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Classification of Pressure Ulcers: A Systematic Literature Review

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Abstract. Different classifications of pressure ulcer are in use making national and international studies on epidemiological issues as well as on effects of prophylactical and therapeutical interventions difficult. A systematic literature search identified 31 pressure ulcer classifications. Thirteen could be retrieved and were further analyzed. Six variants of the International Classification of Diseases (ICD) differ totally in number of classes, hierarchical structure, characteristics included, and level of detail. They share only the fact of a "pressure ulcer". Recommendations of expert organizations and clinical classifications differ as well. The currently introduced grade "suspected deep tissue injury" in the classification proposed by the US-National Pressure Ulcer Advisory Panel (NPUAP) is neither present in the European Pressure Ulcer Advisory Panel (EPUAP) one, nor in the ICD variants. Being aware of the reliability issue in pressure ulcer diagnosis and grading, the situation is appalling. Furthermore, stage adjusted quality assessment, prophylaxis and therapy ends with the borders of a classification. We call the WHO to initiate a harmonization of the ICD variants of pressure ulcer classification and to cooperate with experts' organizations in this field, particularly with regard to the development of ICD-11. Reports on pressure ulcer should always mention the classification used.

Keywords: Pressure ulcer, classification, ICD-10

1. Introduction

Pressure ulcer is a harmful and costly complication of hospital care [1]. For Germany, it is assumed that 2 % of the hospitals budget is dedicated to its treatment [2]. About 5 % of a cohort and 10 % of a cross-sectional sample of inpatients will suffer from at least one pressure ulcer [3]. As consequence, prophylaxis as well as adequate treatment gain great attention. At the University Clinics Essen an interdisciplinary project started in 2002, striving for a reduction of nosocomial ulcers and an improvement of therapy [4]. Part of this project is a systematic recording of information about risk, status, and characteristics of pressure ulcers. Pressure ulcer stage is a necessary parameter to implement a stage-adapted therapy and to evaluate the effect of different treatment strategies. To that time, the German variant of the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) provided solely a code for pressure ulcer without any refinement (code L89) in analogy to the WHO's version.

Thus, the project started with a classification of pressure ulcers recommended by the European National Pressure Ulcer Advisory Panel (EPUAP). In 2004, the ICD-10 German Modification (ICD-10-GM 2004) introduced a further refinement of code L89.- not compatible with the EPUAP-approach (cf. table 1). Because the use of ICD-10-GM is legislatively obliged for hospitals in reimbursement and external quality assurance, the project team decided to switch to the new definition. A parallel use of both definitions will have decreased the reliability of pressure ulcer classifications that

is not obviously high [5]. In a current report on indicators for patient safety, the Organisation for Economic Co-operation and Development (OECD) highlights inconsistencies of pressure ulcer classification as well - even between national variants of the ICD-10 - in presenting differences between the German, the Canadian and the Australian ones [6]. Objectives of the presented work were to identify available classifications and staging systems for pressure ulcers and to analyze the overlap or inconsistencies between them.

Table 1 - Comparison of pressure ulcer grades between EPUAP and ICD-10-GM 2004. Affections of muscles are classified as grade 4 by EPUAP and grade 3 by ICD-10-GM 2004. The difference is already present in the current versions from EPUAP (cf. http://www.epuap.org/, 2008-07-02) and ICD-10-GM 2008 (shortening and translation of the definitions by the first author).

Grade	Definition EPUAP	Definition ICD-10-GM 2004
1	Non blanchable erythema	Non blanchable erythema (L89.1-)
2	Blister	Blister (L89.2-)
3	Superficial ulcer	Deep tissue defect, muscles and tendons are visible and might be affected (L89.3-)
4	Deep ulcer: Extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures	Deep tissue defect with affection of bones (L89.4-)

2. Material and Methods

We used a complex search strategy to identify relevant classifications for pressure ulcers. On the one hand we searched for articles in the literature database Medline via PubMed (http://www.pubmed.org/, 2008-03-05) with a combination of different terms for pressure ulcers (i.e. pressure ulcer, bedsore, bed sore, decubitus ulcer) with the terms „classification“ and „staging“. This search retrieves 507 references. On the other hand we looked at the WHO’s homepage (http://www.who.int/) for national variants of the ICD and used established search engines.
With that search strategy, we identified 31 classifications of pressure ulcers. From 13 different classifications we were able to obtain further information: 5 variants of the ICD-10, the ICD 9th Revision Clinical Modification (ICD-9-CM) 2007 from the US, recommendations of EPUAP and the National Pressure Ulcer Advisory Panel (NPUAP) from the US, and 5 clinical classifications, partly historically relevant. In detail the classifications are as follows:

- US-modification of the ICD-9 (ICD-9-CM 2007, cf. http://www.cdc.gov/nchs/about/otheract/icd9/abticd9.htm)
- Variants of the ICD-10
  - Version of the WHO (ICD-10-WHO 2007, cf. http://www.who.int/classifications/apps/icd/icd10online/)
  - Clinical Modification of the US (ICD-10-CM 2007, cf. http://www.cdc.gov/nchs/about/otheract/icd9/abticd10.htm)
  - Australian Modification (ICD-10-AM 2006) [7]

