Improvement of Mortality Statistics by MUSE

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Introduction

Causes of Death statistics (**CoD** statistics) is an important tool for health policies in the context of growing interest due to ageing of the population and for epidemiological research.

But there are **quality problems** caused by inappropriate certification at physician's level, in terms of inaccurate and missing diagnoses. Additionally non-uniform coding of death certificates is a cause of errors [2]. Andersohn et al. analyzed mortality rates of myocardial infarction and ischaemic heart disease. They found suspect mortality rates and trends in some German regions [3].

MUSE (**m**ulticausal and **u**nicausal **s**election **e**ngine) is a new software tool which supports the implementation of uniform coding practices and reduces daily workload of coding staff.
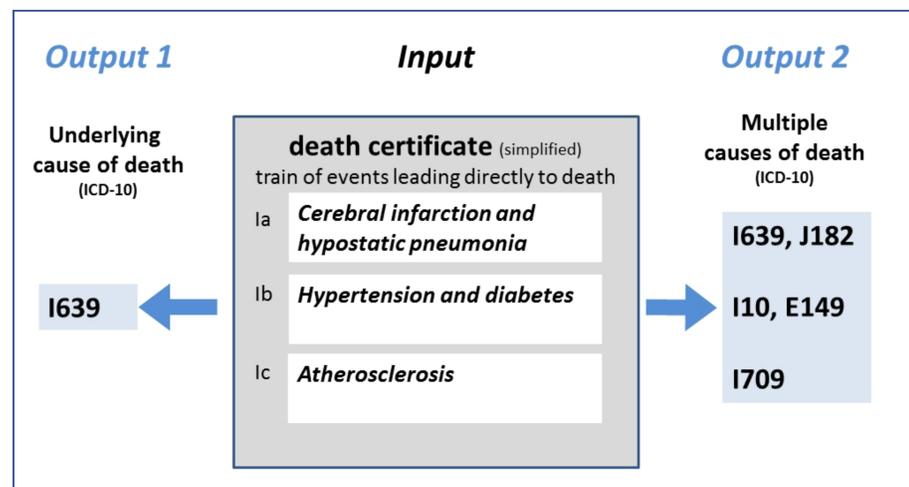
How does MUSE work?

Figure 1 Schema of MUSE data processing

Figure 2 User interface of MUSE

MUSE is a rulebased software tool which processes death certificates in accordance with the complex guidelines of International Statistical Classification of Diseases and Related Health Problems (**ICD-10**) [1].

Figure 1: In the center is a death certificate with a chain of medical diagnoses. The **originating cause of death** (**OC**) written down by the physician is atherosclerosis (code I709). MUSE generates two outputs: The **underlying cause of death** (**UC**) (left hand, code I639) and the **multiple causes of death** (**MC**) (right hand).

Figure 2: The *upper part* of the user interface contains the same medical diagnoses (in German) and the derived ICD-10-codes. The **coding log** (*lower part*) shows the way of automatic selection of UC. Here MUSE makes three decisions (column 2) for the selection of the UC being the main input to the CoD statistics. Temporarily and finally selected codes are in the third column. Coders see messages (column 5) explaining coding steps and the applied guidelines of ICD-10.

MUSE uses an **international mortality knowledge base** („decision tables") provided by the Iris Core Group [4]. MUSE decision logics can be modified simply by changing a configuration file.

Improvement of quality of CoD statistics ..

A) ...by standardization of coding practices
The most important advantage of MUSE is that coders are able to follow the complex decisions of the automatic coding system. The standardized approach is now part of daily coding work. Even less experienced coders can learn standardized coding easily.

B) ...by feedback of MUSE users
Feedback of MUSE users is used for the quality assurance of the coding system itself. A group of coding experts evaluates the feedback and submits proposals for improvement of MUSE and international decision tables.

C) ...by continuous monitoring of electronic data flow
Quality indicators Q1 and Q2 are applied for monitoring the data flow. The 2nd column of adjacent table shows the rates for „every day" certificates (N= 4155,

Q1	Percentage of certificates with automatically selected UC	**59,1 %**
Q2	Percentage of certificates, where UC (coder) and OC (physician) agree	**48,0 %**

data uploads of 20 local health authorities). Processed data also contain typing errors. After text correction Q1 increases significantly.

The indicators reflect both, the quality of medical documentation and the performance of the electronic coding system. They are used to control the improvement of documentation and adapting the MUSE tool.

Summary and outlook

MUSE is a **new software tool** which supports the correct and complete application of ICD-10-instructions during the **statistical preparation of death certificates**. The **variability** caused by different human coding practices can be minimized.

MUSE has been in **routine use since 2012**. Four German statistical offices process about 39 % of all German certificates (> 800.000 per year) with MUSE. After implementation of the new German eGovernment law and a subsequent change to electronic data transfer all regional offices will use MUSE for their daily flow of death certificates.

The Iris Core Group is evaluating MUSE for integration into the international **Iris software** [4]. The first test results are very promising: 95 % of the cases are in coincidence with the deprecated coding kernel of Iris.

References
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[2] Harteloh, P.; De Bruin, K.; Kardaun, J.: The reliablility of cause-of-death coding in The Netherlands, Eur J Epidemiol (2010) 25:531-538
[3] Andersohn, F.; Müller-Riemenschneider, F.; Willich, S. N.: Kodierungsprobleme in der deutschen Todesursachenstatistik am Beispiel ischämischer Herzkrankheiten; Gesundheitswesen 2011; Georg Thieme Verlag KG;
[4] Iris Core Group and Iris Institute: *https://www.dimdi.de/static/en/klassi/koop/irisinstitute/index.htm*