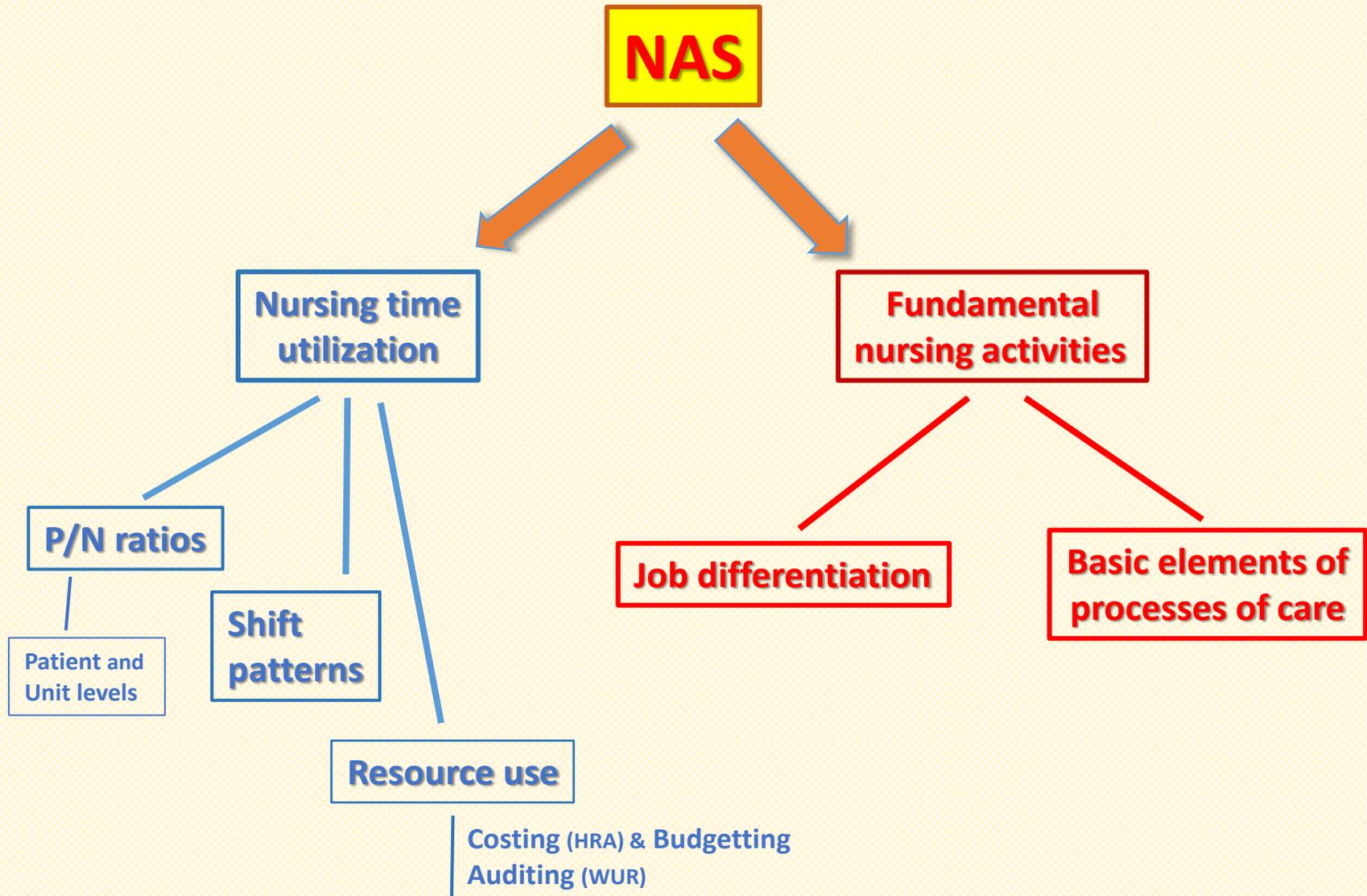
**for the standardized estimation of time utilization**

**Measures the use of nursing time in relation to a complete list of nursing activities, independently of the location where they take place**

**The resulting score, expressing the daily use of nursing time in hours and minutes, is reliable, neglecting however smaller fractions of time**

**The Nursing activities are described in a way that they may cover a limitless range of nursing interventions related to actual or new therapies and technologies.**

# Importance to Management



# **P/N ratio at patient level**

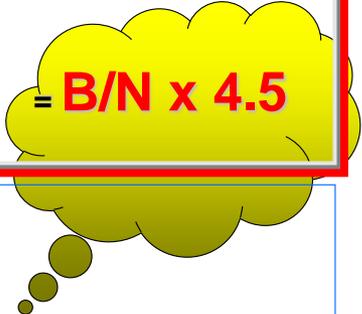
- **Precises the required amount of nursing FTE's**
- **Indicates the required LOC in case of transfer**