  - German Modification (ICD-10-GM 2008, cf. http://www.dimdi.de/static/de/klassi/diagnosen/icd10/htmlgm2008/fr-icd.htm)
  - Canadian Modification (ICD-10-CA) [8]
- Recommendations EPUAP (cf. http://www.epuap.org/gltreatment.html)
- Recommendations NPUAP (cf. http://www.npuap.org/pr2.htm)
- Clinical classifications
  - Classification by Yarkony and Kirk [9]
  - Classification by Eltorai and Chung (cited from [10])
  - Classification by Shea [11]
  - Classification by Guttmann [12]
  - Classification by Seiler (cited from [13])

In the following we will present selective results from our comparison of these 13 different pressure ulcer classifications.

3. Results

The WHO doesn‘t further differentiate pressure ulcers providing a single code, L89. The ICD-9-CM uses only the localization for the refinement of pressure ulcers, all other classifications use at least grades for grouping. There is no consent between the four national modifications of the ICD-10, concerning neither the localizations, nor the grading, or the interpretation of the codes. In consequence, the number of classes available for coding differs totally between the ICD variants (cf. table 2). Three examples should highlight the problems:

1. The ICD-10-CM reflects the localization in the fourth and fifth digit, the grade in the sixth digit of the code. The German, Canadian and Australian variants subdivide pressure ulcers with the grade first and then with the localization.
2. The ICD-10-CM defines a localization ankle, not present in the other national modifications.
3. The Canadian modification defines a stage „with necrosis involving muscle or bone“, not present in any other national variant.

Table 2 - Number of classes for pressure ulcers in the ICD variants.

Variant of the ICD	Number of classes for pressure ulcer
ICD-10-WHO 2007	1
ICD-9-CM 2007	9
ICD-10-CM 2007	125
ICD-10-AM 2006	5
ICD-10-GM 2008	50
ICD-10-CA	8

Also the definitions between the two expert organizations differ. Recently, NPUAP revised its recommendations and introduced a new stage „suspected deep tissue injury“. This is a wound suspected for a damage of underlying soft tissue with intact skin. But a corresponding class is missing in all variants of the ICD. Historically, a comparable stage was proposed by Guttmann as „closed ischial bursa“ [12] or by Shea as „closed large cavity“ [11].

4. Discussion

We analyzed 13 different pressure ulcer classifications retrieved with a systematic literature search. The 13 classifications show relevant differences, even if they share the same parents with the ICD-10-WHO. Differences in the number of provided classes, in the definition of grades, or in the used characteristics completely impede a comparison of pressure ulcers coded with different classifications. The opportunity to adapt the ICD-10 to national demands turns out to be an error, at least for pressure ulcers. WHO should make great efforts to harmonize the national children of the ICD-10-WHO and to establish a link to experts' organizations like EPUAP and NPAUAP to bring together the views of health politics and health care, at least with the ICD-11.

The replacement of a pressure ulcer classification by a description using a terminological system as SNOMED CT could be a solution in the medium term. A mapping from the description of a pressure ulcer - e.g. in a wound documentation system - to classes, could then support different grading schemes as well as different granularities and hierarchies of the classifications.

Further work will show, whether SNOMED CT captures not only standardized nursing terminology, as it was demonstrated by Park et al. [14], but also detailed daily language, as it is present for example in the definitions of NPUAP for stage III: *"Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling. Further description: The depth of a stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep stage III pressure ulcers. Bone/tendon is not visible or directly palpable."*

5. Conclusions

There is still a need for pressure ulcer classifications that support stage adjusted quality assessment, prophylaxis, and therapy. The minimal consent between the 13 classifications analyzed in this paper is "pressure ulcer" - and not more. Therefore, reports on pressure ulcers should always report the classification used. For the ICD-11 we recommend a solution similar to the ICD-10-AM [7]:

L89 Pressure ulcer
If the stage of a pressure ulcer could not be definitely determined, assign the code for the lower stage. If a patient has multiple ulcer sites of differing stages, assign only one code to indicate the highest stage.

L89.1 Pressure ulcer stage I
Pressure Ulcer limited to erythema only. The ulcer appears as a defined area of persistent redness (erythema) in lightly pigmented skin, whereas in darker skin tones, the ulcer may appear with persistent red, blue or purple hues, without skin loss.

L89.2 Pressure ulcer stage II
Pressure ulcer with abrasion, blister, partial thickness skin loss involving epidermis and/or dermis.

L89.3 Pressure ulcer stage III
Pressure ulcer with full thickness skin loss involving damage or necrosis of subcutaneous tissue extending to underlying fascia.

L89.4 Pressure ulcer stage IV

Pressure ulcer with necrosis of muscle, bone or supporting structures (i.e. tendon or joint capsule).

L89.9 Pressure ulcer, unspecified
Pressure ulcer without mention of stage.

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