Utilization of nursing classification systems for the depiction of the nursing process in electronic health records

10th Biennial Conference of ACENDIO
Bern, 18 April 2015
Overview of the presentations

**Aims of utilization nursing process data in electronic health/patient records**
Monika Linhart, RN, PhD

**Which granulation of nursing classification systems is needed to enable nursing documentation in electronic patient records?**
Dr. Pia Wieteck

**European Nursing care Pathways**
Giving Nursing a Language
Sebastian Kraus M.Sc.
EHRs were classified on the basis of the International Organization for Standardization (ISO) definition. According to this definition, the EHR means a repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users. It contains retrospective, concurrent, and prospective information and its primary purpose is to support continuing, efficient and quality integrated health care. ISO also gives a number of other terms commonly used to describe different types of EHRs.


ISO/DTR 20514, Health Informatics – Electronic Health Record – Definition, Scope, and Context, 2004
Proven benefits of an EHR

Examples from the literature:

- Quality dimensions, such as **compliance with standards and defined processes**, as well as computer-aided reminder functions and the support of decision making come into awareness (Chaudhry et al. 2006)

- Computer-assisted **identification of high-risk patients** leads to a decrease of complications e.g. in the areas of deep vein thrombosis and pulmonary embolism (Kucher et al. 2005)

- A longitudinal study showing a **decline of pressure ulcers** by the support of IT in the area of pressure ulcer management (Willson et al. 1995)

- The IT-based **screening of prescribed drugs** revealed, that about 2,5% of all prescriptions were not ideal and led to a prolonged hospital stay, higher costs and an almost twice higher risk of dying (Classen et al. 1997)
Implicit rationing of nursing services in the German health care system

Survey results from an international study (RN4CAST):
On average, 4.7 of 13 selectable care activities were rationed. Germany is thus one of the countries, along with Belgium, England and Greece, where more care activities remain "undone" compared with the mean values of other countries (Zander et al., 2014).
Result:

From 13 areas of activity registered nurses (n = 1511 from 49 hospitals) selected the activities which could not be done in their shift, although this would have been necessary.

Frequency of implicit rationing

- Treatment and procedures: 15%
- Pain management: 19%
- Timed medication: 21%
- Periodic repositioning: 22%
- Preparing for the hospital discharge: 24%
- Skin care: 28%
- Oral care: 29%
- Patient monitoring: 37%
- Adequate documentation of the work done: 40%
- Care planning: 43%
- Advice/instructions of patients: 54%
- Updating care plans: 54%
- Time for affection/talks: 82%

The consequences of implicit rationing for patients/residents are largely unknown

However, there are indications of: Falls, nosocomial infections, clinical incidents, pressure sores, pneumonia, fixation, death, ...

Studies show that a negative impact on the outcome has to be expected when there is an imbalance between the patients needs and factual satisfied care needs.

EHR + standardised Nursing Terminologie

- Basis for policy decisions
- Shifts in the performance spectrum
- Support/funding of Outcome research and EBN
  - Just and reasonable personal management
  - Data for risk management
  - Data for quality management and marketing
  - Data für outcome measure
- Simplified and more correct nursing documentation
- Support for decision-making
- Systematic documentation of patient status over time
- Support of process, information and communication flow
Next question – Which nursing classification system?

EHR/ENP \hspace{1cm} \text{Nursing process} \hspace{1cm} \text{Controlled vocabulary}

e.g. ENP or NANDA and Nic and NOC or....

System of terms, involving, e.g., definitions, hierarchical structure, and cross-references, that is used to index and retrieve a body of literature in a bibliographic, factual, or other database. (NICHSR, 2008)
## Example for a nursing care plan with standardized terminology (ENP)