# P/N ratio at ICU level

The overall P/N ratio during e.g., one year, indicates the average availability of nursing FTE's per bed: the ICU Level of Care

Calculation of planned LOC's:

$$\text{LOC} = \frac{A \times B \times C \times D \times E}{F \times G}$$


$$= B/N \times 4.5$$

A = # shifts per day (3)

B = # beds in the unit

C = # days operating per week (7)

D = Desired occupancy rate (85%)

E = Holidays, illness, etc. (20%)

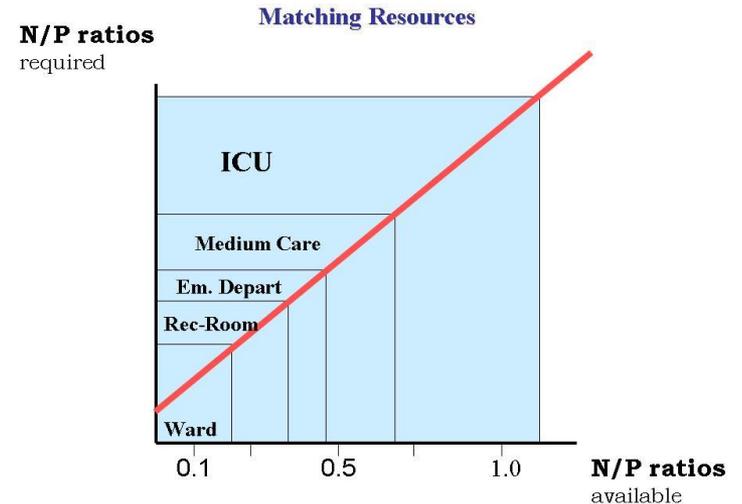
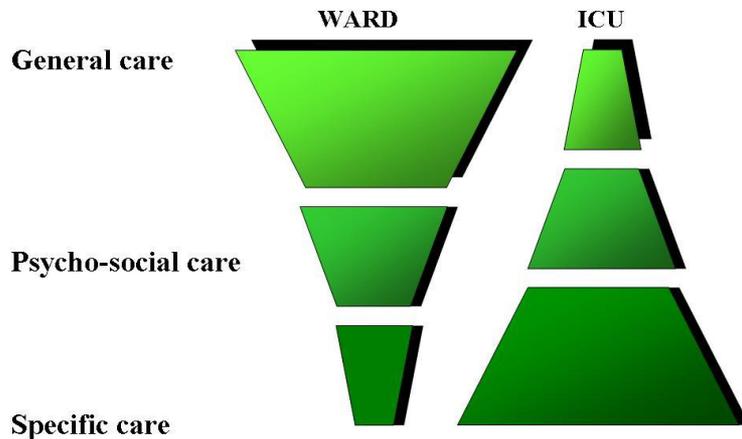
F = # nurses (FTE's)

G = # days working-week (5)

# Use of NAS in the Hospital

NAS score allows to determine the P/N ratio required in each ward  
P/N ratios are essential for admission/discharge decisions

## Nursing use in the ward versus the ICU



# Use of NAS per Shift

In the day, the shifts are not all equal regarding the performed nursing activities

- **because of the patient's illness or condition**
- **because of organizational determinations**

The analyze of daily shift inequalities will allow:

- **the eventual reshuffling of nursing activities among shifts**
- **the reallocation of nursing staffing in the shifts**

**YES, BUT...**

**Each shift (e.g. 8hrs) is 100% of time studied**

**Individual shift scores cannot sum up to 24hrs score**

**Definition of items, and weights cannot be changed**

# WUR

work utilization ratio

$$\mathbf{WUR} = \frac{\text{Total amount of work produced}^*}{\text{Total amount of work available}^{**}}$$

using NAS:

\* sum of scored points

\*\*  $[(\#FTE's \times 200)/3] \times 100$

## NAS is a proxy of cost

### Assumptions:

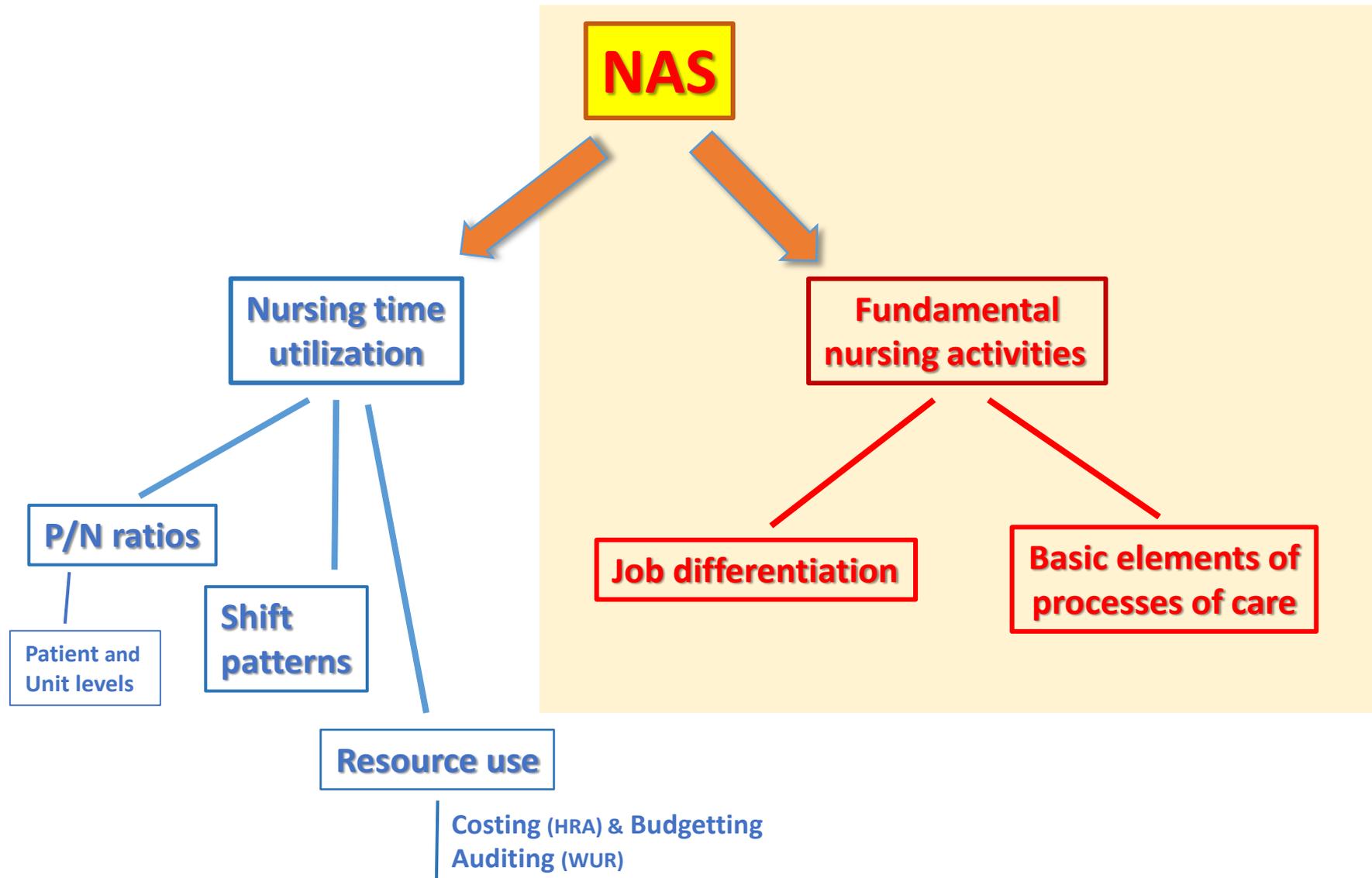
- TISS correlates well with total cost of care, without discriminating cost at patient level
- NAS will assumedly discriminate cost also at patient level (80% of nursing activities)
- There is a constant relation (around 1/3) between total cost and the cost of nursing staff

### Calculate\*:

- 1- the total annual cost of the ICU
- 2- the share of the annual nursing staff cost (in 1)
- 3- the cost of one NAS point
- 4- the nursing time utilization cost (3 X HRA)
- 5- the total cost (\*)

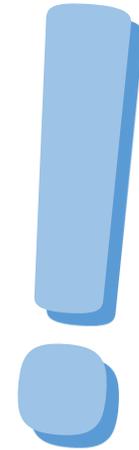
$$*\Sigma \text{ NAS points} \times \text{cost 1 point} \times \frac{\text{Total ICU cost}}{\text{T. nursing cost}}$$

# Importance to Management



## Specific (30%) vs. Basic care (70%)

**Only 30% of the nursing time is used in direct relation to the High Technology in the Unit**



- **Allows for Professional Differentiation**
  - nursing practitioners are already commonly used in many ICU's
  - the use of less qualified nurses is being tested in several Units (e.g. MCU's)
- **Allows for task differentiation and supervision in the Organization**
  - operational staff – perform their duties next to the bed
  - tactical staff – allows the supervision of multiple operations (- e.g. nursing practitioner)

**The fundamental nursing activities  
are the basic elements of the  
processes of care in the ICU**

The analysis and description of the work-processes  
in the ICU, are now at reach...

...so that the processes of care become  
manageable and reproducible.