<table>
<thead>
<tr>
<th>Nursing diagnoses</th>
<th>Resources</th>
<th>Nursing objectives</th>
<th>Nursing interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal hygiene/clothing</strong>&lt;br&gt;The resident is unable to carry out personal hygiene independently due to a hemiplegia/hemiparesis&lt;br&gt;<strong>Characteristics/Symptom:</strong>&lt;br&gt;Is unable to wash himself/herself&lt;br&gt;Is unable to wash certain body parts&lt;br&gt;Ignored the affected side&lt;br&gt;Level 3: Moderate impairment in personal hygiene&lt;br&gt;<strong>Causes/etiologies:</strong>&lt;br&gt;Cerebral vascular accident</td>
<td>Is willing to carry out personal hygiene independently&lt;br&gt;Is motivated to learn new movement patterns&lt;br&gt;Assesses own self-care skills realistically&lt;br&gt;Shows perseverance to acquire new skills&lt;br&gt;<strong>Body awareness</strong> is activated and stimulated&lt;br&gt;Participation during personal hygiene is planned in the nursing care plan according to physical capabilities</td>
<td>Include affected body regions during body hygiene purposefully&lt;br&gt;0 minutes&lt;br&gt;Number of persons 1&lt;br&gt;2x daily&lt;br&gt;In the morning In the evening</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tue 17.06.14</th>
<th>Wed 18.06.14</th>
<th>Thur 19.06.14</th>
<th>Fri 20.06.14</th>
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<td>1 6 12 19 23</td>
<td>1 6 12 19 23</td>
</tr>
</tbody>
</table>

The resident is restricted in carrying out oral hygiene independently<br>**Characteristics/Symptom:**<br>Is unable to use utensils required for dental/oral/denture hygiene<br>Is unable to rinse mouth independently<br>Level 2: Low impairment in mouth/tooth care<br>**Causes/etiologies:**<br>Hemiplegia | Is able to carry out oral hygiene with guidance and support<br>Willingness to learn something new<br>Daily dental hygiene is ensured<br>Oral mucosa is healthy | Carry out assessment of mouth/tooth status<br>10 min.<br>1x daily<br>In the morning | |

<table>
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<th>Fri 20.06.14</th>
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</tbody>
</table>
Which granulation of nursing classification systems is needed to enable nursing documentation in electronic patient records?
Overview

Requirements of nursing classification systems for a useful application in electronic health records

Accuracy and abstraction level of various nursing classifications

Potential impact of granularity on accuracy and explanatory power of nursing classification systems in relation to the nursing care process
Useful application of nursing classification systems in electronic health records

Requirements for nursing classifications

"A precise and unambiguous illustration of the patient's situation and nursing intervention is a requirement"


- Representation of the current nursing knowledge in the form of practice guidelines to support decision making (Gordon 1998)
Accuracy – granularity of nursing classifications

“Whether nursing classification systems provide sufficient granularity to adequately capture nursing practice is controversial.”
(vgl. Moss et al. 2005)

„Presence of terms that represent a fairly coarse—and hence somewhat ambiguous and inconsistent—level of data abstraction that often blurs many of the clinical details essential to accurately capturing nursing practice in a “data-reuse-friendly” form;“
(vgl. Henry & Mead 1997)
Useful application of nursing classification systems in electronic health records

Authors claim for example:

- Complete and comprehensive depth and level of detail with sufficient granularity to illustrate the clinical process; clinical benefit (Bakken Henry et al. 1998, Zielstorff 1998, Gordon 1998, Von Krogh et al. 2012)

- Unambiguity of the concepts without redundancy, avoidance of overlaps, management of synonyms, definitions (Bakken Henry et al. 1998, Zielstorff 1998)

- Hierarchies and inheritance with clear references to parent-child relationships (Bakken Henry et al. 1998, Zielstorff 1998)

- Attributes such as modifiers to illustrate eg severity (Bakken Henry et al. 1998, Zielstorff 1998)

- Context-free terms/concepts (Bakken Henry et al. 1998, Zielstorff 1998)

- Each term of the classification has a unique identifier (Zielstorff 1998)

- Reliability and validity of the concepts (Gordon 1998)
Useful application of nursing classification systems in electronic health records

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- Reliability and validity of the concepts (Gordon 1998)
Granularity – abstraction level

What exactly is meant by that?

Comprehensive depth and level of detail with sufficient granularity to illustrate the clinical process and to ensure a clinical benefit
Granularity of nursing classifications and its meaning

**Definition:** Semantic clarity/accuracy of a linguistic expression (linguistics) degree of aggregation of data (computer science)

Broad granularity: Is the statement "France is hexagonal" correct?
Granularity of nursing classifications and its meaning

Fine granularity:
In a detailed and fine description of France in regard to the form, the statement France has the shape of a hexagon would be false.
Attempt at definition: fine versus broad granularity

The **granularity** (latin 'granum', grain) of a linguistic expression provides information on its (semantic) clarity (expressiveness, unambiguity of terms).

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**The patient is unable to carry out personal hygiene independently** due to a **hemiplegia/hemiparesis**

**Characteristics:**
- Is unable to wash/dry certain parts of the body
- Flaccid paralysis of the affected side
- Ignores the affected side
- Disturbed balance when sitting

**Etiology:**
- Cerebral vascular accident

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**Bathing self-care deficit**

**Defining characteristics:**
- Inability to dry body
- Inability to get bath supplies
- Inability to obtain water source

**Related factor:**
- Neuromuscular impairment

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**Wash the entire body**
- Severely impaired

**Dry the entire body**
- Severely impaired
Granularity of nursing classifications and its meaning

Fine granularity versus broad granularity
Specific formulation versus abstract formulation

How accurate must nursing diagnoses describe the patient's condition or reflect what we observe/perceive/diagnose?
# Nursing care plan with NCS #1

Mr. Schuster

<table>
<thead>
<tr>
<th>Nursing diagnosis</th>
<th>Defining characteristic</th>
<th>Related factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral swallowing</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>• <em>Problem moderate</em></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Nursing care plan with NCS #2

Mr. Schuster

<table>
<thead>
<tr>
<th>Nursing diagnosis</th>
<th>Defining characteristics</th>
<th>Related factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired swallowing</td>
<td>• Choking</td>
<td>Cerebral palsy</td>
</tr>
<tr>
<td></td>
<td>• Cough</td>
<td></td>
</tr>
</tbody>
</table>
Nursing care plan with NCS #3

Mr. Schuster

<table>
<thead>
<tr>
<th>Nursing diagnosis</th>
<th>Characteristics</th>
<th>Etiologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient <strong>only chokes when drinking</strong>, swallowing is <strong>impaired in the oral</strong></td>
<td>• Expresses fear of drinking</td>
<td>Bolus slides predeglutitive (before the actual swallowing) into the throat</td>
</tr>
<tr>
<td><strong>transport/pharyngeal stage</strong></td>
<td>• Cough/throat cleaning during/after swallowing fluids</td>
<td>Dementia</td>
</tr>
<tr>
<td></td>
<td>• Refuses the food/fluid intake</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wet/gurgling voice quality after swallowing</td>
<td></td>
</tr>
</tbody>
</table>
As a result of progressive dementia, Mr. Schuster chokes when drinking. He often coughs after drinking or clears his throat. He often refuses drinking and prefers eating soups with a creamy consistency. Because of the increase of the nursing problem and concerns about pneumonia as a result of microaspiration, you carry out a case review. In addition, there are signs of fluid deficit of Mr. Schuster due to avoidance attitude.
What do you think about Mrs. Meier's care plan?

Please discuss the various care plan excerpts 1, 2, 3. AND
Answer the question: which level of information is necessary to plan adequate nursing interventions?
Excerpt from a cross-mapping study
NANDA-I and ENP

RESEARCH DESIGN
Non experimental, descriptive, comparative cross-sectional study

RESEARCH METHOD
Bi-directional cross-mapping of NANDA-I and ENP nursing diagnoses

Expert rating of the cross mappings in terms of completeness, expressiveness and unambiguity
Evaluation Category: ENP → NANDA-I Mapping according to Zielstorff (1998)

- **Same**: source vocabulary is identical in wording
- **Similar**: source vocabulary is comparable, or alike in substance to the term in the target vocabulary
- **Broader**: source vocabulary is larger in scope, or less specific
- **Narrower**: source vocabulary is smaller in scope, or more specific
- **Not Mapped**: (Extension of the Evaluation Categories according to Zielstorff 1998)
RESULTS: ENP → NANDA-I mapping

**ENP**
The patient is at risk of hyperglycemia/hypoglycemia

**ENP**
The patient has a spontaneous release of urine at regular intervals at a given bladder volume (reflex incontinence)

**NANDA-I**
Reflex urine incontinence

**ENP**
The patient is unable to carry out personal hygiene independently due to a hemiplegia/hemiparesis

**NANDA-I**
Self care deficit: personal hygiene

**ENP**
The patient is at risk of an allergic reaction

**NANDA-I**
Danger of an allergic reaction caused by latex
Results: Expert Evaluation – Clarity/unambiguity

Bar chart: allocation of the rater judgment in percent

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher unambiguity of ENP</td>
<td>43.2%</td>
</tr>
<tr>
<td>Same/similar unambiguity of ENP</td>
<td>42.9%</td>
</tr>
<tr>
<td>Lower unambiguity of ENP</td>
<td>14.0%</td>
</tr>
</tbody>
</table>

Compared to NANDA-I
RESULTS: expert evaluation - expressiveness

Bar chart: allocation of the rater judgment in percent

- Higher expressiveness of ENP: 53.10%
- Same / similar expressiveness of ENP: 31.01%
- Lower unambiguity expressiveness of ENP: 15.89%

Compared to NANDA-I
Summary of partial results of the study

It was shown in the study that a finer granularity contributes to an increase in expressiveness and clarity/accuracy.

**NANDA-I:**
Dysfunctional ventilatory weaning response *(Narrower)*

**ENP:**
The patient is ventilated, there is a risk of complications *(Broader)*

**NANDA-I:**
Ineffective therapeutic regimen management *(Broader)*

**ENP:**
The patient is at risk of not achieving health related aims due to a lack of information/skills associated with diabetes *(Narrower)*
Each classification system has to provide the appropriate level of granularity, which nursing practice and nursing research require.
European Nursing care Pathways
Giving Nursing a Language

10th Biennal Conference of ACENDIO
Bern,
18 April 2015

Sebastian Kraus
(RN, B.A., M.Sc.)
Aims of ENP

Structured illustration of the nursing process in the context of documentation in a standardized professional language

- Support of the communication process
- Support of processes and transitional care
- Support of performance transparency in nursing
- Structuring of the current nursing knowledge
- Support of quality development, nursing staff calculation and outcome measurement
- Support of decision-making processes and critical thinking

Outline of the ENP history

• 1989: Beginning of the inductive development in three stages

• 1994: Publication of the first catalogue
  Containing nursing problems, outcomes and interventions

• 1996: Representation of the ENP catalogue in IT

• 1998: Establishment of a research department

• from 2000: evidence-based development
  (validation studies, cross-mapping, systematic reviews, ...)

1989 2015
The structure of ENP

Division into three sections

- ENP... as a **nursing classification system** for a total of seven groups

- ENP... as **pre-combination** of the elements of this nursing classification system

- ENP... as **practice guidelines** developed from the pre-combination
ENP classifies... across sectors!

Seven groups: components

- Nursing problems / phenomena
- Characteristics
- Etiologies
- Resources
- Nursing objectives
- Interventions
- Intervention specifications
The patient is impaired in **verbal communication** due to **motor aphasia** (Broca's aphasia)
Reference points and standardized syntax of the nursing diagnoses in ENP

Characteristics/Symptoms

- Strongly pronounced agrammatism
- Strongly halting speech flow
- Uses commonplace phrases
- Uses meaningless phrases and/or stereotypes
- ...

Etiologies

Pathophysiologic causes
- Degenerative process of the brain
- Congenital vascular malformations
- ...

Disease-related causes
- Cerebral vascular accident
- Encephalitis
- ...

The patient is impaired in verbal communication due to motor aphasia (Broca's aphasia)
Illustration of the nursing process in the form of a care pathway representing the current knowledge, individualized for each patient!

→ Invitation to critical thinking!

→ Practice guidelines as (short range) modified practical theories

References: Dickoff et al. 1968a & 1968b, Walker & Avant 1998
The structure of ENP: Clear definitions

Examples:

A **nursing diagnosis in ENP** is the term nurses use, if possible, together with a person affected based on the systematic assessment/evaluation with regard to the health status and his/her mental, physiological and developmental state, or his reaction to health problems that provide the basis for decision-making regarding nursing outcomes and interventions that must be selected.

**ENP characteristics** are indicators, symptoms and expressions of the person affected. These help to identify the nursing diagnosis/problems or to differentiate the nursing diagnosis/problem from each other. These indicators can describe symptoms, further features of the problem, biographic or historical, physiological or psychological indicators, a described verbal expression of the person affected regarding the problem, reported reactions of a human being or risk factors.
## ENP: a monohierarchical classification system

### Group: Nursing problems / phenomena

<table>
<thead>
<tr>
<th>Domain</th>
<th>Class</th>
<th>Category</th>
<th>Subcategory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional/physiological area</strong></td>
<td>Personal hygiene/clothing</td>
<td>Self-care deficit washing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-care deficit oral hygiene</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-care deficit hair care</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-care deficit dressing</td>
<td></td>
</tr>
<tr>
<td><strong>Respiration</strong></td>
<td>Ineffective self-cleansing function</td>
<td>The patient has insufficient respiration due to dyspnea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of the respiratory tract</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insufficient respiration</td>
<td>The patient is ventilated, there is a risk of insufficient respiration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk of respiration insufficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk of suffocation</td>
<td>The patient has serous foamy sputum associated with acute dyspnea, there is insufficient respiration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk of aspiration</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk of atelectasis/pneumonia</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Risk of impaired respiration</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>postoperatively</td>
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</tbody>
</table>
The structure of ENP: Summary
### Current status: scope and evidence level of ENP

<table>
<thead>
<tr>
<th>Terms/concepts of the group</th>
<th>Items v2.5</th>
<th>Items v2.6</th>
<th>Items v2.7</th>
<th>Items v2.9</th>
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</thead>
<tbody>
<tr>
<td>Nursing diagnoses</td>
<td>521</td>
<td>542</td>
<td>548</td>
<td>552</td>
</tr>
<tr>
<td>Characteristics / Symptoms</td>
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<td>2719</td>
<td>2905</td>
<td>3984</td>
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<tr>
<td>Etiologies</td>
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<td>2282</td>
<td>2426</td>
<td>3526</td>
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<tr>
<td>Ressources</td>
<td>379</td>
<td>457</td>
<td>473</td>
<td>648</td>
</tr>
<tr>
<td>Nursing objectives</td>
<td>1435</td>
<td>1683</td>
<td>1724</td>
<td>1852</td>
</tr>
<tr>
<td>Nursing interventions</td>
<td>2494</td>
<td>2511</td>
<td>2558</td>
<td>2615</td>
</tr>
<tr>
<td>Intervention specifications</td>
<td>3652</td>
<td>4285</td>
<td>4461</td>
<td>4797</td>
</tr>
</tbody>
</table>

**Each item has a unique and unchangeable ID number!**

- Systematic literature-based revision of about 1/5 of all practice guidelines
- Growing number of ENP validation studies (completed and in progress):
  - Implementation and evaluation in nursing practice
  - Securing content and criteria validity
  - Cross-mapping, expert rating
  - Student theses

Each systematically revised nursing diagnoses is supported by a definition:

The patient is impaired in verbal communication due to motor aphasia (Broca's aphasia)

Impaired or lacking ability to actively participate in verbal communication after completion of language acquisition due to a central speech disorder with the lack of grammatical structures in the sentence structure as a leading symptom.

(DGN 2012, Wehmeyer et al. 2006, ICNP Aphasia [10002438], ICF Communicating with - receiving - spoken messages [d310], ICF Speaking [d330])

The revision history and the level of evidence (based on NANDA-I) is shown for the respective ENP nursing diagnosis:


<table>
<thead>
<tr>
<th><strong>Level of evidence:</strong></th>
<th>ENP practice guideline</th>
<th>ENP nursing diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LoE 3.2</strong></td>
<td><strong>LoE 3.2</strong></td>
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</table>
Systematic further development today

**European Nursing care Pathways (ENP), starting version**

**Influencing factors on the further development**
- Practice projects with institutions
- Findings of previous ENP validation studies
- New scientific findings (studies, guidelines, etc.)
- Analysis of user databases

**Elements of the systematic further development**
- a. Determination of the topics to be revised
- b. Determination of a revision strategy
- c. Systematic literature review and analysis
- d. Revision of the ENP catalogue and consensus
- e. Validation of the additions/changes/deletions

**European Nursing care Pathways (ENP), new version**

**Systematic translation of ENP (English, Italian, French, Spanish)**

Current topics in public health

Feedback from end users

Hypotheses for nursing research

14
Limits of ENP

• ENP can (and should) not replace the nurses expert knowledge

• ENP is not complete:
  – i.e about 23% of the NANDA-I nursing diagnoses can not be illustrated with ENP
  – About 18% of formulations in nursing care plans had to be added individually (2007)

• Currently, there are only a few validation studies which include a review of an entire practice guideline

• The operationalized scales for outcome measurement are partly not yet validated (e.g. own developments)

• ENP is not yet tested in some areas in practical use (e.g. recovery room, operating theatres, neonatal intensive care unit)

• Not all important questions for management, research and education can be answered from the data obtained with ENP

References: Wieteck 2007, Wieteck 2004, Berger 2010
Pflegeplanung leicht gemacht mit ENP

Planen und formulieren lernen

www.recom.eu/get-enp/

Pflegeplanung leicht gemacht mit ENP

Thank you for your attention!

Sebastian Kraus (skraus@recom.eu)
Any questions?